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NEW SMR POWER PLANT AT THE TEMELÍN SITE

ENVIRONMENTAL IMPACT ASSESSMENT DOCUMENTATION FOR THE PROJECT

September 2026

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List of abbreviations

AAC DG	alternate AC diesel generator
AC	alternating current
ALARA	as low as reasonably achievable
ALARP	as low as reasonably practicable
AMP	aging management program
AMSL	above mean sea level
AOPK ČR	Nature Conservation Agency of the Czech Republic
ARIS	Advanced Reactor Information System
ASEK	update of the State Energy Policy
ASME/ACI	American Society of Mechanical Engineers/American Concrete Institute
AT	Austria (international country code)
AV ČR	Czech Academy of Sciences
AZ	reactor core
BAPP	auxiliary service building for primary systems
BAT	best available techniques
BD	Birds Directive
BDBE	beyond design basis event
BN-JB	SÚJB's Safety Guideline for Nuclear Safety
BPEJ	evaluated soil-ecological unit
BS	British Standard
BWR	boiling water reactor
CDF	core damage frequency
CFR	US Code of Federal Regulations
CT	computed tomography
CZ	Czechia (international country code)
Ref. No.	reference number
ČBÚ	Czech Mining Authority
ČD	Czech Railways
ČEPS	part of the business name of ČEPS, a. s. (not an abbreviation)
ČEZ	part of the business name of ČEZ, a. s. (not an abbreviation)
ČGS	Czech Geological Survey
ČHMÚ	Czech Hydrometeorological Institute
ČJP	fresh nuclear fuel
ČNS	Czech Nuclear Society
ČOV	wastewater treatment plant
ČR	Czech Republic
ČS	Red List
ČSFR	Czech and Slovak Federal Republic
ČSÚ	Czech Statistical Office
ČÚZK	Czech Office for Surveying, Mapping and Cadastre
DBA	design basis accident
DBC	design basis conditions
DBE	design basis event
DDREF	dose and dose-rate effectiveness factor
DE	Germany (international country code)
DEC	design extension conditions
DEC-A	Design Extension Conditions without significant fuel degradation
DEC-B	Design Extension Conditions with severe fuel degradation
DFPC	duty fuel pool cooling
DiD	defense in depth
DL	detection limit
DMP 1G	Digital surface model of the Czech Republic, 1st generation
DNBR	departure from nucleate boiling ratio
DOK EIA	environmental impact assessment documentation for the project
DOKP	affected landscape area
DSR ETE	Detailed Seismic Zoning of the Temelín Nuclear Power Plant
DVL	Lower Vltava sub-basin

EC	European Commission
ECUREX	European Community Urgent Radiological Exercise
ECURIE	European Community Urgent Radiological Information Exchange
EDU	Dukovany Nuclear Power Plant
EGU HV	part of the business name of EGU - HV Laboratory a.s. (not an abbreviation)
EIA	environmental impact assessment
EM	external mobile
EMC	electromagnetic compatibility
EMI	electromagnetic interference
EMIT	examination, maintenance, inspection and testing
EN	depending on context: European standard *or* endangered species
ENVI	name of software for processing imagery and remote sensing data
EP	external pipeline
EPR	European Pressurized Reactor
ES	external stationary
ESOMAR	international professional organization for market, opinion and social research
ESTE AI	name of the software code used to calculate the radiological impacts of normal operation (ESTE Annual Impacts)
ESTE	Emergency Source Term Evaluation
ETE1,2	Units 1 and 2 of the Temelín Nuclear Power Plant
ETE3,4	proposed Units 3 and 4 of the Temelín Nuclear Power Plant
EU	European Union
EUR	European Utility Requirements
EURATOM	European Atomic Energy Community
EV	external water
EVC	ex-vessel cooling
EVL	Site of Community Importance
FBR	fast breeder reactor
FCVS	filtered containment venting system
FFPC	faulted fuel pool cooling
FL	flight level
FOAK	first of a kind
FPV	first person view
FRA	free route airspace
FVE	photovoltaic power plant
GA	general aviation
GCM	global climate model
GDA	generic design assessment
GFS	Global Forecast System
GGBS	ground granulated blast-furnace slag
GHG	greenhouse gas
GŘ HZS ČR	Directorate General of the Fire Rescue Service of the Czech Republic
HALEU	high-assay low-enriched uranium
HD	Habitats Directive
HEIS VÚV TGM, v.v.i.	Hydroecological Information System of the T. G. Masaryk Water Research Institute
HEPA	high-efficiency particulate air filter
HGR	hydrogeological region
HIA	health impact assessment
HLSF	high level safety functions
HMI	human-machine interface
HP	brown soils
HTÚ	bulk earthworks
HÚ	deep geological repository
HU	Hungary (international country code)
HVB	main generating unit
HVL	Upper Vltava sub-basin
HZS	Fire Rescue Service
CHKO	Protected Landscape Area
CHOPAV	Protected Area of Natural Water Accumulation
CHSK	chemical oxygen demand
CHV	cooling tower

IAEA	International Atomic Energy Agency
IAEA GSG	IAEA General Safety Guides
IAEA NSS	IAEA Nuclear Security Series
IAEA SSG	IAEA Specific Safety Guides
IAEA RANET	IAEA Response and Assistance Network
IAEA SEED	IAEA Site and External Events Design
ICNIRP	International Commission on Non-Ionizing Radiation Protection
ICOC	water abstraction identifier
ICRP	International Commission on Radiological Protection
ID No.	identification number
ID	identification
IDDS	data box identifier
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IEF	initiating event frequency
IFR	instrument flight rules
ICHS	ischemic heart disease
IM	internal mobile
IMS	integrated management system
INES	International Nuclear and Radiological Event Scale
IP	interaction element
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
ISVS-VODA	Public Administration Information System in Water Management
IT	information technology
IVR	in-vessel retention
IZS	Integrated Rescue System
NPP, NP	nuclear power plant, nuclear power
JJZ	south-south-west
JV	south-east
JZ	*based on context*: nuclear facility, south-west
cad. area	cadastral area
KA	cambisols
KB	České Budějovice control area
KN	Cadastre of Real Estate
KO	critically endangered (species)
KP	Písek control area
KŠ	crisis staff
LB LOCA	large-break loss of coolant accident
LBC	local biocenter
LBK	local biocorridor
LCA	life cycle assessment
LERF	large early release frequency
LNV	light goods vehicles
LOC	locus of control
LOCA	loss of coolant accident
LPG	liquefied petroleum gas
LPIS	Land Parcel Information System
LRF	large release frequency
LRKO	environmental radiation monitoring laboratory
LS	life satisfaction
LTO	*depending on context:* light heating oil *or* long-term operation
LWR	light water reactor
MAAE	International Atomic Energy Agency
MD	Ministry of Transport
MMR	Ministry for Regional Development
MO ČR	Ministry of Defence of the Czech Republic
MOX	mixed oxide fuel
MPO	Ministry of Industry and Trade of the Czech Republic
MQ	minimum flow

MSLB	main steam line break
MÚ	section manager
MV ČR	Ministry of the Interior of the Czech Republic
MV	Ministry of the Interior
MZd	Ministry of Health
MZe	Ministry of Agriculture of the Czech Republic
MZCHÚ	small-scale specially protected area
MZP	minimum residual flow
MZV	Ministry of Foreign Affairs
MŽP	Ministry of the Environment of the Czech Republic
NAP JE	National Action Plan for the Development of Nuclear Energy in the Czech Republic
NBK	supraregional biocorridor
NDOP	Nature Conservation Species Occurrence Database
NEA	Nuclear Energy Agency (NEA), part of the OECD
New NPP	New Nuclear Power Plant
New NPP ETE	New Nuclear Power Plant at the Temelín site
NM	nautical mile
NOAA	US National Oceanic and Atmospheric Administration
NP	National Park
NPP	National Nature Monument
NPR	National Nature Reserve
NRA	national regulatory authority
NRPB	UK National Radiological Protection Board (terminated organization)
NT	*depending on context:* low-pressure *or* near threatened
NUREG	publication series of the U.S. Nuclear Regulatory Commission (NRC)
O	endangered (species)
OBCH	commercial aviation
ObKR	landscape character area
OECD	Organisation for Economic Co-operation and Development
OHO	emergency response organization
ONR	UK Office for Nuclear Regulation
OOP KÚ	Nature Conservation Department of the Regional Authority
ORP	municipality with extended powers
OS	package
UN	United Nations
OV	passenger cars
OZE	renewable energy sources
PG	steam generator
PGA	peak ground acceleration
PGAhor	peak ground acceleration – horizontal component
PHWR	pressurized heavy water reactor
PCHR	passive containment heat removal
PIE	postulated initiating event
PIU	postulated initiating event
PL	Poland (international country code)
PO	Special Protection Area
PP	Nature Monument
PR	Nature Reserve
PřP	nature park
PSA	probabilistic safety assessment
PSHA	probabilistic seismic hazard assessment
PTM	puff trajectory model
PUPFL	land designated for the fulfillment of forest functions
PWR	pressurized water reactor
RAO	radioactive waste
RAS	dissolved inorganic salts
RBC	regional biocenter
RCM	regional climate model
REGCAT	Regional Catalog (of earthquakes)
RHWG	Reactor Harmonisation Working Group

RMU	radiation monitoring unit
ROI	region of interest
RR SMR	designation of the Rolls-Royce SMR reference project
RTG	X-ray examination/radiography
ŘLP ČR	Air Navigation Services of the Czech Republic
ŘSD ČR	Road and Motorway Directorate of the Czech Republic
ŘVC ČR	Directorate of Waterways of the Czech Republic
SAR	Safety Analysis Report
SASZ	small scale areal seismic source zones
SBO	station blackout
SCENIHR	European Commission's Scientific Committee on Emerging and Newly Identified Health Risks
SČP	fresh nuclear fuel storage facility
SDV	screening distance value
SEA	strategic environmental assessment
SEK	State Energy Policy
SEKM	Contaminated Sites Recording System
SG	steam generator
SGTR	steam generator tube rupture
SHARE	Seismic Hazard Harmonisation in Europe project
SK	Slovakia (international country code)
SKK	systems, structures and components
SKŘ	instrumentation and control system
SLDB	Population and Housing Census
SMR	small modular reactor
SMR ETE	New SMR power plant at the Temelín site
SO	strongly endangered (species)
SR	Slovak Republic
SRKO	environmental radiation monitoring station
SRN	Federal Republic of Germany
SSB	safety-related systems
SSP	shared socioeconomic pathways
SSV	north-north-east
SÚJB	State Office for Nuclear Safety
SÚRAO	Radioactive Waste Repository Authority
SÚRO	National Radiation Protection Institute, public research institution
SV	*depending on context:* total vehicles *or* north-east
SVJP	spent nuclear fuel storage facility
SW	software
SZ	north-west
SZÚ	National Institute of Public Health
SŽ	Railway Administration, state organization
TDS	teledosimetric system
TIC	time integral of concentration
TNR	reactor pressure vessel
TOC	total organic carbon
TSFO	physical protection system
TV	heavy vehicles
TVD	essential service water
ÚAN	area with archaeological finds
ÚCL ČR	Civil Aviation Authority of the Czech Republic
ÚFA	Institute of Atmospheric Physics of the Czech Academy of Sciences
ÚJV	part of the business name of ÚJV Řež, a. s. (not an abbreviation)
ÚKŠ	Central Crisis Staff
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
ÚP	spatial plan
ÚPD	spatial planning documentation
ÚPT	Temelín Spatial Plan
ÚRAO	radioactive waste repository
ÚRP	Spatial Development Plan

US EPA	United States Environmental Protection Agency
US NRC	United States Nuclear Regulatory Commission
USA	United States of America
ÚSES	Territorial System of Ecological Stability
USIE	IAEA's Unified System for Information Exchange in Incidents and Emergencies
ÚSKP	Central Register of Cultural Monuments
UTC	Coordinated Universal Time
ÚÚR	Institute for Spatial Development
ÚV	water treatment plant
ÚVZ SR	Public Health Authority of the Slovak Republic
V	east
VD	hydraulic structure
VE	hydroelectric power plant
VHS	water management system
VJP	spent nuclear fuel
VK	ventilation stack
VKP	significant landscape feature
VN	reservoir
VNO	Orlík Reservoir
VOJ	military aviation
VPEK	National Energy and Climate Plan of the Czech Republic
VPR	significant visual feature
VPZ	significant visual characteristic
VU	vulnerable species
VÚ	water body
VÚMOP	Research Institute for Soil and Water Conservation, public research institution
VVER	pressurized water reactor (Russian: Vodo-Vodyanoi Energetichesky Reaktor), the Russian designation for a PWR
VVN	high voltage
VZCHÚ	large-scale specially protected area
WebECURIE	web interface of the ECURIE system
WENRA SRL	WENRA safety reference levels
WENRA	Western European Nuclear Regulators Association
WHO	World Health Organization
YPLL	years of potential life lost
ZDČ	source term
ZHP	emergency planning zone
ZCHD	specially protected species
ZCHÚ	specially protected area
ZOO	zoological garden
ZOPK	Nature and Landscape Conservation Act
ZPF	agricultural land fund
ZÚR Jčk	Spatial Development Principles of the South Bohemian Region
ZÚR	spatial development principles
ZVN	extra-high voltage

Introduction

General

Environmental impact assessment documentation for the Project (hereinafter also referred to as the EIA Documentation or simply the Documentation)

NEW SMR POWER PLANT AT THE TEMELÍN SITE

(hereinafter also referred to as the Project) has been prepared pursuant to Section 8 and Annex No. 4 to Act No. 100/2001 Coll., on Environmental Impact Assessment, as amended (hereinafter also referred to as the Act). The purpose of the Documentation is to provide basic information on the Project and to identify, describe, assess, and evaluate the anticipated direct and indirect environmental impacts of both implementation and non-implementation of the Project, as required by the Act.

The Documentation was prepared between July 2025 and September 2026.

Before the Documentation was prepared, the Project notification (Jacobs Clean Energy s.r.o., October 2024) was prepared and published, on the basis of which the screening and scoping procedure was conducted. The conclusion of the screening and scoping procedure (MŽP ČR, Ref. No. MZP/2025/710/1972 dated 7 July 2025) has been taken into account in this Documentation (for further details, see chapter Requirements of the conclusion of the screening and scoping procedure, page 22 of this Documentation).

Formal content of the Documentation

In formal terms, the content of the Documentation complies with the requirements of the Act.

The Documentation is structured in accordance with Annex 4 to the Act (Requirements for the Documentation), the requirements of which are strictly observed. The headings of the subsections of this Documentation corresponding to the statutory structure always include the full statutory wording in smaller type below the heading, while the main headings are, in some cases, shortened where appropriate. For example:

C.II.
CHARACTERISTICS OF THE CURRENT STATE
OF THE ENVIRONMENT IN THE AFFECTED TERRITORY

2. Characteristics of the current state of the environment and landscape in the affected territory and a description of their components or characteristics which may be affected by the Project, in particular the air (e.g. air quality status), water (e.g. hydromorphological conditions in the area and their changes, quantity and quality of water, etc.), land and soil (e.g. the proportion of undeveloped areas, the proportion and condition of agricultural and forest land, the state of erosion risk and soil degradation, land take, erosion, compaction and sealing), natural resources, biodiversity (e.g. the state and diversity of fauna, flora, communities, ecosystems), climate (e.g. impacts related to climate change, vulnerability of the area to the impacts of climate change), population and public health, material assets and cultural heritage, including architectural and archaeological aspects

In some cases, the legal structure is sub-divided into lower level chapters. This division is not specified by the Act but has been chosen by the author of the Documentation in order to present the data in a clear manner. The titles of subsections of this Documentation, which correspond to the extended embedded structure, no longer contain the full legal text under the chapter title. For example:

C.II.7. Biodiversity

The selected structure covers the full range of environmental and public health aspects defined by the Environmental Impact Assessment Act and is as follows:

1. Population and Public Health
2. Air and Climate
3. Noise and other physical and biological characteristics
4. Surface and Ground Waters
5. Land
6. Natural resources
7. Biodiversity
8. Landscape
9. Material assets and cultural heritage
10. Transport and other infrastructure
11. Other

This structure is consistently followed both in Part C.II. of the Documentation, which describes the state of the environment, and in Part D.I. of the Documentation, which describes environmental impacts. Corresponding data can thus be easily matched (for example: C.II.8. Landscape - D.I.8. Impacts on landscape).

As the structure specified in the above Annex to the Act is relatively extensive, a brief overview of its contents is provided below:

PART A (INFORMATION ON THE DEVELOPER) contains identification details of the Project developer (investor) and its authorized representative.

PART B (INFORMATION ON THE PROJECT) contains information on the Project. It is divided into several subsections:

- Part B.I. contains basic information on the Project, in particular its name, capacity, location, and technical solution, as well as a list of the affected regions, towns and municipalities and a list of the authorities responsible for subsequent proceedings,
- Part B.II. contains information on inputs, i.e. the Project's requirements for land take, the consumption of utilities and resources (e.g. water and other inputs), and transport,
- Part B.III. contains information on outputs, i.e. emissions to air, wastewater discharges and waste generation, noise generation, radiation emissions and, where applicable, other outputs to the environment.

PART C (INFORMATION ON THE STATE OF THE ENVIRONMENT IN THE AFFECTED TERRITORY) contains information on the current state of the environment in the affected territory and its development trends.

PART D (COMPREHENSIVE DESCRIPTION AND ASSESSMENT OF THE PROJECT'S IMPACTS ON THE ENVIRONMENT AND PUBLIC HEALTH) contains the final description and results of the assessment of the Project's impacts on the population and the environment. It is divided into several subsections:

- Part D.I. contains the characteristics of impacts on the population and the environment and an assessment of their magnitude and significance,
- Part D.II. contains the characteristics of environmental risks associated with potential accidents and abnormal conditions,
- Part D.III. contains comprehensive characteristics of environmental impacts, including an assessment of the potential for transboundary impacts,
- Part D.IV. contains the characteristics of measures to prevent, avoid, reduce or, where appropriate, compensate for adverse environmental impacts,
- Part D.V. contains the characteristics of the methods used in the environmental impact assessment (the approach and methods used to prepare the Documentation and its individual parts),
- Part D.VI. contains the characteristics of difficulties (i.e. deficiencies in the underlying information and uncertainties) encountered in the preparation of the Documentation.

PART E (COMPARISON OF PROJECT OPTIONS) contains information on the assessment of Project options (if submitted).

PART F (CONCLUSION) contains a summary conclusion.

PART G (NON-TECHNICAL SUMMARY) contains a generally comprehensible non-technical summary.

PART H (ANNEXES) contains annexes, i.e. maps, surveys, and expert studies prepared as part of the Documentation, as well as, where applicable, other materials providing further details on individual environmental aspects. Related supporting documents and other required elements of the Documentation are also attached here.

In view of the above structure, the following recommendation is made to readers of the Documentation. Readers interested only in general information are referred to PART G (NON-TECHNICAL SUMMARY), page 502 of this Documentation, which summarizes the conclusions of the Documentation in a concise and accessible form, although without presenting the supporting evidence for the statements made. More detailed information can be found in the relevant chapters of the Documentation; readers should bear its formal structure in mind and locate the required information in the respective chapters. More detailed information is provided in the Annexes to the Documentation, although these have only been prepared for the most significant areas assessed.

Substantive content of the Documentation

In terms of substance, and in accordance with the requirements of the Act, the Documentation deals with all relevant environmental components, including public health.

However, the various environmental aspects may be affected by the impacts of the Project to differing degrees. The applicable legislation does not permit certain environmental aspects considered less significant for the assessment to be excluded; the assessment must be carried out in full. This is respected in the Documentation. Therefore, some environmental compartments are given greater attention, proportional to their importance. In this respect, particular account is taken of the nature of the Project (which is a nuclear facility) and of the affected territory (which contains other nuclear facilities). Therefore, the Documentation pays particular attention to the question of ionizing radiation and its related impacts (in particular in the sphere of impacts on the population and public health), including taking into account the Project's concurrent impacts together

with other nuclear facilities on the site. Increased attention is also paid to impacts on climate, impacts on water, impacts on biodiversity (with particular regard to species of Community interest, birds, and habitats of Community interest), and impacts on the landscape.

Particular attention is also paid to the assessment of the risks of accidents or abnormal conditions with potentially adverse environmental consequences.

The substantive content of the Documentation is also based on the requirements set out in the conclusion of the screening and scoping procedure (MŽP ČR, Ref. No. MZP/2025/710/1972 dated 7 July 2025), which specifies particular requirements for the content of the Documentation. These requirements are complied with in full (for further details, see chapter Requirements of the conclusion of the screening and scoping procedure, page 22 of this Documentation).

Methodological preparation of the Documentation

Basic methodological assumptions

One of the basic methodological approaches in environmental impact assessment, and in the nuclear field as well, is a focus on a conservative (safe-side) assessment. Therefore, development of the Documentation is strictly subject to a conservative approach. This means that, for the purposes of the environmental assessment, all data used for the impact assessment are considered conservatively, i.e. at values that are less favorable. Only in this way can it be ensured that the assessment procedures capture all impacts at their potential maximum levels. To this effect, several instruments are applied:

- consideration of conservative environmental parameters of the Project,
- consideration of all combined effects,
- consideration of all phases of the Project life cycle,
- consideration of all environmental aspects,
- consideration of abnormal conditions or extraordinary events, and
- consideration of transboundary impacts.

Characteristics of these instruments are as follows:

Consideration of conservative environmental parameters of the Project

In preparing the Documentation, the environmental parameters of the Project and its individual components are considered at bounding levels determined, inter alia, by legislative requirements in both the environmental field and, in particular, under the Atomic Act and its implementing regulations. The resulting bounding envelope of environmental parameters (Parameters Envelope) is used for the assessment of environmental impacts. The results of the environmental assessment can therefore be evaluated in the knowledge that the actual impact of the selected solution will be lower than the predicted impact. The assessment results are therefore independent of the technical solutions proposed by potential suppliers or their designs[1].

This methodology is used worldwide to assess the environmental impacts of nuclear and other sites, is recommended by the International Atomic Energy Agency[2], and is also recognized by supervisory bodies. Although the Documentation therefore provides basic technical and technological information on a specific reference design (see Chapter B.I.6.3. Project-specific information, page 99 of this Documentation), the final selection of the Project supplier is not part of the EIA process. The environmental and safety requirements are the same for all suppliers, and the impacts are assessed at their maximum levels. The subsequent selection of the supplier therefore cannot be detrimental to the protection of the environment and public health.

The envelope of environmental parameters is evident from Chapters B.I.6. Description of the technical design (page 79 of this Documentation), B.II. DATA ON INPUTS (page 195 of this Documentation) and B.III. DATA ON OUTPUTS (page 201 of this Documentation).

Consideration of all combined effects

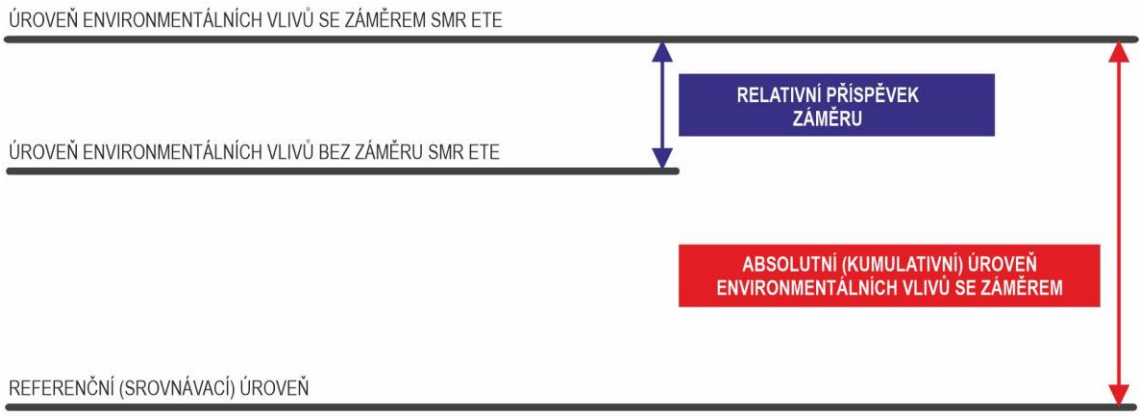
The Documentation assesses not only the individual impact of the New SMR Power Plant at the Temelín site, i.e. its relative contribution to the environmental burden, but, in particular, also takes into account the combined (cumulative/synergistic) effects of all facilities at the site and the environmental background. In addition to the New SMR Power Plant at the Temelín site (SMR ETE), which is the principal subject of the assessment, account is therefore also taken of the impact of the existing Temelín NPP (ETE1,2), the planned New Nuclear Power Plant at the Temelín site (New NPP ETE), and other nuclear facilities at the Temelín site.

[1] For the avoidance of doubt, however, the Documentation also provides a description of the technical and technological solution of the preferred reference supplier's design. In general, however, the supplier of the new nuclear power plant (SMR ETE) may be any other manufacturer whose design complies with the bounding parameters used for the environmental impact assessment (as well as, of course, all other statutory requirements outside the EIA process).

[2] IAEA NG-T-3.11 Managing Environmental Impact Assessment for Construction and Operation in New Nuclear Power Programmes.

The principle of taking into account the combined effects is shown in the following figure.

Fig. 0.1: Principle of taking into account the combined effects



ÚROVEŇ ENVIROMENTÁLNÍCH VLIVŮ SE ZÁMĚREM SMR ETE	LEVEL OF ENVIRONMENTAL IMPACTS WITH THE SMR ETE PROJECT
ÚROVEŇ ENVIROMENTÁLNÍCH VLIVŮ BEZ ZÁMĚRU SMR ETE	LEVEL OF ENVIRONMENTAL IMPACTS WITHOUT THE SMR ETE PROJECT
RELATIVNÍ PŘÍSPĚVEK ZÁMĚRU	RELATIVE CONTRIBUTION OF THE PROJECT
ABSOLUTNÍ (KUMULATIVNÍ) ÚROVEŇ ENVIROMENTÁLNÍCH VLIVŮ SE ZÁMĚREM	ABSOLUTE (CUMULATIVE) LEVEL OF ENVIRONMENTAL IMPACTS WITH THE PROJECT
REFERENČNÍ (SROVNÁVACÍ) ÚROVEŇ	REFERENCE (COMPARISON) LEVEL
REFERENČNÍ (SROVNÁVACÍ) ÚROVEŇ	REFERENCE (COMPARISON) LEVEL

Consideration of all life cycle phases

The Documentation takes into account all phases of the Project life cycle. In addition to the operation phase, the construction phase and, at a conceptual level[1], the decommissioning phase are therefore also assessed.

Consideration of all environmental aspects

The Documentation addresses all areas of the environment. It therefore addresses impacts on the population and public health, impacts on air and climate, impacts of noise and other physical and biological factors (including, in particular, the impacts of ionizing radiation), impacts on surface water and groundwater, impacts on land, impacts on natural resources, impacts on biodiversity, impacts on the landscape, impacts on material assets and cultural heritage, impacts on transport and other infrastructure, and any other environmental impacts.

Also, the Documentation takes into account the cross-links between the individual areas of the environment.

Consideration of abnormal conditions or extraordinary events

In addition to normal operation, the Documentation also assesses potential abnormal conditions or extraordinary events, including both abnormal operating conditions and accident conditions, the latter comprising design basis accidents and design extension conditions.

Consideration of transboundary impacts

The Documentation includes the assessment of transboundary impact, i.e. environmental impact on the territory of the nearest neighboring states. Both operational states of the Project and accident conditions are taken into account.

Method for assessing the environmental impacts of the Project

The assessment method is laid down in Section 5 of Act No. 100/2001 Coll., on Environmental Impact Assessment, as amended, the requirements of which are as follows:

(1) The assessment includes the identification, description, assessment, and evaluation of the anticipated direct and indirect significant environmental impacts of both implementation and non-implementation of the Project.

[1] Under the Act, decommissioning is subject to a separate assessment, which will be carried out at the appropriate time. Therefore, the data referred to in this Documentation are necessarily preliminary.

(2) For a long-term project, its individual phases are assessed separately and in the context of the impacts of the Project as a whole.

(3) The assessment of the Project covers environmental impacts during its preparation, implementation, operation, and possible termination, as well as, where applicable, the consequences of its dismantling and the subsequent remediation or reclamation of the territory where an obligation to carry out remediation or reclamation is imposed by specific legislation. The assessment covers the impact related to the normal operation of the Project as well as the impact resulting from the vulnerability of the Project to severe accidents or disasters, which are relevant to the given Project.

(4) The assessment of the Project also includes proposed measures to prevent possible significant adverse environmental impacts resulting from implementation of the Project, to avoid, reduce, mitigate, or minimize such impacts, or, where appropriate, to enhance beneficial environmental impacts resulting from implementation of the Project, including an evaluation of the anticipated impacts of the proposed measures, as well as proposed measures to monitor possible significant adverse environmental impacts where such measures do not arise from the requirements of other legislation.

These requirements are respected in the Documentation as follows:

(1) The Documentation contains the impact assessment for both the implementation option (i.e. Project implementation) and the zero option (i.e. Project non-implementation). The zero option means maintaining the existing state of the environment or its development trends.

(2) The Project is not divided into several individual phases that would be assessed separately[1].

(3) The Documentation includes an assessment of the period of operation of the Project (which is the primary subject of the assessment), as well as the periods of its preparation and implementation and its termination. Under the Act, termination of operation of the Project is considered a separate project for which an environmental impact assessment must be carried out. Termination of operation of the Project will therefore be subject to a separate environmental impact assessment process, which will be carried out as part of its preparation. In this Documentation, termination of operation is therefore only considered in the broader context of the impacts of the Project as a whole, and is assessed to the extent permitted by the information available at the time the Documentation is prepared, which, particularly for more distant time horizons, is necessarily of a more strategic or conceptual nature.

In addition to normal operation, the Documentation also takes into account the possibility of an accident (i.e. accident conditions in the terminology of the Atomic Act). This issue is addressed at the environmental level (assessment of environmental impacts under accident conditions); however, this must not be confused with an assessment of the level of nuclear safety of the Project from a technical or organizational perspective. For further details on this issue, see the subsection below, Method for taking account of nuclear safety, radiation protection, technical safety, radiation extraordinary event management, and security issues.

(4) The Documentation contains proposed relevant measures, including the monitoring of the environmental impacts of the Project. Measures arising from generally binding regulations are not specifically listed, since a declaration of compliance with the requirements of generally binding regulations cannot itself be regarded as a measure. It is assumed that statutory requirements are, or will be, complied with and that compliance will be monitored by the competent supervisory bodies. The Documentation therefore focuses in particular on measures that go beyond the framework of generally binding regulations.

Method for taking account of nuclear safety, radiation protection, technical safety, radiation extraordinary event management, and security issues

The Documentation has been prepared under Act No. 100/2001 Coll., on Environmental Impact Assessment, as amended. Both the content and the scope of the Documentation are adapted to the requirements of that Act. The Documentation is therefore not a document prepared under Act No. 263/2016 Coll., the Atomic Act, as amended, or its implementing decrees.

Although some overlap between environmental and nuclear issues in the Documentation is unavoidable, the content of the Documentation is particularly focused on its principal purpose, which is the environmental impact assessment. The terminology used has been adapted accordingly and is based primarily on conventions used in environmental impact assessment. Where the Documentation contains information relating to nuclear matters (technical and organizational information, including information on the assurance of nuclear safety, radiation protection, technical safety, radiation extraordinary event management, and security), this information concerns matters that are, or will be, addressed in other documents and other proceedings conducted outside the environmental impact assessment process. In such cases, these matters are not the subject of the Documentation but constitute input or supporting information which, although described and commented on, is not itself subject to assessment.

The environmental impact assessment documentation therefore does not replace the safety or other documentation under the scheme of the Atomic Act.

[1] However, decommissioning of the Project (which constitutes a separate project under the Act) will be subject to a separate assessment, which will be carried out when its preparation takes place. Likewise, the spent nuclear fuel storage facility (which constitutes a separate project under the Act) will be subject to a separate assessment, which will therefore be carried out when that project is prepared. The overall context of these projects is taken into account in the Documentation.

Completion of the environmental impact assessment is a necessary prerequisite for the issuance of subsequent permits for the siting and construction of the Project. Therefore, the environmental impact assessment must take place prior to the issue of subsequent licenses. It is thus anticipated in the development of the Documentation that all requirements of the Atomic Act (and in general any act) will be met. It does not matter that this will only happen at a later stage. What is essential is that all statutory requirements will have been met by the time all subsequent permitting decisions are issued. Conversely, if all statutory requirements are not met, it is reasonably assumed that the Project will not be implemented.

Definition of the affected territory and area of interest

The Documentation uses the terms

- affected territory and
- area of interest,

which have different meanings. They are defined as follows:

Affected territory:	For the purposes of Section 3 of Act No. 100/2001 Coll., on Environmental Impact Assessment, as amended, the affected territory means the territory "whose environment and population could be significantly affected by implementation of the Project". According to this definition, the affected territory is limited to the Project site and its surroundings. According to the results of the assessment of impacts on the individual environmental aspects and public health, no significant impacts on the environment and/or population occur over a wider area.
Area of interest:	For the purposes of preparing the Documentation (conducting surveys and assessments), a so-called area of interest is considered during its preparation, the extent of which varies according to the individual environmental aspects. The area of interest thus defined for working purposes is more general than the affected territory and is also considerably wider. Potential impacts are therefore analyzed over a wider area (including consideration of the potential for transboundary impacts), while the actual description and assessment of impacts are carried out only over the distances within which they can realistically occur.

Requirements of the conclusion of the screening and scoping procedure

Before preparation of the Documentation, a screening and scoping procedure pursuant to Section 7 of the Act was carried out, the purpose of which was to specify the information that should be included in the environmental impact assessment documentation for the Project. The conclusion of the screening and scoping procedure issued by the Ministry of the Environment (Ref. No. MZP/2025/710/1972 dated 7 July 2025) states that the Documentation pursuant to Annex No. 4 to the Act must be prepared with particular emphasis on the following areas[1]:

1. As part of the justification of the need for and location of the Project and the proposed options:

a) provide a detailed justification of the location of the Project with regard to existing and planned nuclear facilities at the site,

b) provide additional justification for the proposed Project as a small modular reactor (hereinafter "SMR"), given the proposed electrical output of up to 500 MW_e,

c) justify the need for the Project in terms of the energy and strategic needs of the Czech Republic, including consideration of electricity generation from renewable energy sources,

d) justify the construction of the New SMR Power Plant, specifying all benefits, anticipated costs (detriments), and risks to society, including consideration of both anticipated and potential radiation exposure of the environment, the population, and individuals throughout the entire process (from construction through to dismantling),

e) state whether the energy generated is to be used solely for electricity generation or also for heat generation, and explain how the different utilization options (electricity only vs electricity + heat) would affect site selection,

f) assess the impact of electricity generation by the SMR on greenhouse gas emissions (particularly CO_2), taking into account the entire life cycle,

g) assess the efficiency of the selected SMR technology in terms of the amount of radioactive waste generated per unit of electrical (or thermal) energy produced,

h) develop the zero/reference option in greater detail and provide a general comparison of the environmental and public health impacts of the implementation option with those of the zero option.

Addressing the requirements:

ad a) Information on Project location is provided in Chapter B.I.5.1. Justification of the Project location (page 72 of this Documentation), specifically in subsection B.I.5.1.1. Information justifying the Project location.

The Project location is based on the concept for the Temelín site as expressed in spatial planning documentation, the provision of connections to the necessary infrastructure systems, and consideration of statutory requirements for the siting of a nuclear power facility.

ad b) Information on small modular reactors and their output is provided in Chapter B.I.6.2.1. Basic information on nuclear power plants (page 80 of this Documentation), specifically in subsection B.I.6.2.1.5. Small modular reactors.

The designation of the Project as a small modular reactor (SMR) is based on the commercial designation used by its reference supplier, Rolls-Royce plc. Although the proposed output of up to 500 MW_e is higher than the usual definition of the output of a small reactor (which, however, is not standardized in any way and, according to an earlier IAEA definition, is generally stated as up to 300 MW_e), the Project exhibits all the characteristics of a small modular reactor, namely a compact design, modularity associated with factory manufacture of components, an efficient fuel cycle, and advanced control and safety systems. The SMR designation therefore reflects not only its size and output (which are in fact small compared with standard large nuclear units currently in operation or under development, with outputs of 1000–1700 MW_e), but above all the modular approach to manufacture and construction.

The current document Technical Reports Series No. 499 - Considerations on Decommissioning in the Design of Small Modular Reactors (IAEA, 2026) then provides the following definition: In terms of power output, small and medium sized or modular reactors are defined as "small" reactors with an equivalent electrical output of less than 300 MW_e, or "medium sized" reactors with an equivalent electrical output of between 300 and 700 MW_e. The SMR ETE Project falls within this definition in terms of its output.

ad c) Information justifying the need for the Project is provided in Chapter B.I.5.1. Justification of the Project location (page 72 of this Documentation), specifically in subsection B.I.5.1.2. Information justifying the need for the Project.

The need for the Project is based on consideration of the strategic documents of the Czech Republic, in particular the National Action Plan for the Development of Nuclear Energy in the Czech Republic (NAP JE), the Plan for Small and Medium Sized Reactors in the

[1] The numbering of the individual areas corresponds to the conclusion of the screening and scoping procedure.

Czech Republic, the National Energy and Climate Plan of the Czech Republic (VPEK), which establishes the framework for the share of electricity generation from individual sources, including generation from renewable energy sources, and the updated State Energy Policy of the Czech Republic (ASEK, under preparation).

ad d) The data to justify the need for the Project are provided in Chapter B.I.5. Justification of the Project location and description of the options considered (page 72 of this Documentation). Radiation exposure is a principal subject of the Documentation and is addressed in Chapter D.I.3.2. Impacts of ionizing radiation (page 345 of this Documentation) and, in the case of accident exposure, in Chapter D.II.1. Radiation risks (page 429 of this documentation).

The Project is consistent with the strategic documents of the Czech Republic in the fields of energy and climate, and its implementation will contribute to achieving the objectives set out in those documents. The Project therefore offers benefits in terms of energy security, self-sufficiency, and climate protection.

ad e) The SMR Project envisages that the energy generated will be used exclusively for electricity generation. Infrastructure for heat supply already exists at the site (hot-water pipelines from Units ETE1,2 to Týn nad Vltavou and České Budějovice); this eliminates the need for an additional heat source and allows the reactor location to be optimized primarily with regard to electrical infrastructure, cooling water availability, geotechnical conditions, and safety requirements, without the need to provide a connection to district heating systems.

ad f) The impact of the Project on greenhouse gas emissions is assessed in Chapter D.I.2.2. Impacts on climate (page 334 of this Documentation), specifically in subsection D.I.2.2.2. Impacts on global climate.

In terms of greenhouse gas emissions (expressed as CO_2 equivalent over the entire life cycle), nuclear power plants, including the SMR Project in question, rank alongside renewable energy sources.

ad g) Information on the anticipated production of radioactive waste from the SMR is provided in Chapter B.III.4. Other (page 203 of this Documentation), specifically in the subsection Ionizing Radiation – Radioactive Waste.

The estimated production of radioactive waste from the SMR is provided in the updated Policy for Radioactive Waste and Spent Nuclear Fuel Management in the Czech Republic (2025–2035 with an outlook beyond 2050), which corresponds to the national program under Council Directive 2011/70/Euratom establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste. This policy conservatively assumes that RR SMR will generate a greater quantity of operational radioactive waste than the New NPP, by approximately +10% (per unit of output). In accordance with the above policy, production of up to 55 m^3 of conditioned radioactive waste per year per 1 GW_e of installed capacity is therefore assumed. The radioactive waste management system will be designed and operated in a manner similar to that used at existing nuclear power plants in the Czech Republic and will fully comply with the requirements of the above policy, Czech legislation, and SÚJB requirements.

ad h) Information on the alternative solutions is provided in Chapter B.I.5.2. Description of the options considered (page 78 of this Documentation); a general comparison of the impacts of the implementation option and the zero option is discussed in chapter PART E (COMPARISON OF PROJECT OPTIONS) (page 497 of this Documentation).

The zero option relates exclusively to the Project involving a single-unit New SMR Power Plant at the Temelín site and, in substantive terms, means non-implementation of this Project. It is considered the reference option, with its impacts being represented by the existing state of the environment in the affected territory, or its development trends, as described in Chapter C.II. CHARACTERISTICS OF THE CURRENT STATE OF THE ENVIRONMENT IN THE AFFECTED TERRITORY (page 208 of this Documentation). The zero option does not in any way concern the operation of other nuclear facilities at or outside the Temelín site, or other energy policy instruments (other methods of electricity generation and/or electricity savings).

2. As part of the description of the technical design:

a) define and describe the technical and environmental legislative requirements applicable to SMRs, with emphasis on the safety aspects of the design, environmental protection, and public health, including requirements arising from European and international standards (WENRA and IAEA), and demonstrate the use of best available techniques (BAT),

b) provide a technical and technological description of the reactor types considered and describe the principle for selecting a specific reactor type,

c) describe and assess the entire life cycle of the New SMR Power Plant for each reactor type considered, including a basic assessment of the anticipated method of termination of operation and decommissioning, provide further information on service life, the life cycle management program, and aging management, and provide a clear Project implementation schedule covering construction, operation, and decommissioning, including links to the life cycles of other nuclear facilities at the site,

d) describe how operation of the facility will be ensured under conditions of limited cooling water availability, including technical and organizational measures in the event of water shortage,

e) describe the concept for the safety classification of safety-related equipment, with particular emphasis on the classification of emergency power supply systems,

f) describe and demonstrate the existence of separate, redundant, and independent systems for shutting down the facility,

g) describe passive systems requiring a power supply and explain their redundancy and diversity,

h) where applicable, identify active backups to passive systems in the event of their failure,

i) describe the nuclear fuel replacement procedure,

j) describe the safety concept and basic safety criteria, and how compliance with them is ensured in accordance with the regulations and requirements referred to in point 2(a),

k) set out the principles and concepts of the SMR safety systems, including a basic description of components important to safety,

l) describe the main principles of physical protection and how protection against terrorist attacks, including cyberattacks and sabotage, and emerging threats (quantum computers, artificial intelligence) is ensured,

m) describe the protection of the containment and other structures important to safety against external impacts such as earthquakes, extreme meteorological conditions, fire, and aircraft crash, describe the leak-tightness functions of the containment, and specify which combinations of hazards were considered and the results obtained,

n) describe how radiation extraordinary event management is ensured from the commencement of construction of the New SMR Power Plant, taking into account the potential impact of a possible radiation accident at the ETE nuclear facility already in operation,

o) describe how nuclear safety is ensured at nuclear facilities already in operation at the site, including from the commencement of SMR construction,

p) set out the defense in depth concept,

q) as part of radiation emergency preparedness and planning, describe the structure of the facility's internal crisis staff, the protective measures adopted, information on available shelters, and information on the emergency planning zone,

r) describe passive safety features,

s) describe the measures addressing hydrogen accumulation during accidents,

t) describe the principle for ensuring safety in the event of a station blackout,

u) describe the concept for ensuring emergency water and electricity supply,

v) examine and assess the possibility of transporting construction materials by rail to the maximum extent practicable,

w) examine and assess the possibility of power evacuation via underground lines and the possibility of relocating the planned power line farther away from the municipality of Kočín,

x) provide additional information on transport modes and routes for the transport of nuclear fuel, spent nuclear fuel, or radioactive waste, including whether transboundary transport will take place and whether dedicated transport infrastructure will be constructed, and analyze the risks associated with transport.

Addressing the requirements:

ad a) The technical and environmental legislative requirements are documented and described in Chapter B.I.6. Description of the technical design (page 79 of this Documentation), specifically in subsection B.I.6.2.2. Basic requirements for nuclear power plants (page 86 of this Documentation), covering legislative requirements, including requirements arising from European and international standards (WENRA, IAEA).

In this respect, the requirement to use best available techniques is a standard legislative requirement arising from the Atomic Act. The Project must comply with the requirements to reflect the current state of science and technology and good practice; this is a mandatory condition. Compliance with the requirements of the Atomic Act will be demonstrated in proceedings conducted under the Atomic Act and verified by the competent supervisory body (SÚJB). It is therefore not a subject of the EIA process. This also applies to the other relevant points and is not repeated below. Note: The EIA Act only requires comparison with best available techniques for projects falling under the Integrated Pollution Prevention Act; this condition is not met in the case under assessment.

ad b) The technical design of the reactor types considered (reference design) is provided in Chapter B.I.6. Description of the technical design (page 79 of this Documentation); information on the method for selecting a specific reactor type is provided in Chapter B.I.5.2. Description of the options considered (page 78 of this Documentation).

An essential point in this respect is that the selection of a specific design type or its supplier is not the subject of the environmental impact assessment. All environmentally relevant Project parameters (the environmental parameters envelope) are available for the environmental impact assessment even without knowledge of the specific reactor supplier. Although this Documentation therefore provides information on the RR SMR reference design, the Project supplier may be either the manufacturer of the reference reactor

type or another manufacturer whose design complies with the bounding parameters used for the environmental impact assessment and, at the same time, with all other statutory requirements, particularly those applicable to nuclear power facilities.

ad c) Information on the Project life cycle, service life, life cycle management program, aging management, and other relevant information is provided in Chapter B.I.6.3. Project-specific information (page 99 of this Documentation). The Project is described and assessed for the period of operation, as well as for the periods of construction, termination of operation, and decommissioning. It should be added that, for the purposes of the Environmental Impact Assessment Act, termination of operation and decommissioning constitute separate activities that will be subject to assessment at the appropriate time. For this reason, the information provided in this Documentation is necessarily preliminary.

A clear Project implementation schedule in relation to the life cycle of other nuclear facilities is provided in Chapter B.I.6.4.2. Schedule for construction, operation, and decommissioning of other facilities at the site (page 190 of this Documentation).

ad d) Information on the provision of cooling water and operation under conditions of limited cooling water availability is provided in Chapter B.I.6.3.3. Operating concept (page 175 of this Documentation), specifically in subsection B.I.6.3.3.5. Water connections and systems.

Based on the assessment of cooling water availability, the reliability of water supply for the Project is adequate, including when the combined (cumulative) demands of other nuclear facilities at the site and the impacts of climate change are taken into account. In the hypothetical event of an acute water shortage, the limited capacity of the water reservoir can be used while reducing electrical output, or the unit can be shut down completely. An important point in this respect is that the tertiary cooling circuit accounts for the greatest water consumption, as it removes waste heat generated during electricity generation; when the power plant is not generating electricity, this consumption ceases. The power plant always has sufficient water reserves available for the safety systems that ensure reactor shutdown and residual heat removal, as well as for fire protection. A potential shortage of cooling water would therefore only affect generation performance, not safety.

ad e) Information on the concept for the safety classification of safety-related equipment, including the classification of emergency power supply systems, is provided in Chapter B.I.6.2.2. Basic requirements for nuclear power plants (page 86 of this Documentation), specifically in subsection B.I.6.2.2.2. Requirements for nuclear safety.

The classification of systems is a mandatory requirement under the Atomic Act and its implementing regulations.

ad f) Information on separate, redundant, and independent systems for shutting down the facility is provided in Chapter B.I.6.2.2. Basic requirements for nuclear power plants (page 86 of this Documentation), specifically in subsection B.I.6.2.2.2. Requirements for nuclear safety.

The requirements for separation, redundancy, and diversity of nuclear systems are mandatory under the Atomic Act and its implementing regulations.

ad g) Information on passive systems is provided in Chapter B.I.6.3.1. Safety concept and basic safety criteria (page 99 of this Documentation).

Passive safety systems are defined as systems that require no external mechanical or electrical power or other energy supply to perform their function. Their operation is based exclusively on natural physical laws, material properties, and the use of internal energy, although activation by backed-up electronic systems and actuating devices (e.g. valves) supplied from the secure power supply system is permitted (according to the IAEA). By contrast, systems that require external sources of motive power are referred to as active safety systems. In practice, passive systems are often diverse from active systems, or vice versa: the function is performed primarily by a passive system, while an active system can take over if necessary.

ad h) Information on passive systems is provided in Chapter B.I.6.3.1. Safety concept and basic safety criteria (page 99 of this Documentation).

In small modular reactors (SMRs), the basic safety functions are provided primarily by passive systems, such as gravity-driven emergency core cooling, accumulators, and natural circulation of the coolant. Backup active systems are available in the event of failure or insufficient capacity of the passive systems. A typical example in pressurized water reactors is diversity in emergency shutdown systems: the passive system uses the gravity-driven insertion of control rods, while the active system is based on the injection of boron concentrate into the reactor core. For the residual heat removal system, natural circulation driven by a temperature difference may be used, or heat may be removed actively using an electrically driven pump.

ad i) The fuel replacement procedure is described in Chapter B.I.6.3.3. Operating concept (page 175 of this Documentation), specifically in subsection B.I.6.3.3.1. Nuclear fuel and spent nuclear fuel management, and, specifically for the reference design, in subsection B.I.6.3.2.2.8. Nuclear fuel handling systems.

ad j) Information on the Project safety concept, the basic safety criteria, and how compliance with them is ensured is provided in Chapter B.I.6.3.1. Safety concept and basic safety criteria (page 99 of this Documentation).

Compliance with the safety criteria in accordance with all relevant regulations is a mandatory requirement under the Atomic Act and its implementing regulations.

ad k) Information on the principles and concept of the SMR safety systems is provided in Chapter B.I.6.3.1. Safety concept and basic safety criteria (page 99 of this Documentation).

The SMR ETE Project envisages the use of Generation III+ light water reactor technology. These reactors typically rely primarily on passive safety systems, which is facilitated by their lower residual heat output, making heat removal simpler than in large units. This category primarily includes reactors using long-proven loop-type technology, in which the reactor core is located within the reactor pressure vessel and the individual loops contain steam generators and reactor coolant pumps. Another Generation III+ light water reactor concept is the so-called integral reactor, in which all primary circuit components are located within a single reactor pressure vessel. The integral configuration allows a higher degree of passive safety, which is directly related to the lower thermal output of these reactors. Irrespective of the specific reactor type, systems that ensure safety are defined by function in Decree No. 329/2017 Coll., on Requirements for the Design of a Nuclear Facility. Passive safety systems use natural physical mechanisms, such as gravity, natural circulation of the coolant, and water reserves, to shut down the reactor and remove residual heat without the need for motive power for active pumps. However, they may require initiation by electronic systems and actuating devices (e.g. valves) supplied from the secure power supply system.

ad l) Information on the main principles of physical protection, including how protection against terrorist attacks, including cyberattacks, sabotage, and emerging threats, is ensured is provided in Chapter B.I.6.2.2. Basic requirements for nuclear power plants (page 86 of this Documentation), specifically in subsection B.I.6.2.2.4. Requirements for the security of nuclear facilities and nuclear material.

Ensuring the physical protection of nuclear facilities and nuclear material is a mandatory requirement under the Atomic Act and its implementing regulations.

The risk of a terrorist attack is assessed in Chapter D.II.1.5.1. Risk of a terrorist attack (page 468 of this Documentation). Protection of nuclear facilities against terrorist attacks is the responsibility of the State. Information from the Ministry of the Interior of the Czech Republic concerning the provision of protection is provided in Annex 6.2 to this Documentation. The physical protection of all nuclear facilities and nuclear material is ensured in accordance with the approved Physical Protection Assurance Plans. The method used to ensure the physical protection of nuclear facilities corresponds to the threat arising from the established design basis threat. It should be noted that the specific physical protection arrangements (descriptions, analyses, and solutions) constitute classified information and therefore cannot be published in this Documentation.

ad m) Information on the protection of the containment and other structures important to safety against external impacts is provided in Chapter B.I.6.3.2. Technical and technological design (page 116 of this Documentation), specifically in subsection B.I.6.3.2.3. Protection against external impacts.

Detailed analyses will be carried out as part of the licensing process under the Atomic Act and its implementing regulations; this is a mandatory requirement. The Project will be designed and implemented so that structures important to safety, particularly the reactor containment, comply with the requirements of Czech legislation, WENRA and IAEA recommendations, and the relevant international standards. The design and implementation will comply in particular with Act No. 263/2016 Coll., the Atomic Act, as amended (in particular Section 46 (design requirements) and Section 47 (siting)), Decree No. 329/2017 Coll., on Requirements for the Design of a Nuclear Facility, Decree No. 358/2016 Coll., on Requirements for Quality Assurance and Technical Safety and Assessment and Verification of Conformity of Selected Equipment, WENRA Reactor Safety Reference Levels – Issue TU (External Hazards), Issue E (Design Basis Envelope, in particular E5.2, E6.1, E7.5, and E9.10), Issue SV (Internal Hazards), IAEA recommendations, e.g. SSG-79, SSG-9, SSR-2/1 (Rev. 1), and other relevant technical standards (Eurocodes, EN, and ASME/ACI, as applicable).

ad n) Information on ensuring radiation extraordinary event management is provided in Chapter B.I.6.2. General (page 80 of this Documentation), specifically in subsection B.I.6.2.2.5. Requirements for radiation extraordinary event management, and also in Chapter D.II.1.6. Measures for radiation extraordinary event management (page 470 of this Documentation).

Ensuring measures for radiation extraordinary event management is a mandatory requirement under the Atomic Act and its implementing regulations.

ad o) Information on how nuclear safety is ensured at other nuclear facilities at the site is provided in Chapter B.I.6.4.3. Method for ensuring nuclear safety of other facilities at the site (page 191 of this Documentation); practical application is described in Chapter D.II.1.4. Radiation risks associated with human activities at the site and in its surroundings (page 465 of this Documentation).

Ensuring nuclear safety at the other nuclear facilities at the site is a mandatory requirement under the Atomic Act and its implementing regulations.

ad p) Information on the defense in depth concept is provided in Chapter B.I.6.2.2. Basic requirements for nuclear power plants (page 86 of this Documentation), specifically in subsection B.I.6.2.2.2. Requirements for nuclear safety. Its practical implementation is described in Chapter B.I.6.3.1. Safety concept and basic safety criteria (page 99 of this Documentation), specifically in Chapter B.I.6.3.1.7. Implementation of defense in depth.

Ensuring defense in depth is a mandatory requirement under the Atomic Act and its implementing regulations.

ad q) Information on ensuring radiation extraordinary event management is provided in Chapter B.I.6.2. General (page 80 of this Documentation), specifically in subsection B.I.6.2.2.5. Requirements for radiation extraordinary event management, and also in Chapter D.II.1.6. Measures for radiation extraordinary event management (page 470 of this Documentation).

Ensuring measures for radiation extraordinary event management is a mandatory requirement under the Atomic Act and its implementing regulations.

ad r) Information on passive systems is provided in Chapter B.I.6.3.1. Safety concept and basic safety criteria (page 99 of this Documentation).

The passive safety systems of Generation III+ reactors use natural physical mechanisms, such as gravity, natural circulation of the coolant, and water reserves, to shut down the reactor and remove residual heat without the need for motive power for active pumps. However, they may require initiation by electronic systems and actuating devices (e.g. valves) supplied from the secure power supply system. Following an emergency reactor shutdown, the control rods immediately fall into the reactor core by gravity, terminating the fission reaction. Subsequent residual heat removal is ensured by natural circulation of the coolant. The heat is removed through heat exchangers to the passive system water tanks located outside the containment, from where it is transferred to the atmosphere. In the event of a loss of coolant accident (LOCA), heat from the containment, which retains the released radioactivity in accordance with the defense in depth principle, is likewise removed by natural circulation of the coolant through dedicated heat exchangers to water tanks located outside the containment. The system is designed to operate autonomously for at least 72 hours without operator intervention. After this period, continued operation only requires replenishment of the water in the tanks using either dedicated means or mobile equipment. This approach minimizes the risk of failure in the event of loss of power or failure of pumps or electronic systems.

ad s) Information on measures addressing hydrogen accumulation during accidents and associated measures for the practical elimination of risks related to potential hydrogen detonation or deflagration is provided in Chapter B.I.6.3.2. Technical and technological design (page 116 of this Documentation), specifically in subsections B.I.6.3.2.2.5.1. Design provision for a design basis accident [JM01] and B.I.6.3.2.2.5.2. Design provision for a severe accident [JM02].

ad t) Information on safety provisions in the event of a station blackout is provided in Chapter B.I.6.3.2. Technical and technological design (page 116 of this Documentation), specifically in subsection B.I.6.3.2.2.6.3. Operation of the RR SMR electrical power supply during loss of off-site power.

ad u) Information on the concept for ensuring emergency water supply is provided in Chapter B.I.6.3.2. Technical and technological design (page 116 of this Documentation), specifically in subsection B.I.6.3.2.2.5.4. Design provision for the supply of operating media [KAX], and also, where applicable, in Chapter B.I.6.3.3. Operating concept (page 175 of this Documentation), specifically in subsection B.I.6.3.3.5. Water connections and systems.

Information on the concept for ensuring emergency electricity supply is provided in Chapter B.I.6.3.2. Technical and technological design (page 116 of this Documentation), specifically in subsection B.I.6.3.2.2.6.3. Operation of the RR SMR electrical power supply during loss of off-site power.

ad v) Information on the assessment of the potential use of rail transport for construction materials is provided in Chapter C.II.10. Transport and other infrastructure (page 300 of this Documentation), specifically in subsection C.II.10.1.2. Rail transport.

The Temelín NPP site is connected to the railway network, and rail transport can be used given the sufficient spare capacity of the Číčenice–Temelín railway line. For conservative reasons (to ensure conservative calculations of the noise and air dispersion situation), this Documentation assumes the maximum share of road transport; however, this in no way limits the potential use of rail transport.

ad w) An overhead line is currently envisaged for power evacuation, as this represents the most suitable and proven solution from a technical, operational, and legislative perspective. It is therefore assessed in this EIA Documentation. The potential use of an underground line will be examined in subsequent studies. The proposed route of the overhead line to the Kočín substation is consistent with the applicable spatial planning documentation of the South Bohemian Region, which designates corridor Ee43 as the only approved route for power evacuation from this site.

ad x) Information on the transport of nuclear fuel, spent nuclear fuel, and radioactive waste is provided in Chapter B.I.6. Description of the technical design (page 79 of this Documentation), specifically in subsection B.I.6.3.3. Operating concept (page 175 of this Documentation). The risks associated with transport are analyzed in Chapter D.II. CHARACTERISTICS OF RISKS TO PUBLIC HEALTH, CULTURAL HERITAGE, AND THE ENVIRONMENT (page 429 of this Documentation), specifically in subsection D.II.1.5.2. Risks associated with the transport of radioactive substances (page 469 of this Documentation).

Existing systems will be used for the transport of nuclear fuel, spent nuclear fuel, and radioactive waste; no new dedicated infrastructure is therefore required. The transport of nuclear material and radioactive waste will comply with all requirements arising from national and international legislation and from the international commitments and treaties of the Czech Republic. It should be noted that specific transport information (routes) is classified and subject to controlled access to classified information and therefore cannot be freely disclosed.

3. Regarding nuclear safety, physical protection, emergency preparedness, and monitoring:

a) demonstrate that no accident without reactor core melting or damage to irradiated nuclear fuel in storage pools will result in a radionuclide release requiring the implementation of protective measures involving sheltering, iodine prophylaxis, and evacuation of the population anywhere in the vicinity of the New SMR Power Plant,

b) demonstrate that, for postulated accidents involving reactor core melting or damage to irradiated nuclear fuel in storage pools, design provisions are in place such that evacuation of the population is not required in the immediate vicinity and long-term restrictions on food consumption do not need to be introduced,

c) demonstrate that accidents involving reactor core melting that could lead to early or large radioactive releases are practically eliminated,

d) include the worst realistic scenario in the assessment, i.e. an analysis of the most severe potential accidents,

e) describe and document analyses of severe accident management involving reactor core melting, particularly regarding the in-vessel retention strategy, including technical means for retaining the corium within the reactor pressure vessel, and regarding ex-vessel cooling, i.e. cooling outside the reactor pressure vessel, including water supply systems and their availability in the event of loss of power, and assess the effectiveness of these measures in the context of severe accident management requirements,

f) perform analyses of the radiological consequences of potential accidents, including modeling the dispersion of radioactive substances across national borders and assessing potential impacts on the population and the environment in neighboring countries.

Addressing the requirements:

ad a) Demonstration that no accident without reactor core melting or damage to irradiated nuclear fuel in storage pools will result in a radionuclide release requiring protective measures involving sheltering, iodine prophylaxis, and evacuation of the population anywhere in the vicinity of SMR ETE is provided in Chapter D.II.1. Radiation risks (page 429 of this Documentation), specifically in subsection D.II.1.2. Radiation extraordinary events (page 434 of this Documentation). Information on the selection of conservative conditions for this assessment is discussed below under point d).

The detailed proof will be provided as part of safety analysis reports in the procedures pursuant to the Atomic Act. In that regard, the appropriate measure is proposed in Chapter D.IV. CHARACTERISTICS OF MEASURES TO PREVENT, AVOID, AND REDUCE ADVERSE IMPACTS, DESCRIPTION OF COMPENSATORY MEASURES (page 479 of this Documentation).

ad b) Demonstration that, for postulated accidents involving reactor core melting or damage to irradiated nuclear fuel in storage pools, evacuation of the population would not be necessary and long-term restrictions on food consumption would not need to be introduced is provided in Chapter D.II.1. Radiation risks (page 429 of this Documentation), specifically in subsection D.II.1.2. Radiation extraordinary events (page 434 of this Documentation). Information on the selection of conservative conditions for this assessment is discussed below under point d).

The detailed proof will be provided as part of safety analysis reports in the procedures pursuant to the Atomic Act. In that regard, the appropriate measure is proposed in Chapter D.IV. CHARACTERISTICS OF MEASURES TO PREVENT, AVOID, AND REDUCE ADVERSE IMPACTS, DESCRIPTION OF COMPENSATORY MEASURES (page 479 of this Documentation).

ad c) Information on the strategy for the practical elimination of early or large radioactive releases in the SMR ETE design is provided in Chapter D.II.1. Radiation risks (page 429 of this Documentation), specifically in subsection D.II.1.3. Practically eliminated conditions (page 460 of this Documentation).

Detailed analyses will be carried out as part of the licensing process under the Atomic Act and its implementing regulations; this is a mandatory requirement.

ad d) Basic information on the scenarios used to assess the radiological consequences of accident conditions for the surroundings and the population is provided in Chapter D.II.1.1.4. Approach to the assessment of the radiological consequences of extraordinary conditions in the EIA process (page 433 of this Documentation).

The assessment includes conservative (bounding) cases of a design basis accident (DBA) and a severe accident involving fuel melting (DEC-B). A generally recognized bounding approach is used to analyze the radiological consequences of accident conditions. Under this approach, both the representative source term (characterizing the magnitude of the radionuclide release to the environment for the assessment of radiological consequences) and other parameters (e.g. meteorological conditions) are specified so that, with an adequate margin, the analyzed radiological consequences are less favorable than those that, taking uncertainties into account, will result from later safety analyses conducted as part of the licensing process under the Atomic Act (e.g. in the Preliminary Safety Analysis Report). This ensures that the potentially least favorable extraordinary conditions are taken into account in the EIA process.

ad e) Options for managing the cooling of reactor core melt following a severe accident using in-vessel retention (IVR) and ex-vessel cooling (EVC) strategies are described in Chapter B.I.6.3.1. Safety concept and basic safety criteria (page 99 of this Documentation), specifically in subsection B.I.6.3.1.8, Strategy for retention of reactor core melt following a severe accident. The specific design implementation of the in-vessel retention (IVR) strategy for the RR SMR reference design is described as design provision [JM02] in Chapter B.I.6.3.2. Technical and technological design (page 116 of this Documentation), specifically in subsection B.I.6.3.2.2.5.2. Design provision for a severe accident [JM02].

The detailed proof will be provided as part of safety analysis reports in the procedures pursuant to the Atomic Act. In that regard, the appropriate measure is proposed in Chapter D.IV. CHARACTERISTICS OF MEASURES TO PREVENT, AVOID, AND REDUCE ADVERSE IMPACTS, DESCRIPTION OF COMPENSATORY MEASURES (page 479 of this Documentation).

ad f) Analyses of the radiological consequences of potential accidents, including modeling the dispersion of radioactive substances across national borders and assessing potential impacts on the population and the environment in neighboring countries, are provided in Chapter D.II.1. Radiation risks (page 429 of this Documentation), specifically in subsection D.II.1.2. Radiation extraordinary events (page 434 of this Documentation). The analyses are performed for bounding cases of a design basis accident (DBA) and a severe accident involving fuel melting (DEC-B). This ensures that the potentially least favorable extraordinary conditions are taken into account in the EIA process (see point d) above).

For events without fuel melting, SÚJB requires demonstration that the event will not result in a radionuclide release requiring the implementation of protective measures involving sheltering, iodine prophylaxis, and evacuation of the population. The assessment performed shows that a design basis accident (DBA) does not result in the need to implement protective measures involving sheltering, iodine prophylaxis, and evacuation of the population anywhere in the vicinity of SMR ETE. At the same time, the event does not result in the need to introduce long-term restrictions on the consumption of locally produced food. The event also has no radiological transboundary impacts on the population of neighboring countries. Given the conservative specification of the DBA source term for SMR ETE, these conclusions can also be applied to DEC-A sequences to be defined for SMR ETE in the future.

For DEC-B events (severe accidents involving fuel melting), SÚJB requires demonstration that evacuation of the population is not necessary even in the immediate vicinity and that long-term restrictions on food consumption do not need to be introduced (where long-term measures are understood as measures extending beyond one year after the event). The assessment performed shows that a severe accident involving fuel melting is certain not to result in a radionuclide release requiring evacuation of the population anywhere in the vicinity of SMR ETE or long-term restrictions on the consumption of locally produced food. Transboundary impacts and effects would be low in terms of doses. For the radiological consequences of accidents, it is generally accepted that if the radiological consequences are acceptable for the population in the immediate vicinity, as is the case here, they are also acceptable for the other environmental components.

WENRA recommendations are also applied to both types of events. For the bounding DBA event, it is demonstrated that the event will have no or only minor radiological impacts, i.e. it will not result in any need to implement urgent protective measures for the population in the vicinity of SMR ETE and will result in no or only a minor need (limited in time and space) to implement restrictions on food and agricultural products. For DEC-B events, it is demonstrated that the event will have radiological consequences limited in space and time, ensuring compliance with the following requirements:

- no need for evacuation at distances greater than approximately 3 km (which is covered by the more stringent SÚJB requirement to exclude evacuation in the immediate vicinity),
- avoiding the need for sheltering and iodine prophylaxis at distances greater than approximately 5 km,
- agricultural products beyond at distances greater than approximately 5 km will be suitable for consumption one year after the accident (which conceptually corresponds to the similar SÚJB requirement, although that requirement is not subject to a distance limit),
- no permanent relocation anywhere outside the power plant site.

4. Regarding radioactive waste and spent nuclear fuel:

a) describe the management system for radioactive waste generated during operation of the SMR facility, including its anticipated quantities, types, and characteristics,

b) describe the spent nuclear fuel management concept in relation to the selection of the specific SMR type, including information on the fuel type and dimensions, enrichment level, and anticipated volume of spent nuclear fuel,

c) include a section addressing the concept of "closing the fuel cycle" as part of the approach to the back end of spent nuclear fuel management,

d) provide an overview of the existing processing facilities at the ETE site that may also be used for the needs of the SMR.

Addressing the requirements:

ad a) Information on the radioactive waste management system is provided in Chapter B.I.6. Description of the technical design (page 79 of this Documentation), specifically in subsection B.I.6.3.3. Operating concept (page 175 of this Documentation). The quantity of radioactive waste is documented in Chapter B.III. DATA ON OUTPUTS (page 201 of this Documentation), specifically in subsection B.III.4. Other (page 203 of this Documentation). The quantity of radioactive waste is considered in accordance with the updated Policy for Radioactive Waste and Spent Nuclear Fuel Management in the Czech Republic.

For RAO management, the future operator of SMR ETE must obtain a valid license pursuant to Section 9(3)(a) of Act No. 263/2016 Coll., the Atomic Act, as amended. To obtain the license, the operator will prepare a RAO Management Strategy taking into account the principles contained in the Policy for Radioactive Waste and Spent Nuclear Fuel Management. Documentation will also be prepared to the extent specified in SÚJB Safety Guide BN-JB-OD-1.1. This documentation will also include safety analyses and the resulting limits and conditions for RAO management.

RAO conditioned at the SMR ETE radioactive waste management workplace and facility and meeting the waste acceptance criteria for disposal will be disposed of at the existing Dukovany repository. Once it reaches its full capacity, RAO will be disposed of in an expanded, new, or deep geological repository (for future options for the disposal of RAO from SMR ETE, see Annex 6.3 to this Documentation). RAO that does not meet the waste acceptance criteria for repositories currently in operation will be stored in the appropriate storage areas at SMR ETE until suitable repositories are constructed. The preparation, construction, and operation of radioactive waste repositories are the responsibility of SÚRAO.

Small modular reactors generally use a compact and standardized design that enables efficient management of operational processes, including radioactive waste management, and, owing to their lower output and optimized operation, they can be expected to generate a lower absolute quantity of radioactive waste. As an advanced Generation III+ pressurized water reactor, the RR SMR reference technology will generate types of RAO typical of this kind of facility. The chemical conditions in the primary circuit differ from those in conventional pressurized water reactors (PWRs) in that boron is not present in the primary coolant during normal operation. The impacts of this different chemistry regime on radioactive waste management are currently being assessed, and no new types of RAO are expected to be generated.

ad b) The method for managing spent nuclear fuel is described in Chapter B.I.6. Description of the technical design (page 79 of this Documentation), specifically in subsection B.I.6.3.3. Operating concept (page 175 of this Documentation).

The method of spent nuclear fuel management is based on applicable Czech legislation and is reflected in this Documentation in accordance with the national Policy for Radioactive Waste and Spent Nuclear Fuel Management, which establishes the framework for the management of individual types of radioactive waste, including spent nuclear fuel, and is essentially the same for all nuclear units in the Czech Republic.

For the RR SMR reference technology, this is a Generation III+ pressurized water reactor using UO2 fuel enriched to up to 4.95% U-235. The fuel assemblies have compact dimensions corresponding to the SMR design, and their exact specification will be described in subsequent stages of the licensing process. The amount of spent nuclear fuel per unit of generated electrical energy is comparable to that of conventional pressurized water reactors.

ad c) Information on the concept for the back end of spent nuclear fuel management is provided in Chapter B.I.6.3.3. Operating concept (page 175 of this Documentation), specifically in subsection B.I.6.3.3.1. Nuclear fuel and spent nuclear fuel management.

The back end of spent nuclear fuel management is not part of the Project. It is the responsibility of the State (Radioactive Waste Repository Authority) and is defined by the Policy for Radioactive Waste and Spent Nuclear Fuel Management in the Czech Republic, which currently provides for an open fuel cycle. The Project will comply with the national Policy and is compatible with both possible approaches, i.e. the currently envisaged open fuel cycle (i.e. storage and disposal of spent nuclear fuel) and, potentially, a closed fuel cycle (i.e. reprocessing of spent nuclear fuel and storage/disposal of residues from reprocessing), should such a policy be adopted in the future.

ad d) The SMR Project at the Temelín site does not envisage the use of the existing radioactive waste management workplaces and facilities serving the operation of the existing Temelín NPP units. This is due to technical, operational, and legislative differences that prevent their use for SMR purposes. The main factors include a different radionuclide composition of RAO, different RAO treatment and conditioning technologies, high logistical demands and costs associated with transporting liquid radioactive waste to another workplace for conditioning, safety and shielding constraints, particularly for RAO with higher activity, regulatory restrictions limiting facility licenses to specific categories of RAO, and capacity limitations or insufficient infrastructure for processing certain forms of RAO (e.g. large volumes, organic content, alpha emitters). For these reasons, the SMR will have its own workplace and facilities for the treatment, conditioning, and storage of radioactive waste. The generic assessment of the RR SMR reference design describes a system for managing liquid, gaseous, and solid radioactive waste that includes a modular approach to its treatment and conditioning. This system will be designed to comply with legislative requirements and the national Policy for Radioactive Waste and Spent Nuclear Fuel Management in the Czech Republic.

5. Regarding the Project inputs and outputs:

a) clearly define and describe, in quantitative and qualitative terms and at their potential maximum levels, all Project requirements for environmental inputs, particularly land, water, other raw material and energy resources (including nuclear fuel), and infrastructure, including their sources,

b) clearly define and describe, in quantitative and qualitative terms and at their potential maximum levels, all radioactive and conventional Project outputs to the environment, particularly radioactive discharges, radioactive waste, spent nuclear fuel, and conventional outputs to air and water, as well as non-radioactive waste.

Addressing the requirements:

ad a) The Project requirements for environmental inputs are defined and described in Chapter B.II. DATA ON INPUTS (page 195 of this Documentation). All inputs are considered conservatively at their potential maximum levels; information on the selection of conservative parameters is provided in chapter Methodological preparation of the Documentation (page 18 of this Documentation).

ad b) The Project outputs to the environment are defined and described in Chapter B.III. DATA ON OUTPUTS (page 201 of this Documentation). All outputs are considered conservatively at their potential maximum levels; information on the selection of conservative parameters is provided in chapter Methodological preparation of the Documentation (page 18 of this Documentation).

6. Regarding the population and public health, propose any measures necessary to mitigate adverse impacts on the population in terms of radiation exposure.

Addressing the requirement:

The requirement to mitigate adverse impacts on the population in terms of radiation exposure is explicitly included in Decree No. 422/2016 Coll., on Radiation Protection and Security of a Radionuclide Source, as amended. This is therefore a mandatory requirement. The Decree also stipulates that, when optimizing radiation protection, the optimal radiation protection option must be selected. It also stipulates that the assessment of exposure of the representative person must be carried out using conservative estimates.

For this reason, the analyses performed in this Documentation use a conservative bounding approach. Chapter D.I.3.2. Impacts of ionizing radiation (page 345 of this Documentation) demonstrates that, during operation of SMR ETE and using conservative bounding design assumptions for radioactive discharges, the statutory exposure limits for the representative person resulting from radionuclide effluents discharged into the environment will not be exceeded, nor will the dose constraints relating to exposure from discharges from all operating and planned nuclear facilities at the Temelín site be exceeded.

The impacts of the Project on public health are assessed in Chapter D.I.1. Impacts on the population and public health (page 313 of this Documentation). The results show that the contribution to the lifetime risk of health detriment from operation of SMR ETE is entirely negligible, and that the cumulative risk of health detriment from operation of all existing and planned nuclear facilities at the site is also negligible. For this reason, no specific measures to mitigate adverse impacts on the population in terms of radiation exposure beyond the requirements of the above Decree No. 422/2016 Coll. are proposed in the EIA process.

To maintain the validity of the conservative bounding approach, it is necessary to ensure that the discharge sources as considered in the EIA process for New NPP ETE and in the EIA process for SMR ETE are not, in aggregate, significantly higher than assumed in the respective EIA processes. Given the applicability of the conservative approach to the assumptions used in the analyses of radiological impacts and risks, a small change in discharge parameters has no practical effect on the resulting exposure or risk.

7. Regarding air and climate:

a) assess the impacts of the Project on climatic characteristics, and describe and take into account both climate change mitigation by the Project and adaptation of the Project to climate change, as well as the vulnerability of the Project to the impacts of climate change,

b) prepare an Air Dispersion Study and propose appropriate dust control measures for both the construction and operation phases of the Project.

Addressing the requirements:

ad a) Information on the impacts of the Project on climate is assessed in Chapter D.I.2.2. Impacts on climate (page 334 of this Documentation). The assessment covers the impact on the local climate resulting from heat and water emissions from operation of the Project via the cooling towers, the impact on climate change due to direct and indirect greenhouse gas emissions (mitigation), and the assessment of the Project's vulnerability to climate risks and climate change (adaptation).

ad b) The Air Dispersion Study is provided in Annex 5.3 to this Documentation (Air Dispersion Study); its results are summarized and discussed in Chapter D.I.2.1. Impacts on ambient air quality (page 332 of this Documentation). Measures for both the construction and operation phases are summarized in Chapter D.IV. CHARACTERISTICS OF MEASURES TO PREVENT, AVOID, AND REDUCE ADVERSE IMPACTS, DESCRIPTION OF COMPENSATORY MEASURES (page 479 of this Documentation).

8. Regarding ionizing radiation:

a) prepare a radioactive material dispersion model containing information on the radionuclides potentially released (the quantity and type of radioactive substances released under different scenarios), information on the associated assumptions concerning accident sequences, and the results of dispersion calculations (release pathways, weather data, and models used),

b) prepare a radiation study demonstrating that, during normal and abnormal operation, the authorized limits for radionuclide effluents discharged into the environment from the New SMR Power Plant will not be exceeded for the critical group of the population and that the dose constraint relating to exposure from discharges from all operating units located at a single site will not be exceeded.

Addressing the requirements:

ad a) The radioactive material dispersion model, including information on the radionuclides potentially released and their activity (the so-called source term) under accident conditions, is described in detail in Chapter D.II.1. Radiation risks (page 429 of this documentation). This Chapter provides all relevant information on the radioactive material dispersion model used under accident conditions, the method used to determine the source term specifying the radionuclides potentially released (the type and activity of radioactive substances

released under different scenarios) into the environment, the exposure pathways considered, the assumptions applied regarding meteorological conditions and the characteristics of the territory, and other necessary information. It also describes the relevant accident sequences in terms of their duration and other parameters affecting the assessment of doses to the population and impacts on agricultural production.

The ESTE model (software codes) used was developed and is continuously improved in accordance with the quality assurance program implemented by its developer, ABmerit, s.r.o., in accordance with ISO 9001. The ESTE programs have been validated and benchmarked at IAEA and OECD level in a number of international projects. The ESTE programs for assessing the impacts of accidents involving releases of radioactive substances are used by numerous institutions and organizations virtually worldwide, including the Emergency Center of the State Office for Nuclear Safety (Prague, Czech Republic) and the Emergency Center of the Ministry for the Environment of the Republic of Austria (Vienna, Republic of Austria).

For further information on representative cases (scenarios) of accident conditions, their assessment methods, and other related information, see also points 3(a) to (f) of the requirements of the conclusion of the screening and scoping procedure above.

ad b) The radioactive material dispersion model (radiation study), including information on the radionuclides released and their activity (the so-called source term) under normal and abnormal operating conditions, is described in detail in Chapter D.I.3.2. Impacts of ionizing radiation (page 345 of this Documentation). This Chapter provides all relevant information on the radioactive material dispersion model used under normal and abnormal operating conditions, the method used to determine the source term, the exposure pathways considered, the assumptions applied regarding meteorological conditions and the characteristics of the territory, and other necessary information. The ESTE Annual Impacts model (software code) is used for the calculation.

The assessment takes into account the combined (cumulative) effects of all nuclear facilities at the site and demonstrates that the dose constraint for the representative person (i.e. for the purposes of the Atomic Act, an individual from the population representing a model group of natural persons receiving the highest exposure from the given source and via the given pathway) will not be exceeded for either liquid or atmospheric discharges.

The model results, i.e. the doses to the representative person, are subsequently used as input for the assessment of impacts on public health; see point 6 of the requirements of the conclusion of the screening and scoping procedure above.

9. Regarding noise and other physical and biological factors:

a) prepare an Acoustic Study assessing noise impacts from both stationary sources and traffic, including during the construction phase of the Project, and propose appropriate noise mitigation measures for both the construction and operation phases of the Project,

b) demonstrate that the construction and operation of the Project will not result, even cumulatively with existing stationary sources, in exceedance of the statutory noise limits in the nearest protected areas during the daytime and night-time periods,

c) demonstrate that, cumulatively with the existing traffic load, traffic noise emissions and statutory noise limits will not be exceeded, including during the construction phase of the Project,

d) demonstrate that the maximum permissible levels of non-ionizing radiation pursuant to Government Regulation No. 291/2015 Coll., on the Protection of Health from Non-Ionizing Radiation, will not be exceeded at protected buildings used for permanent occupancy.

Addressing the requirements:

ad a) The Acoustic Study is provided in Annex 5.2 to this Documentation (Acoustic Study); its results are summarized and discussed in Chapter D.I.3.1. Impacts of noise (page 340 of this Documentation). Measures for both the construction and operation phases are summarized in Chapter D.IV. CHARACTERISTICS OF MEASURES TO PREVENT, AVOID, AND REDUCE ADVERSE IMPACTS, DESCRIPTION OF COMPENSATORY MEASURES (page 479 of this Documentation).

ad b) Demonstration that the construction and operation of the Project will not result, even cumulatively with existing stationary sources, in exceedance of the statutory noise limits in the nearest protected areas during the daytime and night-time periods is provided in the Acoustic Study (see point a) above).

ad c) Demonstration that, cumulatively with the existing traffic load, traffic noise emissions and statutory noise limits will not be exceeded, including during the construction phase of the Project, is provided in the Acoustic Study (see point a) above).

ad d) Demonstration that the maximum permissible levels of non-ionizing radiation will not be exceeded at protected buildings used for permanent occupancy is provided in Chapter D.I.3.3. Impacts of other physical and biological characteristics (page 371 of this Documentation), specifically in subsection D.I.3.3.2. Impacts of non-ionizing radiation. Note: In accordance with the above Government Regulation, compliance is demonstrated throughout publicly accessible areas, not only at places used for permanent occupancy.

10. Regarding surface water and groundwater, prepare:

a) a comprehensive assessment of the project's impacts on the water regime, always including the combined effects of the existing ETE units and the planned New Nuclear Power Plant at the Temelín site (hereinafter the "New NPP ETE"), in all phases of project implementation (construction, operation, and decommissioning), also taking account of the anticipated effects of ongoing climate change;

b) an assessment of the effect of the planned surface-water abstraction from the major Vltava watercourse on the affected surface-water bodies, including hydrologic relationships with upstream and downstream bodies, with emphasis on impacts on the natural hydrologic regime;

c) a water management assessment of the impacts of the Project on the purposes and functions of the waterworks of the Vltava Cascade, including their filling and drawdown regimes, taking into account all purposes for which these reservoirs are used,

d) an assessment of the effect of discharging process wastewater and treated domestic wastewater into the major Vltava watercourse, including quantitative and qualitative characterization of the discharged water, with regard to physicochemical and radiochemical parameters and an assessment of the potential occurrence of radioactive substances;

e) an assessment of the impact of the planned drainage of stormwater into minor watercourses, particularly the Strouha Stream, focusing on potential impacts on water quality in the receiving water body and taking into account the obligations laid down in Section 5(3) of Act No. 254/2001 Coll., on Waters (the Water Act), as amended,

f) an assessment of the effect of expanding the system of drainage wells for artificially lowering the groundwater level, particularly in terms of potential impacts on the possible use of groundwater as a drinking-water source in the wider area.

Addressing the requirements:

ad a) The assessment of the impacts of the Project on the water regime, including consideration of the combined effects of other facilities at the Temelín site, the Project phases, and climate change, is provided in Annex 4.1 to this Documentation (Assessment of Impacts on Surface Water and Groundwater); the methods and conclusions are summarized and discussed in Chapter D.I.4. Impacts on surface water and groundwater (page 379 of this Documentation).

In quantitative terms, the comprehensive assessment of the impacts of the Project on the surface-water regime is carried out in relation to the Vltava and the associated water management system. The assessment focuses particularly on raw-water abstraction from the Hněvkovice waterworks, discharge of some of the abstracted water back to the river at Kořensko, maintenance of minimum flows, and use of reservoir storage functions. The SMR ETE Project is not assessed in isolation but as part of the overall (cumulative) water management arrangement of the Temelín site, i.e. in combination with the existing ETE1,2 units and the proposed New NPP ETE (in the 2x1,700 MW_e output option). This fulfills the requirement to assess the Project in the broader water management context and in relation to other significant demands on surface-water use at the site.

Of the individual implementation phases, operation is decisive for surface-water quantity because it involves long-term water abstraction from the Hněvkovice waterworks and wastewater discharge at Kořensko. During construction and decommissioning, predominantly temporary changes in water-management requirements and runoff conditions may be expected. These phases must therefore be managed organizationally and technically to prevent adverse effects on minimum flows or disruption of water-management-system function. During decommissioning, operational requirements for abstraction and discharge may generally be expected to decrease gradually; controlled and supervised water management will nevertheless remain essential.

The direct quantitative effect of the project is determined primarily by the difference between abstraction and discharge, its seasonal distribution, and the system's ability to augment flows from stored water. The decisive factor is therefore not simply the absolute abstraction quantity, but the overall balance between the Hněvkovice abstraction profile and the Kořensko profile, including the fact that some abstracted water is returned to the Vltava farther downstream. The assessment is therefore based on modeling of the managed water management system, rather than merely on a simple comparison of abstraction with long-term flow.

Under current hydrological conditions, a high level of reliability of both water abstractions and minimum flows has been demonstrated for the cumulative impact (SMR ETE + ETE1,2 + New NPP ETE). Water-management modeling indicates that the system can meet abstraction and minimum-flow requirements under current conditions. This reliability, however, results from managed use of active storage, particularly at Lipno I and Hněvkovice reservoirs. Under current conditions, the project therefore has no significantly adverse effect on surface-water quantity, but it increases the cumulative water requirement and thereby reduces the system's operating reserve.

The impact of climate change is taken into account in the assessment through current hydrological conditions, a sensitivity option involving warming of 2°C, and SSP245 climate change scenarios for the reference periods 2060 and 2080. The results show that, in most modeled future scenarios, abstraction and minimum-flow requirements continue to be met reliably or at an acceptable level. The most adverse climate scenarios nevertheless indicate a potential reduction in reliability, particularly when low flows, higher evapotranspiration demand, and the cumulative requirements of the Temelín site coincide. These results should be regarded as an indication of the climate sensitivity of the system and of the need for ongoing update of the hydrological and climate data.

ad b) The assessment of the impacts of the Project on the affected surface-water bodies, including hydrological relationships with upstream and downstream water bodies and impacts on the natural hydrological regime, is provided in Annex 4.1 to this Documentation (Assessment of Impacts on Surface Water and Groundwater); the methods and conclusions are summarized and discussed in Chapter D.I.4. Impacts on surface water and groundwater (page 379 of this Documentation).

The assessment of the ecological status of surface-water bodies pursuant to the requirements of the Water Framework Directive also includes assessment of the hydromorphological quality element, which, for water bodies in the river category, includes assessment of the impact of anthropogenic pressures on the natural hydrological regime. Under the Water Framework Directive, hydromorphology is a supporting element in the assessment of ecological status, while the status of the biological quality elements is decisive. For surface-

water bodies designated as heavily modified, ecological potential is assessed instead of ecological status. In simplified terms, this means that the requirements for achieving good status/potential may be adjusted (reduced) to take account of the water use for which the water bodies were designated as heavily modified.

Seven water bodies in the river category are designated in the section of the Vltava from Lipno I to Prague–Velká Chuchle. With the exception of water body HVL_0140 (Vltava from Větší Vltavice to the Polečnice / Kájovský Stream), where the hydrological regime is classified as good, the hydrological regime of these water bodies is classified as moderate or worse (i.e. the lowest category).

From the perspective of the wider Vltava Cascade, the project is assessed as acceptable under current hydrologic conditions. The assessment confirms that the minimum flow at the Vrané waterworks profile and the minimum residual flow at the Prague–Chuchle profile are ensured with a high level of reliability under the cumulative option considered. In the long term, however, adverse climate development may reduce the reserve available in reservoir active storage, particularly at Orlík and Slapy. The resulting impact cannot be attributed solely to SMR ETE but must be understood as the combined effect of climate development, catchment water availability, the operating possibilities of the Vltava Cascade, and the cumulative requirements of the entire Temelín site.

Surface-water abstraction and water storage or flow augmentation are always associated with impacts on the natural flow regime. Increased water abstraction requirements for the Temelín site will result in increased flow augmentation in the section from Lipno I to the Hněvkovice Reservoir. They should therefore have no adverse impact on the ecological status of the water bodies in this section. Although flows in the Vltava downstream of the Kořensko profile will be reduced, given the low ratio of the increased water abstraction requirements for the Temelín site to the long-term flow characteristics at Kořensko (and farther downstream on the Vltava), the impact on ecological status in this section is also expected to be insignificant. For drought conditions, the studies assess the reliability of the required minimum flows at the Kořensko, Vrané, and Prague–Velká Chuchle profiles.

ad c) The assessment of the impacts of the Project on the purposes and functions of the waterworks of the Vltava Cascade, including their filling and drawdown regimes and taking into account all purposes for which these reservoirs are used, is provided in Annex 4.1 to this Documentation (Assessment of Impacts on Surface Water and Groundwater); the methods and conclusions are summarized and discussed in Chapter D.I.4. Impacts on surface water and groundwater (page 379 of this Documentation).

The increase in water abstraction for the Temelín site is linked to ensuring the storage function of the Lipno I, Hněvkovice, Orlík, and Slapy reservoirs. Ensuring water abstractions and minimum flows is the primary purpose of these reservoirs. Other related purposes are maintaining reservoir levels for recreation and navigation and operating hydroelectric power plants. For the Lipno I Reservoir, the reliability of maintaining the recreational water level is also assessed. As regards operation of the hydroelectric power plant at this reservoir, increased abstraction requirements do not reduce the total outflow from the reservoir; however, the need for greater use of active storage to ensure water abstractions for the Temelín site may reduce the volume available for discretionary reservoir operation and thus reduce the scope for optimizing power plant operation. Although flows in the Vltava downstream of the Kořensko profile will be reduced, given the low ratio of the increased water abstraction requirements for the Temelín site to the long-term flow characteristics at Kořensko and farther downstream, no significant impact of the increased abstractions for the Temelín site on maintaining water levels for recreation and navigation or on the operation of hydroelectric power plants can be expected. The assessment shows that any adverse impact on the storage function of the Orlík and Slapy reservoirs could be caused to a greater extent by the impacts of climate change on flows in the Vltava.

ad d) The assessment of the impact of discharging process wastewater and treated domestic wastewater is provided in Annex 4.1 to this Documentation (Assessment of Impacts on Surface Water and Groundwater). For non-radioactive parameters, the methods and conclusions are summarized and discussed in Chapter D.I.4. Impacts on surface water and groundwater (page 379 of this Documentation); for radioactive parameters, the methods and conclusions are, in accordance with the structure of the Documentation, included in Chapter D.I.3.2. Impacts of ionizing radiation (page 345 of this Documentation), specifically in subsection D.I.3.2.7. Other impacts of ionizing radiation.

The impact of operation of the SMR ETE Project is estimated for concurrent operation with the existing ETE1,2 power plant and, where applicable, also with New NPP ETE, i.e. for two options for combined effects:

- SMR ETE + ETE1,2,
- SMR ETE + ETE1,2 + New NPP ETE (in the 2x1,700 MW_e output option).

For both of these combined-effects options, the impact of operation of the SMR ETE Project at critical profiles is modeled for two hydrological situations:

- "normal flow" – the long-term mean flow (Q_a) is used for modeling,
- "drought – climate change impact" – flow Q_{355} is used for modeling.

In addition, maximum (minimum) values are also modeled at the profile downstream of the Kořensko Reservoir using the minimum guaranteed flow (Q_{zab}).

Modeling is also carried out for two discharge scenarios:

- "average discharge" – based on the actual measured concentrations in ETE1,2 wastewater (average for 2015–2024) and analogous concentrations in wastewater (assuming that the water management systems of all three facilities will be essentially similar) also for SMR ETE and New NPP ETE; for radioactivity parameters, the actual measured values of activity discharged from ETE1,2 (average for 2015–2024) are used, while for the other sources of the Project output option assessed (SMR ETE and,

where applicable, New NPP ETE), the specified source term for the SMR or the design radionuclide discharges according to the New NPP ETE EIA Documentation are conservatively used,

- "maximum discharge" – based on the "max" or "m" emission limits specified in the permit for wastewater discharge from ETE1,2; for the other sources of the output options assessed (SMR ETE and, where applicable, New NPP ETE), the same approach as for the average discharge scenario is used; this scenario constitutes an extreme (bounding) condition that has not occurred in practice at ETE1,2.

The impact of the SMR ETE Project on surface-water quality is estimated for the following critical profiles:

- Kořensko Reservoir – downstream – non-radiological parameters, including temperature; radioactivity parameters,
- VNO Zvíkovský most – non-radiological parameters, including temperature; radioactivity parameters,
- Solenice – non-radiological parameters, including temperature; radioactivity parameters,
- Kamýk nad Vltavou – non-radiological parameters, including temperature,
- Štěchovice – non-radiological parameters, including temperature; radioactivity parameters.

An assessment of the impact of tritium on the river is also performed for the Podolí and Hřensko profiles.

Overall, it can be concluded that, at the profile downstream of the Kořensko Reservoir and at the other critical profiles farther downstream on the affected Vltava watercourse, water quality does not comply with certain statutory values arising from different types of requirements. However, the effect of the existing surface-water quality, particularly polluted water from the Lužnice River, is crucial in this respect. The contribution of SMR ETE to this pollution is very small; the share of wastewater from SMR ETE in the mass flow of the assessed parameters in the receiving water body is in the order of tenths of a percent to several percent.

For both combined-effects options, the receiving water body complies with statutory requirements for radioactivity parameters under both flow situations (Q_a and Q_{355}). The exception is tritium, which, under adverse conditions involving the concurrence of maximum discharge and the climate-change flow situation, i.e. low flows, does not meet the indicative value for the use of water for drinking purposes at the Solenice profile (although it meets, with a margin, the maximum permissible level pursuant to Decree No. 422/2016 Coll., on Radiation Protection and Security of a Radionuclide Source, as amended). This problem may also be reflected farther downstream at the Prague-Podolí profile. It is therefore necessary to coordinate concurrent discharges from the individual sources of the output options assessed and to take account of the flow situation in the receiving water body so as to prevent the extreme situation of a very low flow in the receiving water body coinciding with discharge of the maximum permitted instantaneous quantities of these parameters.

ad e) The assessment of the impact of stormwater drainage into minor watercourses is provided in Annex 4.1 to this Documentation (Assessment of Impacts on Surface Water and Groundwater); the methods and conclusions are summarized and discussed in Chapter D.I.4. Impacts on surface water and groundwater (page 379 of this Documentation).

At present, the Strouha Stream is used to drain pumped groundwater and stormwater from the ETE1,2 site. During operation of SMR ETE, water from the SMR ETE site is expected to be discharged into the Strouha Stream together with water drained from the ETE1,2 site and, where applicable, from New NPP ETE. For this purpose, the retention basin at the SMR ETE site and the existing ETE1,2 stormwater drainage system will be used. Part of the stormwater from the external area of the SMR ETE site and pumped groundwater from the SMR ETE site will be discharged into Dvorčice Pond and subsequently into Dvorčický Stream, which will contribute to stabilizing their water management and ecological functions. Most of the water drained from the Temelín site (ETE1,2, SMR ETE, and New NPP ETE) will, however, continue to be directed to the Strouha Stream, where increased flows compared with the current state can therefore be expected.

As regards the qualitative parameters of the discharged water, no significant change in its composition compared with the current state is anticipated, but only an increase in quantity; no substantial change in water quality in the Strouha Stream is therefore expected. However, given the increase in flow, an increase in the total load of substances entering the receiving water body can be expected.

ad f) The assessment of the impact of extending the drainage-well system, including potential impacts on the use of groundwater as a drinking-water source, is provided in Annex 4.1 to this Documentation (Assessment of Impacts on Surface Water and Groundwater); the methods and conclusions are summarized and discussed in Chapter D.I.4. Impacts on surface water and groundwater (page 379 of this Documentation).

A significant intervention in the water regime of the territory will be the lowering of the groundwater level in the excavation for construction of the reactor building and the subsequent permanent lowering of the groundwater level beneath its foundations, similar to the current situation on the adjacent ETE1,2 site. To minimize the impacts on the water balance of the affected catchment, support flows in Dvorčický Stream, and preserve the important habitat of Dvorčice Pond, it is appropriate to retain this water within the relevant catchment (see point e) above).

As a result of this intervention and development of the site, infiltration of precipitation into groundwater will decrease within the cone of depression. All findings to date indicate that the impacts of artificially lowering the groundwater level using drainage wells on the SMR ETE site will be local only. Under the most adverse conditions, the drainage wells will be located close to the boundaries of the SMR ETE construction area, meaning that the cone of depression will extend several tens of meters beyond the construction area; applying the precautionary principle, a maximum extent of groundwater-level lowering of up to 100 m from the boundaries of the SMR ETE construction area may be assumed.

To prevent overlap between the cones of depression of potential groundwater abstractions and the area affected by groundwater-level lowering at SMR ETE, a conservative 200 m zone around the SMR ETE area is defined in which any groundwater abstractions could be affected by lowering of the groundwater level beneath the reactor building. There are no groundwater sources currently used or potentially suitable for use within this distance. Potential groundwater sources in the wider area located more than 200 m from the SMR ETE area will not be affected in any way by the planned drainage.

11. Regarding soil, the geological environment, and natural resources:

a) assess the suitability of the site for the siting of an SMR in terms of seismic conditions, with particular emphasis on its location near the Hluboká Fault,

b) describe the geological and seismological conditions at the site, including the microseismicity measurements performed, in the EIA Documentation. The assessment should also take into account the recent seismic activity (earthquake) in 2024 in the area near Mirotice.

Addressing the requirements:

ad a) Information on the suitability of the Temelín site in terms of seismic conditions is provided in Chapter C.II.11.1. Geological environment and seismicity of the area (page 305 of this Documentation), including consideration of the existing Hluboká Fault.

It should be noted that the assessment of the seismicity of the area is, or will be, a mandatory part of the subsequent proceedings under the Atomic Act. Compliance with the statutory requirements for the siting of a nuclear facility pursuant to Decree No. 378/2016 Coll., on the Siting of a Nuclear Facility, is a necessary condition. For the purposes of the EIA process, therefore, the information is informative in nature.

ad b) The geological and seismological conditions at the site are described in Chapter C.II.11.1. Geological environment and seismicity of the area (page 305 of this Documentation). The information also includes an assessment of the potential contribution of the recent seismic event in the Mirotice area to the seismic hazard values for the Temelín site.

12. Regarding fauna, flora and ecosystems, landscape and landscape character:

a) conduct a biological survey and prepare an assessment of the impacts of significant interventions pursuant to Section 67 of Act No. 114/1992 Coll., on Nature and Landscape Protection, as amended, by a holder of the relevant authorization,

b) assess the impact on landscape character,

c) assess the impact on potentially affected elements of the territorial system of ecological stability,

d) based on the information prepared to date, provide an estimate of the approximate extent of tree felling and vegetation removal during construction,

e) assess the potential impact of radiological accidents on specially protected areas, including those located more than 10 km from the Project.

Addressing the requirements:

ad a) The biological survey and assessment of the impacts of significant interventions pursuant to Section 67 of Act No. 114/1992 Coll., on Nature and Landscape Protection, as amended (the so-called "biological assessment"), prepared by a holder of the relevant authorization, is provided in Annex 3.1 to this Documentation (biological assessment). The results of the biological survey are summarized in Chapter C.II.7. Biodiversity, specifically in Chapter C.II.7.5. Fauna and flora. The results of the biological assessment are summarized and discussed in Chapter D.I.7. Impacts on biodiversity (page 397 of this Documentation).

ad b) The assessment of impacts on landscape character is provided in Annex 3.2 to this Documentation (Assessment of Impacts on Landscape Character); its results and conclusions are summarized and discussed in Chapter D.I.8. Impacts on landscape (page 416 of this Documentation).

ad c) The impact on potentially affected elements of the territorial system of ecological stability is assessed in Annex 3.1 to this Documentation (Biological Assessment); the results and conclusions are discussed in Chapter D.I.7. Impacts on biodiversity (page 397 of this Documentation), specifically in Chapter D.I.7.4. Impact on the territorial system of ecological stability.

ad d) The estimated approximate extent of tree felling and vegetation removal during construction is specified in Annex 3.1 to this Documentation (Biological Assessment) and is taken into account in Chapter D.I.7. Impacts on biodiversity (page 397 of this Documentation). The extent is conservatively determined as the maximum possible extent of impacts on woody vegetation within the designated Project areas and will not exceed 29.6 ha. The actual extent of tree felling will be specified in subsequent stages of Project preparation and will be limited to the extent necessary.

ad e) The potential impact of the radiological consequences of accidents on specially protected areas is documented in Chapter D.II.1.2. Radiation extraordinary events (page 434 of this Documentation), specifically in Chapter D.II.1.2.4. Assessment of the

radiological consequences of radiation extraordinary events on biota. The assessment is performed up to a distance of 100 km from the Project, with the radiological impacts on nearby protected areas specifically assessed.

13. Regarding transport, transport and other infrastructure:

a) assess the capacity of the existing infrastructure for the proposed Project,

b) specify the anticipated transport routes on public roads during construction works and the transport of materials and construction workers,

c) assess the traffic volumes associated with operation and construction of the Project and the impacts on the traffic situation in the affected territory, including the transport of oversized and heavy components,

d) model the traffic situation in the event of the closure of road II/138,

e) assess the impact of increased water vapor production (particularly from cooling systems) during operation of the Project on rime formation and road icing and other hazardous weather phenomena near adjacent roads, particularly roads II/105 and II/138, and assess whether siting the SMR at this location could further impair road safety at this junction.

Addressing the requirements:

ad a) Verification of the capacity of the existing technical infrastructure required for operation and construction of the Project (in particular, connection to the electricity grid and water management system) forms part of the technical design of the Project presented herein and described in Chapter B.I.6. Description of the technical design (page 79 of this Documentation). As regards transport infrastructure (roads and railways), information on its capacity is discussed in Chapter D.I.10.1. Impacts on transport and other infrastructure (page 424 of this Documentation).

ad b) The traffic volumes, routes, and composition associated with the Project are specified in Chapter B.II.6. Requirements for transport and other infrastructure (page 197 of this Documentation).

ad c) The assessment of the impacts of the Project on the traffic situation in the affected territory in connection with operation and construction of the Project is provided and discussed in Chapter D.I.10. Impacts on transport and other infrastructure (page 424 of this Documentation).

ad d) The assessment of the impacts of the Project on the traffic situation in Chapter D.I.10. Impacts on transport and other infrastructure (page 424 of this Documentation) also includes consideration of the possible closure of road II/138.

During construction of the SMR ETE Project, road II/138 is expected to be closed to public traffic in the section between roads II/105 and II/141 (i.e. within the SMR ETE construction site and the associated construction facilities). Existing traffic will be diverted via roads II/141 and II/105; the closed section of road II/138 will only remain accessible to traffic associated with the construction of SMR ETE, traffic serving the landfill and Temelínec settling pond site, and Integrated Rescue System vehicles.

ad e) The impact of increased water vapor production on rime formation and road icing and other hazardous weather phenomena near adjacent roads is assessed in Chapter D.I.2.2. Impacts on climate (page 334 of this Documentation), specifically in Chapter D.I.2.2.1. Impacts on local climate.

The assessment considers the combined/cumulative effect of SMR ETE and other existing and planned nuclear facilities at the site (ETE1,2, New NPP ETE); impacts on local climatic characteristics (humidity, temperature, water deposition, plume shadowing, and icing) are assessed as very low and insignificant, while the specific impact on local icing affecting nearby roads is assessed as negligible.

14. Regarding cumulative impacts:

a) the EIA Documentation must take into account the interactions between the proposed SMR reactor and the existing and planned units at the ETE site (shared infrastructure, potential safety and operational interactions, and cumulative environmental impacts),

b) take into account the anticipated cumulative effects associated with the construction of the planned New NPP ETE,

c) assess the anticipated environmental impacts arising from the combined (cumulative/synergistic) effects of all existing and planned nuclear and non-nuclear facilities at the site. Cumulative impacts should be assessed as early as the construction phase of the Project.

Addressing the requirements:

ad a) The Documentation takes into account the interactions between the SMR ETE Project and the existing and planned units at the Temelín site; information on how these interactions are taken into account is provided in Chapter B.I.4. Nature of the Project and potential for cumulative impacts with other projects (page 70 of this Documentation). The environmental impacts of the SMR Project are assessed taking into account the combined (cumulative) impacts of existing/operating nuclear facilities at the Temelín site, planned nuclear facilities at the Temelín site (taking into account their preparation and operation schedules), as well as the overall environmental

background of the affected territory and its development trends described in Chapter C.II. CHARACTERISTICS OF THE CURRENT STATE OF THE ENVIRONMENT IN THE AFFECTED TERRITORY (page 208 of this Documentation and the following pages).

The SMR ETE Project will use/share the existing ETE1,2 systems for the supply of raw water and drinking water, wastewater discharge, and stormwater drainage, which have sufficient spare capacity, including for the planned New NPP ETE. In addition, the Project will be equipped with its own independent infrastructure.

ad b) The environmental impacts of the SMR ETE Project are assessed taking into account the combined (cumulative) impacts associated with the construction of New NPP ETE; information on how these impacts are taken into account is provided in Chapter B.I.4. Nature of the Project and potential for cumulative impacts with other projects (page 70 of this Documentation).

ad c) The environmental impacts of the SMR ETE Project are assessed taking into account the combined (cumulative) impacts of existing and planned nuclear and non-nuclear facilities at the site, including during the construction phase of the Project. Information on the approach to assessing combined/cumulative impacts is provided in Chapter B.I.4. Nature of the Project and potential for cumulative impacts with other projects (page 70 of this Documentation).

15. All relevant requirements and comments contained in the statements received and listed below must be taken into account and addressed in the EIA Documentation and its Annexes. In this context, it is appropriate to include, at the beginning of the EIA Documentation, a chapter describing how the individual comments were taken into account or addressed.

Addressing the requirement:

The Documentation addresses and takes into account all relevant requirements and comments contained in the individual statements submitted during the screening and scoping procedure. The requested chapter describing how the comments have been taken into account or addressed is included in the Documentation (this Chapter).

The list of entities that submitted statements during the screening and scoping procedure and a brief summary of their statements and comments, as set out in the conclusion of the screening and scoping procedure, is as follows[1]:

Czech Republic:

- *Municipality of Temelín (statement dated 18 December 2024)*

  The municipality requests that the EIA Documentation consider alternative designs and locations for the evacuation of electrical power to the transmission system, as well as maximum use of rail transport for the transportation of construction materials. The municipality also requests that a Traffic Study be prepared. It also requests an assessment of the impact of seismic activity, the impacts on surface water and groundwater in relation to the municipality of Kočín and the nearby biocorridor, and cumulative impacts in connection with the planned construction of additional nuclear units. Lastly, it requests the inclusion of information on dust-control and noise-control measures during construction and asks the Developer to consider the possibility of green noise-control measures for the operation phase. It also requests the submission of a proposal for compensatory measures for vegetation removed by felling.

- *Town of Týn nad Vltavou (statement Ref. No.: MÚT/31801/2024 dated 18 December 2024)*

  The town requests an assessment of the impact of increased traffic volumes on public health, with particular emphasis on the noise situation and emissions in the built-up area of the town, and, where appropriate, the proposal of measures to mitigate these adverse impacts. Lastly, it requests that cumulative impacts associated with the planned construction of New NPP ETE also be taken into account.

- *South Bohemian Regional Authority (statement Ref. No.: KUJCK 135635/2024 dated 18 December 2024)*

  The Regional Authority has no comments on the submitted Project.

- *České Budějovice Municipal Authority (statement Ref. No.: OOZP/12071/2024/Ko dated 16 December 2024)*

  The Municipal Authority has no comments on the submitted Project and merely draws attention to the statutory requirements.

- *Regional Public Health Authority of the South Bohemian Region, based in České Budějovice (statement Ref. No.: KHSJC 37298/2024/HOK CB-CK dated 29 November 2024)*

  The Regional Public Health Authority requires assurance that the Project will not increase noise exposure above the public health limits and that the permitted levels of non-ionizing radiation will not be exceeded at protected residential buildings. The EIA Documentation must contain conclusive and unambiguous evidence demonstrating compliance with these requirements.

- *State Office for Nuclear Safety (statement Ref. No.: SÚJB/SJB/31985/2024 dated 18 December 2024)*

  The Office requests that the EIA Documentation provide a clear and detailed justification for the construction of the SMR nuclear power plant, taking into account all benefits and impacts on the population and the environment, from the construction phase through to final

[1] The list, order, and brief summary of the statements and comments submitted by the individual entities correspond to the conclusion of the screening and scoping procedure.

decommissioning. It further requests that the EIA Documentation contain a detailed description of important areas, including the safety concept and basic safety criteria, the protective envelope (containment) and other safety-significant structures, the means of ensuring defense in depth, the principle and concept of safety systems, accident conditions, geological, hydrogeological, and seismological conditions at the site, the concept for radioactive waste and spent nuclear fuel management, radioactive discharges, ensuring the protection of facilities already in operation, and arrangements for radiation extraordinary event management.

- *Ministry of Culture (statement Ref. No.: MK 98192/2024 OPP dated 17 December 2024)*

  The Ministry points out that, depending on the cooling system selected, the Project may affect the established "landscape silhouette" and consequently the landscape character, and requests that information on the nearest cultural monuments be added to the text of the Notification (or the Documentation).

- *Povodí Vltavy, State Enterprise (statement Ref.: PVL-84441/2024/410 dated 19 December 2024)*

  The river basin administrator requests that the EIA Documentation include a detailed assessment of the impact of the Project in terms of the planned surface-water abstraction, cumulatively with the existing nuclear units and the New Nuclear Power Plant, focusing on impacts on the hydrological regime of the affected water bodies, a water-management assessment of the impacts on hydraulic structures, and consideration of ongoing climate change. The assessment should result in compensatory measures or alternative Project options having lower impacts on the population, public health, fauna, and ecosystems. It further requests a detailed assessment of wastewater discharges and stormwater drainage, both separately for the Project and in combination with existing and planned nuclear facilities in the area, during the construction and operation of these projects.

- *South Bohemian Museum in České Budějovice (statement Ref.: 2570/2024 dated 18 November 2024)*

  No comments; attention is drawn to the statutory requirements.

- *Calla – Sdružení pro záchranu prostředí, z.s. (Association for the Preservation of the Environment; statement dated 19 December 2024)*

  The association objects to the ambiguity of the technology being assessed and the associated differences in environmental and public-health impacts, questions the designation of the Project as an SMR, draws attention to what it considers to be an excessive amount of energy generated at the site concerned, objects that the information on Project outputs is solely based on assumptions, and argues that the Project Notification fails to consider potential synergistic impacts with the proposed final nuclear repository project at the Janoch site.

- *Jihočeské matky, z.s. (South Bohemian Mothers; statement dated 8 December 2024)*

  The association requests that a specific type of small modular reactor be assessed in the EIA Documentation. It further requests an assessment of the impacts of surface-water abstraction and wastewater discharge associated with the Project, including other planned projects at the site. It also points out that more Project options should be assessed in the EIA process and, lastly, requests an assessment of the impacts of severe accidents, particularly in view of the current geopolitical situation.

- *South Bohemian Regional Organization of the Green Party (statement dated 16 December 2024)*

  The regional organization of the Green Party objects that the Notification only describes an abstract, hypothetical Project whose technical design and final configuration are unknown, questions nuclear power as a strategic energy source, objects to what it considers an insufficient assessment of Project options and the absence of an assessment of nuclear-waste risks, and criticizes the justification of the need for the Project. It also attaches to its statement a German analysis of the technical safety and risk assessment of nuclear facilities and requests that the risks identified therein be included in the EIA Documentation. It further requests that the parameters and technical design of the Project (in particular, the number and technical parameters of the reactors) be specified in greater detail in the EIA Documentation. It also requests that the safety features be specified and the cumulative safety risks assessed.

- *Občanská iniciativa pro ochranu životního prostředí z.s. (Civic Initiative for Environmental Protection; statement dated 12 December 2024)*

  The association objects to the location of the Project near public roads and highlights what it considers to be the benefits of renewable energy sources compared with the proposed Project. It also requests that the possibility of evacuating electrical power using an underground cable system be examined, that the capacity of the infrastructure used to convey abstracted water be assessed, and that the impacts of water abstraction and wastewater discharge on surface waters and the capacity of watercourses be evaluated. It also requests that the EIA Documentation provide more detailed information on nuclear fuel replacement and storage and assess the impact of water vapor emissions on roads (or, more generally, the impact on the microclimate in the vicinity of the Project). Lastly, it requests an assessment of the impacts of seismicity and weather conditions.

- *Ministry of the Environment:*
  - *Climate Change Adaptation Department (statement dated 6 December 2024)*

    Without comments.
  - *Water Protection Department (statement dated 18 December 2024)*

The Department requests that the Documentation specify the quality characteristics of the industrial wastewater generated. It also requests that a hydrogeological assessment be prepared in view of the need to extend the existing drainage-well system. It also draws attention to the statutory requirements.

- *Climate Protection Policy Department (statement dated 26 November 2024)*

  Without comments.
- *Air Protection Department (statement dated 12 February 2025)*

  Without comments.

- *EUROSOLAR.CZ – national section for renewable energy of the European Association for Renewable Energy, EUROSOLAR e.V. (statement dated 24 January 2024[1], submitted after the deadline)*

  Pursuant to Section 6(6) of the Act, MŽP does not take into account statements submitted after the deadline. However, this statement is taken into account in this Documentation.

Slovak Republic:

- *Ministry of the Environment of the Slovak Republic (statement No.: 17142/2024-11.1/bd 79280/2024 dated 10 December 2024)*

  The Ministry does not request participation in the transboundary assessment procedure. The Slovak party also proposed that the conditions of the binding EIA opinion include a requirement for future international expert cooperation in the field of nuclear safety and for the sharing of expert information.

Republic of Poland:

- *Generalna Dyrekcja Ochrony Środowiska (statement DOOŚ-WST.442.26.2024.ZM.6 dated 17 January 2025 and DOOŚ-WST.442.26.2024.ZM.6 dated 26 February 2025)*

  The Directorate requested participation in the transboundary assessment procedure. It also requests that the EIA Documentation include a description of the options analyzed and identify and compare their anticipated environmental impacts, including justification of the proposed option. It further requests that the EIA Documentation include an analysis of the radiological consequences and severe accident scenarios.

- *Państwowa Agencja Atomistyki (statement DBJ-WOZR.416.1.2024.1 dated 9 January 2025)*

  The Agency requests that the EIA Documentation include an analysis of the radiological consequences and severe accident scenarios containing information on the state of the reactor core and also taking into account accidents involving containment damage.

Republic of Austria:

- *Bundesministerium für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie (BMK) sowie die Bundesländer Burgenland, Kärnten, Niederösterreich, Oberösterreich, Salzburg, Tirol und Vorarlberg (expert review by Umweltbundesamt GmbH, Vienna, 2025 (received on 20 January 2025))*

  The expert review is primarily advisory in nature. The authors consider it particularly necessary to finalize the SMR design and therefore recommend postponing preparation of the EIA Documentation until the design has been finalized. The main reason is uncertainty regarding the input data for analyses used in expert assessments within the EIA Documentation, for example in the area of radioactive releases, since the SMR design may change during the approval process, which could result in underestimation in the radiological assessment. According to the review, the zero option is also not clearly defined and should be clearly defined in the EIA Documentation. It is also recommended that the chapter addressing Project options be expanded, that the cumulative impact of nuclear facilities at the site be assessed, and that possible combinations of individual types of hazards be taken into account and described as part of the safety assessment. It is further requested that the impacts of potential radioactive releases on Austrian territory be assessed and, lastly, that the EIA Documentation quantify the amounts of spent nuclear fuel and radioactive waste and provide detailed information on how they will be managed.

- *Public (51 statements + 2 statements submitted after the deadline)*

  MŽP received 48 statements from Austrian institutions and the public through the Bundesministerium für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie, and a further 3 statements directly from members of the Austrian public by email, making a total of 51 statements. A further 2 statements were received after the deadline; pursuant to Section 6(6) of the Act, MŽP does not take statements submitted after the deadline into account; however, these statements are nevertheless taken into account in this Documentation.

  Summary of the main comments of the Austrian public on the Project: The reactor type is unknown and is still at the development stage; none of the SMR designs presented yet exists or has been licensed. Opponents of the Project, including individuals, municipalities, and organizations such as Global 2000, Atomstopp, and others, draw attention to the unfinished State Energy Policy, which has not undergone

[1] Probably a typographical error in the year; the chronological context indicates that the year should be 2025.

strategic environmental assessment (SEA), and argue that no decision on the construction of a new nuclear power plant can be made until it has been adopted. They draw attention to uncertainties concerning the number and output of the reactors, which exceed the IAEA definition of an SMR (300 MWe), and question the suitability of the Temelín site in view of the accumulation of existing and planned nuclear facilities, whose concurrent operation could pose a serious risk, particularly in the event of an accident or natural disaster. They also criticize inaccuracies, speculation, and unverified information in the EIA Documentation, including manipulated parameters derived from various SMR designs (including the now discontinued Nuward project), and request that the Project focus on a specific design – the Rolls-Royce SMR – only after it has been approved in the United Kingdom. They also question whether completion of construction by 2035 is realistic in view of the delays typical of similar projects and request a wide range of additional information and analyses, including on safety systems, accident risks, the impact of climate change, possibilities for using waste heat, analysis of the impacts of radioactive emissions, and radioactive waste management. The critics request that the EIA process be discontinued because they consider the Project premature, speculative, and potentially misleading, arguing that at this stage its impacts on the environment and public health cannot be meaningfully assessed.

Federal Republic of Germany:

- *Bayerisches Staatsministerium für Umwelt und Verbraucherchutz (statement Ref.: 81-U8804.5-2025 dated 14 January 2025)*

  The Ministry requested participation in the transboundary assessment procedure and requires the EIA Documentation to contain a detailed description of all reactor technologies considered, their safety concepts, and their potential interactions with the existing and planned units at the site. It also requests clarification of the Project's compliance with Czech and international regulations, including the possibility of applying legal exemptions. The EIA Documentation should provide information on shared infrastructure, the impacts of external events (e.g. earthquakes and floods), emergency planning, potential radionuclide releases and their dispersion, as well as nuclear fuel transport and radioactive waste management, including potential transboundary shipments. The Ministry also points out the need to provide a clear overview of all relevant international standards and demonstrate how they have been taken into account in the Project.

- *Public (52 statements)*

  MŽP received a total of 52 statements directly from the German public by email.

  Summary of the main comments of the German public on the Project: The Project does not yet specify a particular reactor technology; it is unclear whether a boiling water or pressurized water reactor will be used, and only generic options are considered, some of which have already been discontinued (e.g. NUWARD). The designation SMR is considered misleading because the output of the planned facility (up to 500 MW_e) exceeds the IAEA definition of small modular reactors. The suitability of the Temelín site is also questioned because two large nuclear power units already exist there and the region produces more electricity than it consumes. The comments also point to the absence of an assessment of the cumulative impacts of the Project, particularly with regard to the planned deep geological repository for radioactive waste at the nearby Janoch site. The EIA Documentation does not provide answers to key technical questions: how many units are to be built, which reactor will be used, whether the technology is certified by the IAEA, how interim fuel storage and disposal will be addressed, and what safety measures are planned for the population. The public also draws attention to the risks of transboundary accidents, environmental impacts, high costs, and the absence of a long-term solution for radioactive waste management. The SMR technology is frequently described by members of the public as obsolete and as impeding the development of sustainable renewable energy sources.

The manner in which all relevant requirements and comments contained in the statements received have been taken into account and addressed is set out in the following overview. This overview summarizes the requirements and comments contained in the statements received, but only those that go beyond points 1 to 14 above.

For the purposes of the environmental impact assessment process, relevant requirements and comments are considered to be those concerning impacts on the environment or public health as defined by Act No. 100/2001 Coll., on Environmental Impact Assessment, as amended. Section 2 of the Act defines the scope of assessment as follows: *"Impacts on the population and public health and impacts on the environment are assessed, including impacts on fauna and flora, ecosystems, biodiversity, soil, water, air, climate and landscape, natural resources, material assets and cultural heritage as defined by specific legislation, and the interactions and relationships between them. Impacts on biodiversity are assessed with particular regard to species of Community interest, birds, and European habitats."* The relevance of the individual requirements and comments is therefore assessed against this statutory criterion.

This does not mean that other requirements and comments which fall outside the scope of the above definition are not taken into account and addressed. However, they are taken into account and addressed in a more general form and/or by reference to the relevant context in which they are and/or will be addressed. As a matter of principle, the subject of this EIA Documentation is environmental considerations (i.e. impacts on the environment and public health), rather than other considerations (design, structural, operational, strategic, economic, legislative, or other considerations). It is reasonably assumed that all matters falling outside the scope of environmental impacts are and/or will be resolved at the appropriate stages of Project preparation in accordance with the applicable legislation. At the same time, it is not essential whether this has already happened or will happen at other stages of the Project preparation.

An overview of the requirements and comments contained in the statements received and the manner in which they have been taken into account and addressed is provided below.

15.1. Justification of the need for and location of the Project, Project options:

a) justify the need for such a high electrical output at the site; locating another reactor at the site is unnecessary from an energy perspective, and the electricity must be transformed and transmitted to other areas, with associated losses,

b) if the EIA process is to be meaningful, several Project options should be assessed, including the zero option; different numbers of nuclear facilities will result in different levels of discharges into the environment,

c) further development of nuclear power will not meet the strategic energy objectives; construction will not begin until after 2030 and delays in completion can be expected; the principal route to decarbonization is energy savings, reduced energy intensity, and the development of renewable energy sources,

d) nuclear facilities will not contribute to the energy self-sufficiency of the Czech Republic because they will always depend on fuel purchased on world markets; the same applies to imports of specific goods and services,

e) with regard to energy security, nuclear facilities are the most problematic, particularly because of the storage and transport of nuclear materials, which may become targets for terrorists,

f) the so-called zero option is not considered; the possibility of constructing no nuclear power plant and meeting electricity demand in another way (through additional renewable energy sources or even energy savings) is not considered; the zero option needs to be developed further,

g) the SMR ETE Project is a bet on a non-renewable energy source using obsolete technology in new commercial packaging; the ASEK did not take into account all renewable energy options, which are now at a higher and increasing level than assumed by the ASEK, accompanied by a continuing decline in the cost of energy from renewable sources, which will make it the cheaper form of energy within a decade; renewable energy sources are not mentioned among the options, i.e. the possibility of meeting all or almost all energy demand from renewable energy,

h) the Project is not considered in several options in terms of location, capacity, or technical design; it is proposed as a single implementation option consisting of the construction of a new SMR nuclear power plant in a single-unit configuration at the Temelín NPP site, and the selected option is described as the optimal option; Appendix II to the Espoo Convention stipulates that environmental impact assessment documentation should, where appropriate, contain a description of reasonable alternatives (for example, locational or technological alternatives) to the proposed activity, including the no-action alternative, and a description of the potential environmental impact of the proposed activity and its alternatives and an estimation of its significance; by contrast, Annex IV to the EIA Directive states that the documentation should contain a description of the reasonable alternatives (for example in terms of project design, technology, location, size, and scale) studied by the developer that are relevant to the proposed project and its specific characteristics, and indicate the main reasons for selecting the chosen option, including a comparison of the environmental impacts; to ensure a comprehensive assessment of the environmental impacts of the construction project, the EIA Documentation should contain a description of the options analyzed, identify and compare their anticipated environmental impacts, and justify the proposed option,

i) the rationale for non-renewable investments should be reconsidered; SMRs are not yet under construction anywhere, and the costs incurred in this direction may prove to have been spent without any return,

j) construction of SMR ETE is a pointless investment that is inconsistent with energy savings and affects other energy sources and energy-policy instruments,

k) the State Energy Policy used to justify the Project has not been completed and has not undergone SEA; references to this policy are therefore not appropriate,

l) the plan to replace coal-fired power plants, which are expected to cease operation around 2030, is unrealistic given a planning and construction period of 15–20 years per reactor; in the case of nuclear power plants that have been built, construction has as a rule taken three to four times longer than originally promised; the Project is therefore unsuitable for replacing generating sources that will already have been decommissioned, and alternative scenarios are lacking,

m) the construction of prototype, test, or experimental nuclear power plants envisaged by the Project must not take place in areas where people live nearby who could be exposed to radiation in the event of an accident (Czech Republic, Austria).

Addressing the requirements and comments:

ad a) The Project is not inherently designed as a local source; its electrical output will be evacuated to the transmission system. In view of the results of the grid study, power evacuation at the site and the subsequent transmission and distribution of electricity to points of consumption will not pose a risk with regard to operation of the transmission system.

In addition to electricity-system requirements (availability of electricity infrastructure, transmission capacity of power lines, short-circuit ratings of substations, and others), sites for the construction of a nuclear facility are subject to stringent requirements for site suitability with regard to nuclear safety and radiation protection (geological, hydrogeological, engineering-geological, and geodynamic phenomena, hydrological characteristics of the area, distribution of settlements in the surrounding area, and

others). With regard to the construction of a nuclear power plant, site characteristics are absolutely crucial, which is also one of the reasons why the Temelín site was selected, as it is highly advantageous in these respects.

The required output is derived from the long-term system balance requirements (replacement of coal-fired generating sources being decommissioned, coverage of peak winter loads, and maintenance of an adequate capacity reserve) and from the need for stable, emission-free output complementing variable generation from renewable energy sources. The location at the Temelín site makes use of existing energy and safety infrastructure (power evacuation, secured land, and emergency planning), thereby minimizing new land take and new impacts.

ad b) Act No. 100/2001 Coll., on Environmental Impact Assessment, as amended, does not impose a requirement for mandatory assessment of options. The selection of options entering the environmental impact assessment process (see Chapter B.I.5.2. Description of the options considered) is entirely within the competence of the Project developer. The selection of the implementation option, i.e. the specific Project entering the assessment, is therefore fully compliant with the requirements of the Act. A similar approach is followed in the assessment of other nuclear and non-nuclear facilities.

The zero option is an indispensable reference option. Its impacts are represented by the current state of the environment in the affected territory and its development trends, as described in Chapter C.II. CHARACTERISTICS OF THE CURRENT STATE OF THE ENVIRONMENT IN THE AFFECTED TERRITORY, and is therefore implicitly included in the assessment.

The discharges to the environment included in the assessment of impacts on the environment and public health take into account the relevant combined effects of other specific facilities. There is therefore no uncertainty in this respect.

ad c) The Project, or more generally the development of nuclear power, is not an alternative to energy savings and renewable energy sources, but a complement to them. Among other things, it provides long-term decarbonized generation during periods of low generation from renewable energy sources and stabilizes the system. At the same time, it diversifies generation and contributes to energy security.

ad d) Nuclear facilities form one component of energy policy and contribute to the diversification of the Czech Republic's energy security. Their added value in this respect lies in stable decarbonized generation (see the response to the preceding point) and in supporting the domestic knowledge economy (domestic industry is capable of meeting a large proportion of specific needs), although fuel is purchased on the global market. Uranium is a commercially widely available commodity, and there are options for securing sufficient fuel stocks, including diversification of suppliers.

ad e) The Project is designed to meet the requirements for physical protection and security arrangements laid down by the Atomic Act, SÚJB decrees, and international recommendations (e.g. the IAEA NSS). Nuclear materials are stored in controlled, guarded, and structurally robust buildings designed also to withstand external attacks. Transport of nuclear materials is subject to special security arrangements, including armed escort and confidentiality of routes and timing, and is coordinated with the Police of the Czech Republic and other components of the IZS.

The state is responsible for external protection of nuclear installations as regards terrorist attack risk, while the operator is responsible for internal protection by means of the project design and organization of the security system. Primary protection against deliberate attacks is the responsibility of the state. The state has a range of means at its disposal (intelligence services, the armed forces, the police, monitoring of terrorist activities, protection of airspace, preventive measures in air transport, special units, etc.), whose deployment through the Ministry of Defence of the Czech Republic, Ministry of the Interior of the Czech Republic, and SÚJB means that the risk of a successful terrorist attack on a nuclear facility or transport of nuclear material is, with a high degree of probability, eliminated or minimized.

Under the Act on the Armed Forces of the Czech Republic and the Act on Ensuring the Defense of the Czech Republic, the existing Dukovany and Temelín nuclear power plants are classified as facilities important for national defense, and if extraordinary security measures are declared by the Government of the Czech Republic or in the event of a military conflict, the defense of these nuclear power plants is ensured by the Armed Forces of the Czech Republic. A similar approach will also be applied to SMR ETE.

ad f) The zero option is considered in the assessment and constitutes an indispensable reference option (see point b) above). However, it must not be confused with an assessment of other methods of electricity generation. The zero option relates exclusively to the Project for the new SMR nuclear power plant at the Temelín site and, in substantive terms, means that this Project is not implemented. The zero option does not concern any other energy-policy instruments, i.e. other methods of electricity generation and/or electricity savings, which are addressed at the conceptual (strategic) level rather than as part of the assessment of the specific SMR Project.

ad g) The State Energy Policy, or its update (ASEK), is not the subject of this Documentation. The subject of this Documentation is the assessment of the environmental effects of the specific SMR ETE Project, not a discussion of the information contained in the ASEK.

The ASEK is a conceptual document based on modeling of realistically achievable energy scenarios rather than on the theoretical maximum potential of individual technologies. The assessment of renewable energy sources in the ASEK and the modeling of scenarios in the National Energy and Climate Plan approved by the Government of the Czech Republic are based

on a combination of technical, geographical, environmental, and system potential, including constraints arising from the transmission system, energy storage, and controllability of generation. The National Energy and Climate Plan of the Czech Republic, approved by the Government of the Czech Republic in December 2024, was prepared pursuant to Regulation (EU) 2018/1999 of the European Parliament and of the Council on the Governance of the Energy Union and Climate Action and contains objectives and policies in all five dimensions of the Energy Union for the period 2021–2030, with an outlook to 2050; as regards transformation of the generation mix, it takes into account ambitious development of renewable energy sources accompanied by energy savings, development of energy storage, sufficient capacity of controllable generating sources, and nuclear power sources, including SMRs.

ad h) Information on the selection of options entering the environmental impact assessment process, including the reasons for selecting the solution concerned, is provided in Chapter B.I.5.2. Description of the options considered. The selection of the option entering the assessment, i.e. the specific Project, is entirely within the competence of the Project developer. This approach is fully compliant with the requirements of the Act, and a similar approach is followed in project-level environmental impact assessments of other nuclear and non-nuclear facilities.

ad i) The investment decision is not the subject of this Documentation. It is not clear what is meant by the statement "SMRs are not being built anywhere". According to the IAEA ARIS database (SMR Catalog, 2024), a number of SMRs are under construction or in operation worldwide.

ad j) The investment decision is not the subject of this Documentation. The subject of this Documentation is the assessment of the environmental effects of the specific SMR ETE Project.

However, the SMR ETE Project is not inconsistent with the energy-savings policy, since energy savings and the development of generating capacity play complementary rather than competing roles in energy policy. Although energy savings reduce the rate of growth in demand, they cannot in themselves eliminate the need to renew and replace aging generating sources or ensure that the system's baseload demand is met. Even under an ambitious energy-savings scenario, an absolute reduction in the need for reliable electricity sources cannot be expected, particularly in view of the long-term trends towards electrification of transport, heating, and industrial processes. Investment in SMRs therefore cannot be regarded as a rejection of the principle of energy savings, but rather as a complement to them within realistic planning of the future energy mix. In this respect, the development of renewable energy sources and other energy-policy instruments (energy savings) is not affected by the Project; their development is addressed in the relevant contexts.

ad k) It can be agreed that, at present, the version of the State Energy Policy of the Czech Republic approved in May 2015 remains the only valid and binding document. However, the information contained in the State Energy Policy is not the primary subject of this Documentation; strategic documents in the field of energy and climate serve as context in this respect, and the environmental impact assessment is independent of them.

Although the updated State Energy Policy has not been completed, the modeling used for it is identical to that used in the VPEK approved by the Government, which was also accepted by the European Commission (28 May 2025). This strategic document relies to a considerable extent on the development of new renewable and nuclear generating sources.

ad l) The timing of the replacement of generating sources is a matter of energy policy (ASEK), addressed at the strategic level, and is therefore not the subject of this Documentation, which is prepared at the project level.

The SMR construction project is not conceived as a short-term solution for the phase-out of coal-fired capacity, but as part of the long-term transformation of the energy mix over a period of several decades. SMRs are designed with the aim of shortening implementation times through standardization, modular manufacturing, and reducing the extent of construction work carried out directly at the site. Experience with delays in the construction of large nuclear power plants cannot be mechanically applied to SMR technology, whose fundamental added value lies precisely in reducing the risks associated with lengthy and complex construction. It therefore cannot be generally asserted that all nuclear projects have experienced delays, nor is it possible to infer the general infeasibility or unsuitability of this technology for long-term planning.

ad m) The SMR ETE Project is not a prototype, test, or experimental unit. It will be subject to the requirements of all binding legislation applicable in the Czech Republic, particularly in the fields of the use of nuclear energy and environmental protection. It will therefore be a fully licensed facility.

15.2. Description of the technical design:

a) it is not clear which technology is the subject of the assessment; reference is made to a nuclear unit with one or two reactors with a total electrical output of up to 500 MW_e, involving either a boiling water reactor or a pressurized water reactor; the EIA process should not have been initiated under these circumstances,

b) the design of a specific reactor type must be assessed; without knowing the specific reactor type and without its development having been completed, neither its safety nor its environmental impacts can be assessed,

c) *small modular reactors are at the technological development stage; only a few units have been built to date, and there is no experience with manufacturing them in the larger quantities on which their key economic advantage is supposed to depend; if they were only manufactured as individual units, their cost per unit of output would be significantly higher than that of large units, which are themselves uncompetitive with other sources because of their high costs and the high risk of construction cost overruns,*

d) *there is a lack of experience with the operation of SMRs in a conventional electricity grid,*

e) *an abstract, hypothetical project is being assessed whose technical design and final configuration are unknown (an unspecified Generation III+ LWR unit with a high degree of passive safety features and an electrical output of up to 500 MW_e is being assessed, with no lower limit specified at all; the number of circuits is not specified; it is unclear whether the unit will consist of one or two nuclear reactors, which is fundamental to the safety assessment; the passive safety features are not specified; it is not a small but a medium-sized reactor; irrelevant and general information is provided together with the basic parameters of four different reference designs; this therefore does not constitute a description of the technical design of the Project; general information cannot possibly cover all potential environmental risks),*

f) *in October 2024, ČEZ concluded an agreement with the UK-based company Rolls-Royce SMR on cooperation in the deployment of small modular reactor technology and acquired a 20% stake in the company; it will therefore participate directly in the development of the new modular reactor technology and its manufacture, and the Documentation can consequently work with the Rolls-Royce UK SMR design; however, this design is also still under development and construction is not expected to begin until after 2030,*

g) *SMRs are not commercially available and will theoretically become available in the future,*

h) *it is not known whether one or two circuits will be used,*

i) *it is not known whether the water supply has sufficient capacity,*

j) *the storage of spent fuel outside the containment is considered unsafe,*

k) *a detailed description of PWR technology is redundant when the exact SMR design is not currently known,*

l) *the price of the listed SMR types and its development over time should be provided,*

m) *the stated enrichment of less than 5% is questionable, since higher enrichment at HALEU levels is generally envisaged for SMRs; particular account should be taken of the fact that, according to a Stanford University study, SMR waste will have radioactivity two to thirty times higher than waste from large reactors; overall, small modular designs perform worse than conventional reactors in terms of radioactive waste generation, management requirements, and disposal options; after 10,000 years, the radiotoxicity of plutonium in spent fuel discharged from the three modules studied will be at least 50% higher than that of plutonium in conventional spent fuel per unit of energy generated; a different method of treatment and disposal of highly radioactive spent fuel assemblies will therefore be required,*

n) *the future electricity system is expected to have a higher share of renewable energy sources, which will increase the requirements for potential load-following operation of the planned facility; the EIA should show how the facility can be integrated into such a system, and analyses should also be provided of how load-following operation of the facility affects components important to safety (including aging and wear phenomena),*

o) *pursuant to Section 2, Article 8a of Directive 2014/87/Euratom, early or large radioactive releases should be practically eliminated; the EIA should therefore describe the releases expected during operation, in the event of design basis accidents and also beyond design basis accidents (severe accidents), and how practical elimination is methodologically demonstrated,*

p) *in addition to the basic technical description, the EIA should contain the following information:*
   - *a description and demonstration that separate, redundant, and independent systems are available for shutting down the facility, and a description of how these systems meet the requirements applicable to the facility,*
   - *a description of components shared between multiple safety levels and multiple levels of the defense in depth concept,*
   - *a description of how safety analyses are performed in accordance with the applicable regulations,*
   - *where applicable, a description of active redundancies for passive systems in the event that they fail to operate,*
   - *a description of passive systems that require electrical power for activation, and a description of the redundancy and diversity of this electrical power supply,*
   - *a description of the aging management and maintenance concept,*
   - *an introduction to, description of, and background information on the DBA, DBC, and DEC-A/B systems,*
   - *a description and demonstration of severe accident analyses and the planned technical measures to mitigate their consequences,*
   - *a description of the design solution for a core melting accident and demonstration of its functionality, and a description of the operating principle of the in-vessel retention strategy, including the availability of water injection systems for ex-vessel cooling,*
   - *a description of the management of hydrogen accumulation in the event of accidents,*
   - *a description of the filtered containment venting system,*
   - *a description of the measures to be taken to enable control and monitoring of the component manufacturing process,*

- *a detailed and comprehensive description of the core inventory, postulated accident sequences and frequencies, and the energy released in connection with the postulated accidents,*
- *a compilation of radionuclides released during the postulated accident sequences,*
- *for severe accidents, a description of the measures implemented to mitigate releases to the environment,*

q) *state the extent to which the possibility of a "general exemption from legal requirements in special cases" pursuant to Section 228b of the Atomic Act may be applied.*

Addressing the requirements and comments:

ad a) The subject matter of the Project is clearly defined by its technical description (Chapter B.I.6. of this Documentation) and the envelope of its environmental parameters (Chapters B.II. and B.III. of this Documentation). It will consist of one unit with one nuclear reactor.

ad b) The environmental impacts do not depend on the specific technical design of the Project, its stage of development, or even its trade name. They depend on its conservative environmental parameters, which are determined, among other things, by statutory requirements both in the environmental field and, in particular, under the Atomic Act and its implementing regulations. The bounding envelope of environmental parameters considered in this way can be used to assess environmental impacts, and the results of the environmental assessment can be evaluated on the understanding that the actual impact of the selected design will be lower than the predicted impact. The assessment results are therefore independent of the specific technical designs of potential suppliers or their projects.

This methodology is used worldwide to assess the environmental impacts of nuclear and other facilities, is recommended by the International Atomic Energy Agency, and is also recognized by regulatory authorities. The environmental and safety requirements are the same for all suppliers, and the impacts are assessed at their maximum levels. Thus, the subsequent selection of a supplier cannot be to the detriment of the protection of the environment.

For the avoidance of doubt, however, the Documentation also provides a description of the technical and technological solution of the preferred reference supplier's design. In general, however, the supplier of the new nuclear power plant (SMR ETE) may be any other manufacturer whose design complies with the bounding parameters used for the environmental impact assessment (as well as, of course, all other statutory requirements outside the impact assessment process).

ad c) The economics and serial production of SMRs are not the subject of the EIA process or of this Documentation. The subject of this Documentation is the assessment of the environmental effects of the specific SMR ETE Project. From the perspective of environmental impacts, the decisive factor is that the technology assessed is based on a proven Generation III+ light water reactor type and that the requirements and parameters needed for the environmental impact assessment are reliably available.

ad d) Integration into the electricity system is not the subject of the EIA process or of this Documentation. For the purposes of the environmental impact assessment, what is material in this respect is that flexible operation (load following) is technically feasible for the SMR technology considered and does not alter the conservative environmental parameter envelope used for the Project.

ad e) Impacts on the environment and public health do not depend on the specific technical design of the Project, its stage of development, or even its trade name. They depend on its environmental parameters, which are determined, among other things, by statutory requirements both in the environmental field and, in particular, under the Atomic Act and its implementing regulations. The conservatively determined envelope of environmental parameters can be used to assess environmental impacts, and the results of the environmental assessment can be evaluated on the understanding that the actual impact of the selected design will be lower than the predicted impact. The assessment results are therefore independent of the specific technical designs of potential suppliers or their projects. This methodology is used worldwide to assess the environmental impacts of nuclear and other facilities, is recommended by the International Atomic Energy Agency, and is also recognized by regulatory authorities. The environmental and safety requirements are the same for all suppliers, and the impacts are assessed at their maximum levels. Thus, the subsequent selection of a supplier cannot be to the detriment of the protection of the environment.

For the avoidance of doubt, however, the EIA Documentation also provides a description of the technical design of the preferred reference supplier's design. The Rolls-Royce SMR project (RR SMR) is used as the reference project. The RR SMR project is a pressurized water reactor with a three-loop configuration and forced coolant circulation, using a combination of active and passive safety features. The reactor uses standard fuel (UO_2, enrichment <5%), and boric acid is not used for reactivity control. The net electrical output of the reference project will be up to 500 MW_e. The project assumes a single-unit configuration and is presented as such in this EIA Documentation.

This refines and defines the initial parameters used in the assessment, while the input values used (Chapter B.II. DATA ON INPUTS) and output values (Chapter B.III. DATA ON OUTPUTS) are selected on a bounding and sufficiently conservative basis to cover, with an adequate margin, both the currently known parameters of the reference project and any changes to them during subsequent design stages. A description of the main systems of the RR SMR reference project, including the safety systems, is provided in the Documentation to the extent required for the purposes of environmental impact assessment (Chapter B.I.6. Description of the technical design). This Chapter provides both the basic safety characteristics generally applicable to

Generation III+ LWR-type SMRs and the specific characteristics of the RR SMR reference project, which falls within this category.

Although, at the time of preparation of the EIA Documentation, it is anticipated that the SMR ETE Project will be implemented using the RR SMR reference project, another SMR project may also be selected for SMR ETE provided that it complies with the bounding parameters used for the environmental impact assessment (and, of course, also with all other statutory requirements outside the environmental impact assessment process).

The above approach using an environmental parameter envelope is used worldwide for assessing the environmental impacts of nuclear and other facilities, is recommended by the International Atomic Energy Agency (IAEA NG-T-3.11, Managing Environmental Impact Assessment for Construction and Operation in New Nuclear Power Programmes), and is also recognized by regulatory authorities.

ad f) In October 2024, the Project developer, ČEZ, a. s., entered into a strategic partnership with the UK-based company RR SMR with the aim of deploying SMRs in the United Kingdom and the Czech Republic and, through an equity investment in the company, acquired an approximately 20% stake. The developer's objective is primarily to participate in localization of the design for the Czech Republic, with a large part of the design being identical to that of the first unit built in the United Kingdom. The RR SMR is a Generation III+ pressurized water reactor technology that operates on the same principle and is structurally very similar to the reactors operated at the existing Temelín and Dukovany sites, for which extensive operating experience is available.

Several potential suppliers were originally considered (see Chapter B.I.5.2. of this Documentation); the projects were assessed against multiple technological and economic criteria, as well as in terms of partnership and technology readiness. The Rolls-Royce RR SMR project was identified as the most suitable partner for the SMR program. It is therefore selected as the reference project for the environmental impact assessment, and its parameters are used as the primary basis in this EIA Documentation.

However, this does not mean that the RR SMR project has thereby been selected. The selection of the specific reactor design or its supplier is not the subject of the environmental impact assessment. All environmentally relevant Project parameters (the environmental parameters envelope) are available for the environmental impact assessment even without knowledge of the specific reactor supplier. The supplier for the SMR ETE Project may therefore be either the manufacturer of the reference reactor type (RR SMR) or another manufacturer whose project meets all statutory conditions, particularly those required for nuclear energy facilities, while also complying with the envelope parameters used for the environmental impact assessment.

ad g) The RR SMR reference project is currently available, and the Project developer is directly involved in ensuring its availability. In this case, commercial availability does not mean simply purchasing the design on the market, but rather localizing it to the specific regulatory conditions of the Czech Republic and the site characteristics of the Temelín site.

ad h) The RR SMR reference project is a Generation III+ pressurized water reactor, cooled and moderated by light water, with a two-circuit, three-loop configuration.

ad i) The hydrological analyses (Chapter D.I.4. of this Documentation) demonstrate that, based on the assessment, the raw-water source (the Vltava River at the Hněvkovice profile) provides sufficient reliability of supply for the SMR ETE Project (including the existing ETE1,2 and the planned New NPP ETE). The existing raw-water supply system (pumping station, supply pipeline, treatment facilities, and reservoir) will need to be modified accordingly, and the existing raw-water abstraction limit will also need to be increased.

ad j) Storage of irradiated/spent nuclear fuel outside the containment is a well-established solution with extensive operating experience. The vast majority of Western-designed plants use a design solution involving the storage of irradiated/spent nuclear fuel outside the containment, with a dedicated building for irradiated/spent nuclear fuel storage located within the nuclear island.

The SMR ETE Project will fully comply with Decree No. 329/2017 Coll., on Requirements for the Design of a Nuclear Facility, and the safety level of irradiated/spent nuclear fuel storage will meet internationally recognized requirements. Spent fuel management will follow a multi-level defense in depth concept, i.e. pool storage in a controlled area, followed by dry storage in robust containers in dedicated seismically resistant buildings with physical protection and monitoring. All fundamental safety functions will be fulfilled.

ad k) The SMR design is described by the technical design of the RR SMR reference project. With regard to the environmental impact assessment, however, this information is indeed redundant, since the conservative environmental parameter envelope used for assessing environmental impacts is independent of the specific design and, by its nature, does not require detailed information.

ad l) Economic information is not the subject of the EIA process or of this Documentation.

ad m) The RR SMR project envisages the use of standard nuclear fuel enriched to less than 5% U-235 (Rolls-Royce specifies a maximum of 4.95% U-235). The amount of spent nuclear fuel per unit of electricity generated is expected to be comparable for the SMR and conventional pressurized water reactors.

ad n) The capability of a nuclear facility to operate in load-following mode forms part of the requirements for the design of a nuclear facility. Based on operating experience from nuclear power plants abroad, information is available on the effects of load-following operation on a nuclear facility, and the design of the SMR ETE Project will therefore be adapted to these requirements

to the extent reasonably practicable. The increase in installed renewable generation capacity is therefore a factor taken into account in preparing the construction and developing the design of the SMR ETE Project. The aging management program (AMP) and lifetime management will form part of the Project safety documentation.

Load-following operation does not increase environmental discharges above the conservative values defined by the Project's environmental parameter envelope.

ad o) The above information is included in the Documentation, and its impacts are analyzed and assessed. Information on radioactive discharges during operational states (normal and abnormal operation) is provided in Chapter B.III.4. of this Documentation. Information on the source term for radiation extraordinary events (design basis accident, severe accident) is provided in Chapter D.II.1.2. of this Documentation. Information demonstrating practical elimination is provided in Chapter D.II.1.3. of this Documentation.

ad p) The above requirements are highly complex and in many respects go beyond the requirements applicable to environmental impact assessment documentation (EIA Documentation). The EIA Documentation is not technical, design, or licensing documentation for the SMR ETE Project, but a document assessing its environmental effects. The content and scope of the description of its technical design are adapted to this purpose, in full compliance with the requirements of Act No. 100/2001 Coll., on Environmental Impact Assessment, as amended. The emphasis is therefore placed on the environmental inputs and outputs of the Project, as defined by their conservative envelope. The description of the technical design used assumes compliance with all regulatory requirements of the Atomic Act, without assessing technical compliance with those requirements. The EIA Documentation therefore does not replace safety or other documentation prepared under the Atomic Act. In preparing the Documentation, it is therefore assumed, rather than assessed, that all requirements of the Atomic Act and related regulations are or will be complied with. Complete evidence will therefore be provided in the safety analysis reports and other safety documentation submitted to SÚJB under the Atomic Act for the relevant licensing proceedings.

Basic information addressing the individual points of the requirement for the Rolls-Royce Small Modular Reactor reference project (RR SMR) is as follows:

- The RR SMR project will include separate, redundant, and independent reactor shutdown systems that will ensure fulfillment of the fundamental safety function of reactivity control in accordance with the requirements of Section 45(2) of the Atomic Act and will meet the design and functional criteria laid down in Decree No. 329/2017 Coll., on Requirements for the Design of a Nuclear Facility. These systems will be designed, assessed, and demonstrated as capable of bringing the reactor to a stable subcritical state and maintaining this state over the long term, including in the event of a single failure or common cause failure.
- The RR SMR project will be designed to demonstrably provide multiple levels of defense in depth (DiD) through separate, redundant, and diverse components and systems. These systems will be physically, electrically, and functionally segregated so that failure of one component or level of defense cannot affect the function of the others. The design will comply with the requirements of Sections 45 and 46 of the Atomic Act, Decree No. 329/2017 Coll., Decree No. 162/2017 Coll., and the principles of IAEA SSR-2/1 (Rev. 1) and WENRA SRL 2020.
- Safety analyses for the RR SMR project will be performed in full compliance with the requirements of Czech nuclear legislation, in particular Sections 48 and 49 of the Atomic Act, Decree No. 162/2017 Coll., on Safety Assessment, and Decree No. 329/2017 Coll., on Requirements for the Design of a Nuclear Facility. The safety assessment of the RR SMR project will be performed in the subsequent licensing processes to the extent required by Czech nuclear legislation. It will include deterministic and probabilistic assessments and consideration of relevant internal and external hazards. The analyses must demonstrate that the RR SMR design fulfills the principles for the safe use of nuclear energy laid down in Sections 45 and 46 of the Atomic Act, i.e. control of reactivity, removal of residual heat, and prevention of the release of radioactive substances, and that risks are reduced to a level that is reasonably low taking into account the available means.
- The RR SMR project will have to demonstrate that the fundamental safety functions are ensured even in the event of failure of individual provisions, including through the use of redundancy, diversity, and independence to the extent required by Czech nuclear legislation, so as to enable safe reactor shutdown, removal of residual heat, and maintenance of containment integrity in accordance with the requirements of Section 45(2) of the Atomic Act and Sections 6 to 10 of Decree No. 329/2017 Coll., on Requirements for the Design of a Nuclear Facility.
- The RR SMR project will include passive safety systems whose functions are based on natural physical processes (condensation, gravity-driven flow, and heat accumulation). These systems do not require a continuous electrical power supply to perform their main function; however, power may be required for selected sensors, actuators, and control circuits for their initial actuation and control. Power supply to these components will be provided with redundancy and diversity through the safety measure supply system, comprising multiple independent AC and DC divisions, standby power sources, and uninterruptible power supply systems (Category I secure power supply) based on continuously charged storage batteries. The design will comply with the requirements of Czech nuclear legislation, the international standard IAEA SSR-2/1 (Rev. 1), and the WENRA Safety Reference Levels (2020).

- Aging management and maintenance of the RR SMR project equipment will be designed in accordance with the requirements of Czech nuclear legislation and international standards. Aging management and maintenance will form part of the facility safety management system throughout its life cycle. The aging management program will include identification of systems, structures, and components subject to aging, assessment of relevant degradation mechanisms, specification of monitored parameters and acceptance criteria, condition monitoring, and corrective actions. The maintenance program will include preventive, predictive, and corrective activities, testing, and inspections to an extent commensurate with the safety significance of the equipment. Specific aging management and maintenance programs for the RR SMR will be prepared and documented in the subsequent design and safety documentation. The concept is based on Act No. 263/2016 Coll., Decree No. 329/2017 Coll., on Requirements for the Design of a Nuclear Facility, Decree No. 162/2017 Coll., on Safety Assessment, Decree No. 358/2016 Coll., on Requirements for Quality Assurance and Technical Safety and Assessment and Verification of Conformity of Selected Equipment, and Decree No. 21/2017 Coll., on Ensuring Nuclear Safety of a Nuclear Facility. Aging management (AMP) and the maintenance program (EMIT – Examination, Maintenance, Inspection and Testing) are integral parts of the manufacturer's and future operator's integrated management system (IMS) for quality and safety and are designed in accordance with the requirements of IAEA SSR-2/1 (Rev. 1) and WENRA Safety Reference Levels (2020).
- The RR SMR project will be designed in accordance with the requirements of the Atomic Act (Sections 46 and 48 of Act No. 263/2016 Coll.) and implementing Decrees No. 329/2017 Coll. and No. 162/2017 Coll. so that the safety analyses cover all design basis conditions (DBC) and design extension conditions (DEC). The concept will be based on defense in depth and will ensure the management of all types of operational and accident conditions, from normal operation (DBC 1) to severe accidents (DEC-B). These conditions will be covered by both deterministic and probabilistic analyses and will serve to demonstrate that the reactor design fulfills all fundamental safety functions under Czech legislation and international standards.
- The RR SMR project will include comprehensive severe accident analyses (DEC-B) and the implementation of systems and technical measures for mitigating their consequences, ensuring fulfillment of the fundamental safety function of confinement of radioactive substances pursuant to Section 45(2) of the Atomic Act and compliance with the requirements of Decree No. 329/2017 Coll., on Requirements for the Design of a Nuclear Facility. The analyses and design provisions will demonstrate that even in the event of reactor core melting, containment integrity will not be impaired and no early or large radioactive release to the environment will occur.
- The RR SMR project will be designed to manage even the most severe DEC-B accident conditions. The in-vessel retention concept and associated cooling systems will ensure that, in the event of fuel melting, the molten core material remains inside the reactor pressure vessel and does not come into contact with the concrete structures of the containment (IVR strategy). The in-vessel retention system, severe accident primary circuit depressurization system, passive containment heat removal system, active containment heat removal system, and hydrogen recombination and controlled combustion system will together ensure maintenance of reactor pressure vessel integrity, removal of residual heat, and prevention of steam- and hydrogen-related phenomena. The design will fulfill the safety function of preventing the release of radioactive substances pursuant to Section 46 of the Atomic Act and will meet the requirements of Decree No. 329/2017 Coll. for the practical elimination of an early or large radioactive release.
- The RR SMR project will include comprehensive provisions for hydrogen management and removal within the containment in the event of design basis and design extension accidents (DEC-A and DEC-B). The design will ensure prevention of hazardous hydrogen accumulation, deflagration, or detonation and will maintain containment integrity. The hydrogen management system will comply with the requirements of Czech nuclear legislation and the international standards of the IAEA and WENRA.
- The RR SMR project assumes the application of a closed, passively stabilized containment concept without the need for filtered venting. Containment integrity will be maintained under all design basis and design extension conditions (including severe accidents) by passive cooling and hydrogen management systems, and filtered containment venting is therefore not required for the RR SMR project. Containment robustness and compliance with design limits will be demonstrated by deterministic analyses, including assessment of severe accidents and containment design limits.
- The RR SMR project will implement a comprehensive quality management and oversight system. Manufacture of components important to nuclear safety will be subject to a quality management system and graded oversight according to their safety significance. Control will include, in particular, specified witness and hold points, approved inspection and test plans, material and document traceability, non-conformance management, and supply chain oversight. The quality management system, applying a graded approach, will ensure that all components are designed, manufactured, verified, and released for installation in accordance with the requirements of the Atomic Act, Decrees No. 358/2016 Coll. and No. 408/2016 Coll., and the international standards ISO 9001, ISO 19443, ASME NQA-1, and IAEA GSR Part 2.
- Description of the reactor core inventory: UO_2, U-235 enrichment up to 4.95%, maximum fuel pellet burnup 65 GWh/tHM. Decay heat values are calculated using the SCALE code suite. The radionuclide inventory in the fuel over the fuel cycle is

determined using the ORIGEN code, which uses data on the radionuclide composition of the fuel and neutron flux values. TRITON is used as the depletion and decay code.

Table 0.1: Postulated accident sequences and frequencies

Plant state		ID	Frequency (IEF)
Operational states	Normal operation – abnormal operating conditions	DBC-2i	> 1E-02, *
		DBC-2ii	> 1E-02, *
Design basis accidents	Fault condition	DBC-3i	1E-02 to 1E-03
		DBC-3ii	1E-03 to 1E-04
		DBC-4	1E-04 to 1E-05, *
Design extension conditions	Complex sequences	DEC-A	< 1E-05, *
	Severe accidents	DEC-B	< 1E-05, *

* ... The IEF is not strictly defined by its anticipated frequency. The categorization was compared with the Czech legislative framework, in which differences are apparent in the assessment methodology and in the frequency values and limits (acceptance criteria).

Initiating events for design basis accidents include: Large Break Loss of Coolant Accident (LB LOCA), Steam Generator Tube Rupture (SGTR), Main Steam Line Break (MSLB).

Initiating events for design extension conditions, including severe accidents, include: Large Break Loss of Coolant Accident (LB LOCA), Station Blackout (SBO), Steam Generator Tube Rupture (SGTR), Main Steam Line Break (MSLB). For severe accidents, releases to the environment are determined on the basis of the core inventory combined with release data from MAAP5 code outputs. The frequency at which a release is assumed to occur is calculated as part of the probabilistic safety assessment.

- The methodologies for source term calculation and analysis of the radiological consequences of design basis accidents and design extension conditions are based on relevant validated methods of the IAEA, WENRA, NRC, and other relevant institutions. Assuming successful containment isolation (i.e. no bypass scenario), the analysis of the radiological consequences of design basis accidents and severe accidents assumes a containment leakage rate of 0.2% of containment volume per 24 hours. This leakage is conservatively assumed to be released directly to the atmosphere. No filtration or retention of containment leakage is contemplated in the analysis of the radiological consequences of design basis accidents or severe accidents. The HEPA filters incorporated in the discharge stack have been conservatively disregarded in the fault/accident analyses performed to date. Most radionuclides are assumed to be released as fine particles/aerosols, while noble gases are released as neutral gases. The source term calculations derive a time-dependent release fraction (phase). Each phase is assigned a release rate so as to achieve the correct cumulative release.
- The RR SMR project will be designed to ensure limitation and retention of radioactive substances within the containment and adjacent systems in the event of severe accident conditions. A set of technical and organizational measures will ensure that, under design extension conditions (DEC-A, DEC-B), an early or large release of radioactive substances to the environment is practically eliminated.

Information on the technical design of the Project is provided in Chapter B.I.6. Description of the technical design.

ad q) The SMR ETE Project is being prepared in full compliance with legal requirements, and the use of Section 228b of the Atomic Act is not currently envisaged for the Project.

15.3. Nuclear safety, physical protection, emergency preparedness, and monitoring:

a) the impacts of a severe accident caused, for example, by a targeted military or terrorist attack, which cannot be ruled out in view of the current geopolitical situation, should be assessed; the risk of an accident also increases with a high concentration of nuclear facilities at a single site,

b) if the EIA Documentation is to fulfill its purpose, the impacts of severe accidents on the wider surrounding area must be assessed, including with regard to the adverse effects of radiation doses below applicable limits; the issue cannot be dismissed on the grounds that the probability of a severe beyond-design-basis accident is low,

c) the location of the Project near public roads presents an increased hazard because of the possibility of an unexpected attack directly from the roads; it is considered likely that New NPP ETE will not be implemented, and it would therefore be far more appropriate to use the New NPP ETE area for siting,

d) in the event of armed conflict and the use of the most advanced ballistic missiles, the territory of the Czech Republic is not as well protected as Western Europe; if any new nuclear power plant, including an SMR, is constructed, and also with regard to existing nuclear power plants, investment is required in military systems that will protect, in particular, sites with nuclear power plants,

e) given that none of the four proposed designs has been licensed, it would be useful to consider possible licensing difficulties, potential risks associated with a FOAK situation, and risks arising from the initial operation of a new design; the fact that SMR ETE will be a FOAK increases the risk that unforeseen circumstances may cause problems,

f) an assessment is requested of human induced external events (large-scale fires in the surrounding area, transport of dangerous goods, aircraft crashes, and terrorist attacks; detailed information is not requested for the last item and general information may be provided),

g) it is impossible to model radioactive releases and estimate their probability because the design and safety assessment have not been completed and the designs are still under development; this is particularly important for DEC conditions, specifically DEC-B, because the objective of the SMR design is to practically eliminate accidents that could lead to a large or early radioactive release across the full spectrum of internal and external hazards,

h) the Notification promises an "analysis of radiological effects for the transboundary areas of the nearest neighboring country, for a representative conservative DBA case and a major accident under design extension conditions"; for the latter, a DEC-B event with initial containment failure should be analyzed, which would be sufficient to estimate doses to the population and environmental impacts in Austria,

i) the area examined must cover at least Europe and address long-range transport of pollutants and radionuclides,

j) the CDF (core damage frequency) and LRF (large release frequency) resulting from the risk analysis must be documented; the risk analysis must provide a comprehensive view of the overall safety of the facility,

k) it must be demonstrated that the Project applicant is capable of financially covering all damage incurred and its remediation, up to and including the largest accident; the same applies to claims for compensation,

l) where possible, provide information on physical protection and aircraft crashes.

Addressing the requirements and comments:

ad a) The risk of a terrorist attack is assessed in Chapter D.II.1.5.1. Risk of a terrorist attack. The Project will be resistant to the crash of a large aircraft and will meet other robustness and resistance requirements, which constitutes an important part of protection against external threats, including terrorist attacks. Further information on protection against terrorist attacks is provided in the information from the Ministry of the Interior of the Czech Republic on the system for protecting nuclear facilities against terrorist attacks (see Annex 6.2 to this Documentation).

Information on the main principles of physical protection, including how protection against terrorist attacks (including cyber, sabotage, and emerging threats) is ensured, is provided in Chapter B.I.6.2.2. Basic requirements for nuclear power plants, specifically in Chapter B.I.6.2.2.4. Requirements for the security of nuclear facilities and nuclear material. The SMR ETE Project will be designed to meet the requirements for physical protection and security arrangements laid down by the Atomic Act, SÚJB decrees, and international recommendations (e.g. IAEA NSS). Nuclear materials are stored in controlled, guarded, and structurally robust buildings designed also to withstand external attacks. The physical protection of all nuclear facilities and nuclear material is ensured in accordance with the approved Physical Protection Assurance Plans. The method used to ensure the physical protection of nuclear facilities corresponds to the threat arising from the established design basis threat. It should be noted that the specific physical protection arrangements (description, analyses, and solutions) constitute classified information and therefore cannot be published in this Documentation.

ad b) The assessment of the radiological consequences of accidents, including a severe accident, is provided in Chapter D.II.1.2. Radiation extraordinary events of this Documentation. The assessment is performed for an area extending 100 km around SMR ETE, which also includes parts of the neighboring countries of Austria and Germany. For Slovakia and Poland, the area analyzed is extended to a distance of up to 400 km from SMR ETE.

ad c) The site meets the requirements for separation, access control arrangements, and separation distances. Detailed physical protection arrangements (including the above-mentioned attacks from roads) are addressed in classified documents.

The New NPP ETE area is not available for the SMR ETE Project and remains reserved for implementation of New NPP ETE.

ad d) The Project is designed to meet the requirements for physical protection and security arrangements laid down by the Atomic Act, SÚJB decrees, and international recommendations (e.g. the IAEA NSS). Nuclear materials are stored in controlled, guarded, and structurally robust buildings designed also to withstand external attacks. Transport of nuclear materials is subject to special security arrangements, including armed escort and confidentiality of routes and timing, and is coordinated with the Police of the Czech Republic and other components of the IZS.

The state is responsible for external protection of nuclear installations as regards terrorist attack risk, while the operator is responsible for internal protection by means of the project design and organization of the security system. Primary protection against deliberate attacks is the responsibility of the state. The state has a range of means at its disposal (intelligence services, the armed forces, the police, monitoring of terrorist activities, protection of airspace, preventive measures in air transport, special units, etc.), whose deployment through the Ministry of Defence of the Czech Republic, Ministry of the Interior of the Czech Republic, and SÚJB means that the risk of a successful terrorist attack on a nuclear facility or transport of nuclear material is, with a high degree of probability, eliminated or minimized.

Under the Act on the Armed Forces of the Czech Republic and the Act on Ensuring the Defense of the Czech Republic, the existing Dukovany and Temelín nuclear power plants are classified as facilities important for national defense, and if extraordinary security measures are declared by the Government of the Czech Republic or in the event of a military conflict, the defense of these nuclear power plants is ensured by the Armed Forces of the Czech Republic. A similar approach will also be applied to SMR ETE.

ad e) The selection of the Project technology is directed towards a licensable design with the maximum degree of standardization. Licensing issues are not the subject of the EIA process, and potential licensing risks do not affect the validity of the environmental conclusions.

ad f) All the above aspects are taken into account in the EIA Documentation to a level of detail appropriate to the purpose of the EIA Documentation under the Act. They will subsequently be addressed in full detail in later stages of the licensing process under the Atomic Act. All these aspects are also addressed in the safety documentation for the operating ETE1,2, which is located in the immediate vicinity of SMR ETE; similar results can therefore be expected for SMR ETE, although individual details may differ.

External events are discussed in Chapter B.I.6.3.1.14. External hazards. Fires in the vicinity of SMR ETE are discussed in Chapter B.I.6.3.1.14.5. Wildfires and will form part of the SMR ETE design basis (in particular, protection of control rooms against the effects of potentially toxic combustion products). Transport of hazardous materials on nearby roads is discussed in Chapter B.I.6.3.1.14.6. Human induced external effects, identifying potentially hazardous transport of materials to be included in the SMR ETE design basis (resistance to blast waves, fire effects, and toxic cloud dispersion). For aircraft crashes, a distinction is made between an accidental aircraft crash, for which a so-called design-basis aircraft is specified and which SMR ETE must withstand without major damage, and a deliberate crash of a large aircraft, which must not result in a severe accident or a large release of radioactive substances to the environment. More detailed information is provided in Chapter D.II.1.4. Radiological risks associated with human activities at the site and in its surroundings, specifically in Chapters D.II.1.4.2. Preliminary assessment of the risk of an accidental aircraft crash and D.II.1.5.1. Risk of a terrorist attack, which describes the approach to addressing a deliberate crash of a large aircraft and other terrorist attacks.

Information on the main principles of physical protection, including how protection against terrorist attacks (including cyber, sabotage, and emerging threats) is ensured, is provided in Chapter B.I.6.2.2. Basic requirements for nuclear power plants, specifically in Chapter B.I.6.2.2.4. Requirements for the security of nuclear facilities and nuclear material. The issue of terrorist attacks is also addressed in the statement of the Ministry of the Interior of the Czech Republic provided in Annex 6.2 to this Documentation.

ad g) The method used to determine the source term is described in Chapter D.II.1.2.2. Determination of the source term for assessment of the radiological consequences of radiation extraordinary events. The derivation of the source term for both DBA and DEC-B was based on EUR requirements for limiting the economic consequences of accidents and US NRC recommendations contained in NUREG-1645, NUREG-1940, and 1.183 reports concerning modeling of radionuclide behavior in the containment. Containment leakage is assumed to be 0.2% of containment volume per 24 hours (while the design containment leakage rate for the RR SMR reference project under accident conditions is 0.1% of containment volume per 24 hours, i.e. half that value). In determining the source terms, account is taken of the ratio between the reactor core sizes of the RR SMR reference project and large units, as well as the results for releases of radioactive substances into the containment environment according to the safety analysis reports for large units. The release mechanism is the same for SMRs and large units, as are the physical and chemical phenomena accompanying the event in the reactor core and containment. In determining the source term for SMR ETE DBAs, comparison with available DBA analyses contained in the safety analysis reports for new large PWR units confirmed that, for all design basis accidents, releases to the environment over the entire duration of DBA accident conditions for the key radionuclides I-131 and Cs-137 are significantly lower than the bounding source term used for SMR ETE for the same category of events, by at least two orders of magnitude. The large margins in the bounding DBA source term for SMR ETE relative to radiological acceptance criteria provide sufficient margin to cover the radiological consequences of the basic postulated sequences falling within DEC-A accident conditions.

The requirement to demonstrate the practical elimination of accidents that could lead to an early or large release forms part of the SMR ETE design basis and must be demonstrated in the safety documentation, because the Atomic Act and its implementing decrees require practical elimination of such events to be demonstrated. The approach to the practical elimination of early and large releases for the RR SMR reference project (but generally applicable to other SMR projects as well), in relation to the requirements of Czech legislation and the design, is described in the Documentation, at a level relevant to the purposes of the EIA process, in Chapter D.II.1.3. Practically eliminated conditions.

ad h) The relevant analyses for a representative conservative design basis accident (DBA) case and a severe accident under design extension conditions (DEC-B), including their transboundary impacts, are assessed in the Documentation, with the results presented in Chapter D.II.1.2. Radiation extraordinary events. For both DBA and DEC-B, containment leakage higher than the design leakage rate is assumed (see the comment on point g) above), while containment integrity is maintained. Loss of containment integrity under severe accident conditions would result in a large release, which must be practically eliminated

under Czech legislation and such elimination must be demonstrated. Modeling such an event in this manner therefore makes no sense in terms of the requirements applicable to SMR ETE.

ad i) The assessment of the consequences of radiation extraordinary events covers an area extending 100 km around SMR ETE, which also includes parts of the neighboring countries of Austria and Germany. The 100 km range is sufficient for assessing intervention levels for the protection of the population in the Czech Republic, Austria, and Germany. For potential short-term impacts on agricultural production and the placing of food on the market, the assessment for Poland and Slovakia is extended to a distance of up to 400 km. For a severe accident (DEC-B), intervention levels for the protection of the population are not exceeded anywhere in Austria or Germany, including in border areas. Local intervention measures to protect agricultural production or prohibit the placing of food on the market may extend beyond 100 km, but at distances of 400 km or more they may only be exceeded with a low probability and exceptionally for sheep's and goat's milk. For the bounding design basis accidents (DBA), no criteria are exceeded even in the nearest border areas, with the exception of a measure to protect agricultural production in relation to I-131 deposition in a small area of Austria near the Czech border, 50 km from SMR ETE, where a possible minor exceedance of the Austrian reference level is identified with a probability of 5%, and, furthermore, with regard to the placing of sheep's and goat's milk on the market during the first 7 days after the event. The assessment results and the definition of the areas assessed are provided in Chapter D.II.1.2. Radiation extraordinary events.

ad j) The RR SMR project will include a comprehensive deterministic and probabilistic safety assessment (PSA), the results of which will document the core damage frequency (CDF) and the large release frequency / large early release frequency (LRF/LERF) for radionuclides. These indicators will form part of an integrated risk analysis in accordance with the requirements of Czech nuclear legislation and international practice and will provide a basis for demonstrating that the overall level of nuclear safety of the facility is acceptable and that risks are reduced to the ALARA level and, where relevant and justified, to the ALARP level[1].

ad k) Financial liability is comprehensively regulated by the Atomic Act and the related international conventions. Information on these matters is provided in Chapter D.II.1.7. Liability for nuclear damage.

ad l) The requirements for physical protection, i.e. the security of a nuclear facility and nuclear material, are defined in Act No. 263/2016 Coll., the Atomic Act, and its implementing Decree No. 361/2016 Coll., on the Security of a Nuclear Facility and Nuclear Material. The security of the new nuclear power plant will comprise physical barriers, technical systems (detection and monitoring), protection of digital systems (against cyberattack, tampering, or falsification), response arrangements, administrative measures, operating procedures, and an agreement with the Police on the provision of response protection. As part of SMR preparation, sufficient internal security measures will be established to protect the SMR against terrorist attacks, including a potential attack involving a civil transport aircraft, and against sabotage. These security measures will include, in particular, links to state-provided intelligence and information support, an integrated physical protection system (TSFO), controlled access to individual SMR areas, physical guarding by security personnel and intervention by the Police of the Czech Republic, cybersecurity, an SMR technical design providing enhanced resistance to terrorist attacks and sabotage, and aviation security measures and airspace protection.

A specifically monitored risk area is the threat of an aircraft crash resulting from a deliberate attack. Following the attacks in New York and Washington on 11 September 2001, all countries with advanced nuclear power programs increased the security of all nuclear facilities against terrorist attacks, including attacks involving large commercial aircraft. Compared with aircraft impacts resulting from accidental causes, this is an entirely different issue, and the approach to protection is also fundamentally different, being based primarily on a combination of enhanced robustness, particularly of the containment, and preventive measures.

The risk to the SMR from a terrorist attack will be assessed and addressed in subsequent stages of Project preparation and implementation using standard nuclear-facility security measures and procedures established in current practice and consistent with the applicable requirements of international and national legislative regulations. Detailed analyses of the consequences of accidents affecting SMR structures as a result of aircraft impact and other human induced external events could potentially be misused in the preparation of sabotage or a terrorist attack. These demonstrations of robustness, their assumptions, and their results will therefore constitute classified information pursuant to Act No. 412/2005 Coll., on the Protection of Classified Information and Security Eligibility, as amended.

Under the Act on the Armed Forces of the Czech Republic and the Act on Ensuring the Defense of the Czech Republic, the existing Temelín and Dukovany nuclear power plants are classified as facilities important for national defense, and if

[1] ALARA and ALARP represent key principles of protection against ionizing radiation aimed at keeping radiation doses as low as possible through time, distance, and shielding, while economic and societal considerations are also taken into account in the optimization of radiation protection. The ALARA principle is used by the IAEA and is also reflected in Czech legislation. The ALARP principle is applied with the same objective in licensing practice in the United Kingdom and, although it is not directly codified, is also used in practice in some other countries, such as Canada. Application of the ALARP principle is not limited to risks arising from ionizing radiation but is also generally applied to other risks, such as occupational safety risks. The main difference between ALARP and ALARA lies in their approach to economic proportionality. While ALARP is based on assessing the degree of risk reduction in relation to the costs incurred, ALARA does not primarily reflect the cost aspect and seeks to reduce risk as far as technically achievable. In practical application, however, the two approaches are similar. Priority is given to eliminating or reducing risks with the greatest actual or potential impact on the health of workers and, where applicable, the population; for measures that would provide only minimal further risk reduction, or where the relevant risk is already insignificant in itself, an economic (ALARP) or technical (ALARA) analysis is applied to confirm the need for additional risk-reduction measures.

extraordinary security measures are declared by the Government of the Czech Republic or in the event of a military conflict, the defense of these nuclear power plants is ensured by the Armed Forces of the Czech Republic. A similar approach will also be applied to the SMR.

Information on the above matters is provided in Annex 6.2 to this Documentation (Information from the Ministry of the Interior of the Czech Republic on the system for protecting nuclear facilities against terrorist attacks).

15.4. Radioactive waste and spent nuclear fuel:

a) small nuclear reactors may produce substantially more nuclear waste per unit of output than conventional large reactors; waste from existing large pressurized water reactors amounts to approximately 5 cubic meters per gigawatt of thermal output per year, while for an integral pressurized water reactor this quantity is approximately 2.5 times higher, for a molten salt reactor approximately five times higher, and for fast reactors as much as 30 times higher,

b) the impact of radioactive waste and spent nuclear fuel generation on the Temelín site is not addressed; it is not clear where the VJP would be stored or ultimately disposed of; similarly, the information on radioactive waste is unclear because there is no experience regarding the type and quantity of waste that an SMR might generate,

c) the EIA Documentation must analyze the environmental impact arising from the treatment and disposal, and subsequently the final disposal, of radioactive waste generated at SMR ETE; since there is no operating experience with the SMRs concerned, actual radioactive waste generation cannot be determined with certainty, but a best estimate can be made as to whether the existing waste treatment and disposal facilities at ETE1,2 can be used or whether new waste treatment and disposal facilities need to be constructed.

Addressing the requirements and comments:

ad a) Small modular reactors use a compact and standardized design that allows efficient management of operational processes, including radioactive waste management, and their lower output and optimized operation can be expected to result in lower absolute radioactive waste generation. For the SMR ETE Project, a unit RAO generation rate of 55 m^3/GW_e/year, as specified in the updated Policy for Radioactive Waste and Spent Nuclear Fuel Management in the Czech Republic, is conservatively assumed.

ad b) The principles and procedures for radioactive waste and spent nuclear fuel management will be the same for the SMR ETE Project as for existing nuclear power plants and will be governed by the applicable national Policy for Radioactive Waste and Spent Nuclear Fuel Management in the Czech Republic. VJP will be stored in the SMR ETE pools for up to 10 years, after which it will be transferred to a new spent nuclear fuel storage facility to be constructed at the SMR ETE site or at another selected location. After the storage period, the VJP will be disposed of in a deep geological repository. RAO conditioned at the SMR ETE radioactive waste management workplace and facility and meeting the waste acceptance criteria will be disposed of at the existing Dukovany repository. Once it is full, RAO will be disposed of in an expanded, new, or deep geological repository. RAO that does not meet the waste acceptance criteria for repositories currently in operation will be stored in the relevant storage areas at SMR ETE until suitable repositories have been constructed. The preparation, construction, and operation of radioactive waste repositories fall within the competence of SÚRAO.

The SMR ETE reference project uses proven pressurized light water reactor technology, and the categories and types of radioactive waste will therefore be similar to those from large light water reactors.

ad c) The EIA Documentation for the SMR ETE Project analyses the impacts of this facility as described by its environmental inputs and outputs. The impacts of other facilities for radioactive waste and spent nuclear fuel management, i.e. RAO repositories, are addressed in the relevant contexts.

The SMR ETE Project does not envisage the use of the existing radioactive waste management workplaces and facilities serving the current Temelín NPP units.

15.5. Project inputs and outputs:

a) the information on outputs is based on assumptions rather than facts; without selecting a specific developed and licensed technology, the impacts on individual environmental components cannot be assessed,

b) the ionizing radiation outputs from SMR ETE are of similar magnitude to those actually occurring at ETE1,2; SMR is therefore an obsolete and outdated technology that should no longer be used,

c) peaks in radioactive gas releases during refueling or reactor opening are not mentioned; annual effective doses, being average values, do not reflect the actual values of radioactive release peaks, which are assumed to be responsible for the increase in childhood leukemia near nuclear power plants; the temporal patterns of radioactive emissions are therefore not taken into account, which would explain the frequently cited controversy between the small but statistically significant increase in the incidence of

leukemia in children under 5 years of age within 5 km of nuclear power plants and the inconspicuous average values of radioactive emissions,

d) estimates of bounding parameters provided by SMR manufacturers are used, and the environmental impact assessment is based on these parameters; these parameters may not be realistic (for example, if parameters of the discontinued NUWARD project were also taken into account) and are also unnecessary if the Rolls-Royce project has already been selected, since its specific parameters can be used, but only if the project has already been completed,

e) the authorized estimates provided by SMR technology suppliers cannot be verified; at the same time, an uncertainty analysis should be included in these estimates,

f) it should be stated whether the radioactive outputs relate to the maximum individual year or are averaged over the entire design life of the facility,

g) for radioactive aerosols emitted to air, their spatial and mass distribution, material composition, and particle shape should also be provided; variability should be statistically analyzed and confidence intervals should be stated; the effect of ionizing radiation charges on the particles should also be addressed.

Addressing the requirements and comments:

ad a) Impacts on the environment and public health do not depend on the specific technical design of the Project, its stage of development, or even its trade name. They depend on its environmental parameters, which are determined, among other things, by statutory requirements both in the environmental field and, in particular, under the Atomic Act and its implementing regulations. The conservatively determined envelope of environmental parameters can be used to assess environmental impacts, and the results of the environmental assessment can be evaluated on the understanding that the actual impact of the selected design will be lower than the predicted impact. The assessment results are therefore independent of the specific technical designs of potential suppliers or their projects. This methodology is used worldwide to assess the environmental impacts of nuclear and other facilities, is recommended by the International Atomic Energy Agency, and is also recognized by regulatory authorities. The environmental and safety requirements are the same for all suppliers, and the impacts are assessed at their maximum levels. Thus, the subsequent selection of a supplier cannot be to the detriment of the protection of the environment.

For the avoidance of doubt, however, the EIA Documentation also provides a description of the technical design of the preferred reference supplier's design. The Rolls-Royce SMR project (RR SMR) is used as the reference project. This refines and defines the initial parameters used in the assessment, while the input values used (Chapter B.II. DATA ON INPUTS) and output values (Chapter B.III. DATA ON OUTPUTS) are selected on a bounding and sufficiently conservative basis to cover, with an adequate margin, both the currently known parameters of the reference project and any changes to them during subsequent design stages. The information on outputs is therefore based on the technical and safety documentation of the reference project, which constitutes technically justified assumptions and provides a complete basis for assessing the environmental effects of the Project. A licensed project is not a prerequisite for the assessment. Although, at the time of preparation of the EIA Documentation, it is anticipated that the SMR ETE Project will be implemented using the RR SMR reference project, another SMR project may also be selected for SMR ETE provided that it complies with the bounding parameters used for the environmental impact assessment (and, of course, also with all other statutory requirements outside the environmental impact assessment process). An important point in this respect is that the environmental parameters of the Project (including inputs/outputs) will be checked, or verified, in subsequent stages of Project preparation, i.e. compared with the Project parameters used in the assessment.

ad b) The Project uses technology similar to the existing ETE1,2, i.e. a light-water-moderated pressurized water reactor (PWR), and its outputs are therefore inherently similar. However, this does not imply that the technology is obsolete; on the contrary, the SMR ETE Project constitutes the latest stage of development of this technology. It should be noted that, to ensure a conservative assessment, the Project discharges are set conservatively, i.e. at higher values, and it can be reasonably expected on the basis of operating experience with PWR-type reactors that actual discharges will be lower than the values assumed for the Project. A direct comparison between the design discharges from SMR ETE assumed in the assessment and the actual (measured) discharges from ETE1,2 therefore does not provide objective conclusions.

ad c) Discharges from the ETE1,2 nuclear units are continuously monitored both directly at the source (the ventilation stack) and in the immediate surroundings. Monitoring is performed by the operator and is independently performed and verified by SÚJB. A description and the results of the monitoring are provided in Chapter C.II.3.2.2.2.2. Discharge monitoring. Based on data from the monitoring reports of the ETE1,2 Environmental Radiation Monitoring Laboratory (LRKO), partial increases in discharges of selected radionuclides can indeed be observed during unit outages associated with opening the primary circuit to enable refueling, when measured at the source, i.e. at the ventilation stack. However, this increase is small and affects only to a very limited extent the radionuclides that are decisive in terms of the representative person's annual exposure from airborne discharges (C-14, Ar-41, H-3). With regard to air monitoring in the vicinity of the Temelín NPP, any increases in discharges during outages and refueling are not detectable at all for any of the monitored radionuclides, including I-131, Cs-134, and Cs-

137, and their concentrations fluctuate randomly over the course of the year at levels well below the specified investigation level, with no relationship to outages or reactor opening.

With regard to childhood leukemia, Chapter C.II.1.3.3.2. Health characteristics contains a summary table of the incidence of leukemia in children and young adults in the ETE area of interest. It shows that, since the existing power plant was commissioned, no case of childhood leukemia has been recorded in the immediate vicinity of ETE1,2, while one case of non-Hodgkin lymphoma has been recorded in a more distant area. More cases were recorded in the more distant control areas. In the case of ETE1,2 operation, therefore, no causal relationship has been identified between the incidence of childhood leukemia and operation of the nuclear power plant.

ad d) The environmental impacts do not depend on the specific technical design of the Project, its stage of development, or even its trade name. They depend on its conservative environmental parameters, which are determined, among other things, by statutory requirements both in the environmental field and, in particular, under the Atomic Act and its implementing regulations. The bounding envelope of environmental parameters considered in this way can be used to assess environmental impacts, and the results of the environmental assessment can be evaluated on the understanding that the actual impact of the selected design will be lower than the predicted impact. For the avoidance of doubt, however, the Documentation also provides a description of the technical design of the preferred reference supplier's design. The assessment uses specific bounding parameters of the Rolls-Royce reference project (RR SMR). Completion of the project design is not relevant to whether the EIA process can be carried out. See also point a) above.

ad e) The authorized estimates provided by technology suppliers, i.e. the parameters used for the environmental impact assessment, will be verified (checked/validated) in subsequent stages of Project preparation. See also point a) above. As regards uncertainty analysis, the assessment uses bounding (i.e. limiting) parameters, compliance with which is a necessary condition.

ad f) The assessment of radiological impacts provided in Chapter D.I.3.2. Impacts of ionizing radiation is based on the maximum bounding annual discharges from SMR ETE. The results therefore relate to maxima within a single year. When assessing lifetime doses and the resulting health risks (Chapter D.I.1. Impacts on the population and public health), the annual maxima are then conservatively used and accumulated for the representative person, even though, depending on a number of factors, the representative person may live in a different area and belong to a different age group in individual years. Thus, the maxima of maxima are accumulated, with the maxima of maxima determined for ETE1,2 and New NPP ETE also conservatively added as part of the combined effects.

ad g) All analyses of the radiological impacts of SMR ETE model the spatial distribution of aerosol deposition over the entire area assessed (approximately 100–200 km from SMR ETE), including transfer into the food chain through foliage and through the root system from soil; transfer of tritium H-3 and carbon C-14 into the food chain is also modeled, and the conservative assumption is applied that all aerosols in atmospheric discharges have a particle size (aerodynamic particle diameter, AED) of up to 10 µm. These are inhalable particles, i.e. particles capable of penetrating into the lungs and potentially subsequently, via the blood, into other parts of the body, and which can potentially result in the highest dose to the representative person or the population because they contribute to the committed effective dose from inhalation. (If larger particles were considered, no committed effective dose from inhalation would arise and the calculated radiological impact would be non-conservative, i.e. lower. Moreover, in the wider vicinity of SMR ETE, larger aerosol particles would be deposited close to the source and would not reach greater distances, i.e. they would not, for example, cause radiological impacts in neighboring countries.).

The assumption of particle sizes up to 10 µm is generally used in assessments of the radiological impacts of routine operational discharges through ventilation stacks from nuclear reactors. This assumption is also supported by the fact that atmospheric discharges to the environment through the ventilation stack pass through filters (iodine filters and aerosol filters), and it is therefore assumed that only small aerosol particles and gases may pass through the filters.

It should be emphasized that the assumption of particle sizes up to 10 µm is conservative with regard to radiological impacts on the representative person and, more generally, on the population and the environment in the vicinity of the SMR, including neighboring countries.

15.6. Population and public health:

a) assess all impacts of the Project on public health from the perspective of Act No. 258/2000 Coll., on the Protection of Public Health, as amended, particularly with regard to noise from Project construction and operation and with regard to non-ionizing radiation, and prepare a comprehensive health risk assessment,

b) disagreement with the statement that no inhabitants are affected by significant impacts of the Project; inhabitants will be directly affected by construction, and adverse impacts will extend to the wider surrounding area, which includes a considerable number of municipalities with permanent residents,

c) it is not stated in which control area the incidence of new cases of childhood leukemia was identified; disclosure of this information is requested,

d) what effect does radioactivity have on the sex ratio.

Addressing the requirements and comments:

ad a) The assessment of impacts on public health, prepared by a holder of the relevant authorization for this type of assessment, is provided in Annex 2.1 to this Documentation (Assessment of Impacts on Public Health). The assessment takes into account all relevant factors potentially affecting public health.

ad b) The term "significant impact" in this case relates to the requirements of the applicable legislation, particularly the Public Health Protection Act, and the limits arising from it. Compliance with these requirements and limits for all population groups is a necessary condition, demonstrated by the results of the relevant studies (impacts of ionizing and non-ionizing radiation, noise impacts, and impacts on air quality), which are used as a basis for assessing impacts on public health. This is also the basis for the statement that no inhabitants are affected by significant, i.e. above-limit, impacts of the Project. However, this in no way calls into question the fact that residents of the surrounding municipalities and the wider surrounding area will be affected by operation and construction of the Project. The extent of this impact is the subject of the assessment.

ad c) Data on the incidence of childhood leukemia are presented in tabular form in Chapter C.II.1.3. Health status of the population of this Documentation, specifically in Chapter C.II.1.3.3.2.4. Incidence of childhood leukemia and non-Hodgkin lymphomas. Over the most recent ten-year period assessed, 2 cases were recorded in the České Budějovice control area (KB); no new cases were identified in any of the other exposed or control areas. The data are from publicly available sources.

ad d) ICRP documents are the primary source of recommendations and guidance on radiation protection against risks associated with ionizing radiation and are generally respected and accepted as a source of dose factors and weighting factors used in radiation protection. ICRP recommendations (e.g. the latest calculated dose factors recommended by the ICRP) are subsequently incorporated into IAEA recommendations, EC directives or recommendations and, where applicable, national legislation on protection against the effects of ionizing radiation. Dose factors and weighting factors used in radiation protection are determined on the basis of model calculations (computer modeling), using clearly defined reference male and female body phantoms (male and female "voxel phantoms"). The anatomical and physiological characteristics of the reference phantom are provided in ICRP-89, "Report of the ICRP Task Group on Reference Man".

According to paragraph (33) of ICRP-103, the Commission (i.e. the ICRP) considers it appropriate for radiological protection purposes to use tissue weighting factors averaged over age and sex and averaged over numerical estimates of risk. The system for protection against the effects of ionizing radiation is sufficiently robust to provide adequate protection for both sexes (robustness meaning the safety margin incorporated in the established public exposure limits, the safety margin used in setting intervention levels for urgent protective actions in an emergency, and the safety margin used in setting the dose constraint for annual doses associated with radioactive discharges from normal routine operation of a nuclear facility). This therefore does not give rise to a requirement for sex- and age-specific radiological protection criteria, which could be unnecessarily discriminatory.

The exceptions are protection of the fetus in the mother's body (i.e. protection of the mother during pregnancy) and protection of the child during breastfeeding. The dose coefficients recommended by the ICRP for calculating dose to the fetus are provided in ICRP-88. In connection with protection of the fetus in the mother's body or protection of the infant, the IAEA Basic Safety Standards apply, through exposure limits, a specific level of radiation protection to pregnant and breastfeeding women. The higher level of protection applied to women against the effects of ionizing radiation is therefore in fact applied in order to provide greater protection to the fetus in the mother's body or to the child during breastfeeding.

This approach is also applied in the computational analyses of the radiological impacts of SMR ETE.

15.7. Air and climate:

a) the underestimated data on climatic extremes in the area presented in the Notification should be reassessed, also taking into account new climate change trends and the fact that operation of the SMR is expected to continue throughout the 21st century,

b) professional organizations supporting nuclear power state a greenhouse gas emission value for electricity generation at nuclear power plants of 12 grams of CO_2 per kWh; however, these data differ by up to an order of magnitude from the emission values published by other authors (Lenzen 10–130 g/kWh with an average of 65 g/kWh, other studies 8–64 g/kWh, Storm 65–116 g/kWh, China an average of 42.94 g/kWh),

c) it should be demonstrated that airborne pollutant particles in the event of severe accidents comply with Directive (EU) 2024/2881 on ambient air quality and cleaner air for Europe,

d) the greenhouse gas emissions analysis should also take into account, among other things, the energy required for accident management (taking into account the overall probability of reactor failure) and the energy required for the final storage of spent fuel.

Addressing the requirements and comments:

ad a) Data on climatic extremes are based on long-term monitoring of meteorological parameters at the Temelín site carried out by ČHMÚ, on the basis of which parameters for extreme conditions relating to meteorological phenomena that may occur at the site are established. These parameters are periodically reassessed on the basis of measurement results. The current results, taking into account measurement records up to 2024 (ČHMÚ, 2025), are provided in Chapter C.II.2.2. Climatic factors of this Documentation. Throughout the operating life of SMR ETE, climatic parameters will continue to be monitored and periodically reassessed and will provide a basis for periodic safety reviews of SMR ETE.

ad b) This Documentation is based on the general reference document Carbon Neutrality in the UNECE Region: Integrated Life-cycle Assessment of Electricity Sources, UNECE 2022, which gives a value of 5.1–6.4 g CO_{2eq}/kWh for nuclear power; see Chapter D.I.2.2.2. Impacts on global climate. In addition, the same Chapter contains, on the basis of the requirement in the conclusion of the screening and scoping procedure, an independent analysis of greenhouse gas emissions associated with electricity generation at SMR ETE based on life cycle assessment (LCA) methodology. The analysis arrives at an emission value of 9.240 g CO_{2eq}/kWh. The results of the analysis, also taking into account its conservative assumptions, essentially confirm the above conclusions of UNECE 2022 regarding the very low specific greenhouse gas emissions of nuclear power sources compared with other energy sources.

ad c) The Directive referred to above does not apply to radioactive pollution. Accident situations with an extremely low probability (CDF $<10^{-5}$ per year) will not affect ambient air quality in any way.

ad d) An independent greenhouse gas emissions analysis has been prepared for the SMR ETE Project; the results are provided in Chapter D.I.2.2.2. Impacts on global climate. The analysis is based on life cycle assessment methodology (LCA), which is based on the framework recommended by the European Commission and international standards for calculating equivalent greenhouse gas emissions, in particular the GHG Protocol and IPCC guidelines. Accident situations with an extremely low probability (CDF $<10^{-5}$ per year) do not affect the greenhouse gas emission data in any way, including from the perspective of their management. As regards final disposal of spent nuclear fuel, international LCA studies indicate that this process accounts for a negligible share of the total carbon footprint of the nuclear fuel cycle (typically <0.5%).

15.8. Ionizing radiation:

a) in operational and accident conditions, transformations of radioactive substances, including transformation from gas to particles, should be taken into account.

Addressing the requirements and comments:

ad a) In all analyses of the radiological impacts of SMR ETE, under both operational and accident conditions, radioactive decay of the individual radionuclides considered is modeled and taken into account; the transformation of a given radionuclide into its daughter nuclide is also taken into account. If radioactive decay of the parent radionuclide does not result in a stable daughter nuclide, the radioactivity of the daughter nuclide (and any change of state from gaseous to aerosol form) is also taken into account in the calculation. In addition, for radionuclides in the iodine group, three chemical forms of iodine are considered in calculations of the radiological impacts of operational radioactive discharges or accidental releases from nuclear facilities: aerosol iodine, elemental iodine, and organic iodine. In accordance with procedures supported by experimental data/measurements of the chemical forms of iodine in ambient air, the following distribution of iodine forms is assumed: 25% iodine in aerosol form, 30% elemental iodine, and 45% organic iodine. This assumption regarding iodine forms is also used by the ESTE tool, which is used for the radiological analyses in this EIA Documentation for SMR ETE.

For the analysis of the bounding case of a design basis accident (DBA) falling within category DBC-4, the additional conservative assumption is made that, during dispersion of the radioactive plume and its interaction with the environment, no transformation of a significant proportion of elemental iodine into organic or aerosol iodine occurs.

15.9 Noise and other physical and biological factors:

a) assurance is requested that the Project will not increase noise exposure above the public health limits,

b) the design of noise-control measures should take into account, for example, green noise-control measures if a noisier cooling option is selected.

Addressing the requirements and comments:

ad a) Compliance with the public health limits is a necessary condition. The Documentation includes an Acoustic Study (Annex 5.2) demonstrating that the noise issue can be addressed in compliance with the public health limits.

ad b) The results of the Acoustic Study show that noise-control measures outside the SMR ETE site are not required. In general, it should be added that green noise-control measures (if this means tree planting) are very ineffective in terms of noise attenuation.

15.10. Surface water and groundwater:

a) a water management permit – a permit for the discharge of wastewater into surface waters – must be obtained; given the composition of the wastewater concerned, the permit is issued by the water authority at regional authority level (Section 107(1)(j) of the Water Act),

b) if radionuclides are also discharged in the wastewater, a favorable opinion from SÚJB is required (Section 4(2) of Government Regulation No. 401/2015 Coll.),

c) if radionuclides are also discharged in the wastewater, it must be ensured that the permissible surface-water pollution parameters are not adversely affected (Annex 3 to Government Regulation No. 401/2015 Coll.),

d) with regard to wastewater management, all provisions of Section 38 of the Water Act must be complied with,

e) since implementation of the Project would involve handling hazardous harmful substances, all provisions of Section 39 of the Water Act must be complied with (in particular, the requirement to prepare an emergency plan and the obligation to perform leak-tightness tests),

f) any implementation of the Project must be carried out in accordance with the Water Act and its implementing legislation, in particular Government Regulation No. 401/2015 Coll. and Emergency Decree No. 450/2005 Coll.,

g) assess in greater detail the impact on groundwater and surface water in relation to the municipality of Kočín and the biocorridor.

Addressing the requirements and comments:

ad a) This is a reminder of statutory obligations, which will be complied with. This is a necessary condition that does not need to be imposed separately in the EIA process.

ad b) This is a reminder of statutory obligations, which will be complied with. This is a necessary condition that does not need to be imposed separately in the EIA process.

ad c) This is a reminder of statutory obligations, which will be complied with. This is a necessary condition that does not need to be imposed separately in the EIA process.

ad d) This is a reminder of statutory obligations, which will be complied with. This is a necessary condition that does not need to be imposed separately in the EIA process.

ad e) This is a reminder of statutory obligations, which will be complied with. This is a necessary condition that does not need to be imposed separately in the EIA process.

ad f) This is a reminder of statutory obligations, which will be complied with. This is a necessary condition that does not need to be imposed separately in the EIA process.

ad g) The assessment of impacts on surface water and groundwater, including in relation to the municipality of Kočín and the biocorridor (Dvorčice Pond and the Dvorčický Stream), is provided in Annex 4.1 to this Documentation; the results and conclusions are summarized in Chapter D.I.4. Impacts on surface water and groundwater of this Documentation.

15.11. Soil, the geological environment, and natural resources:

There are no additional requirements or comments beyond the requirements set out in point 11 of the conclusion of the screening and scoping procedure.

15.12. Fauna, flora and ecosystems, landscape and landscape character:

a) prepare a compensation plan for vegetation and trees removed as a result of construction; such compensation should include planting at least the same quantity, ideally close to the affected sites,

b) disagreement with the felling of vegetation in area F2.

Addressing the requirements and comments:

ad a) Pursuant to Act No. 114/1992 Coll., on Nature and Landscape Protection, as amended, a compensation plan for removed vegetation and trees (i.e. replacement planting) as a result of construction forms an integral part of the supporting documentation

for a tree-felling permit. This requirement will therefore be complied with; it is a necessary condition that does not need to be imposed separately in the EIA process.

ad b) Area F2 consists predominantly of young reclamation plantings of woody vegetation. Based on the biological assessment performed, the proportion of natural habitats in this area is assessed as very low; however, in the context of the surrounding agriculturally and technically influenced landscape, the woody vegetation represents a more significant vegetation structure. In general, the actual extent of tree felling will be specified in subsequent stages of Project preparation, will be limited to the necessary minimum, and will be subject to the relevant permitting procedures. If this area is used as part of the construction of new power sources at the Temelín site (New NPP ETE, SMR ETE), its use would be temporary; no permanent structures would be located there, and, as in the past, the area would subsequently be reclaimed and reforested.

15.13. Transport, transport and other infrastructure:

a) prepare a traffic accessibility study for both construction and operation, including an analysis of situations involving possible closures of road II/138 (consideration of construction of a bypass around the municipality of Temelín and relocation of road II/138 with a connection to road II/105 and, where appropriate, a turning lane from this road to the SMR area),

b) assess the impact of traffic in the built-up area of the town of Týn nad Vltavou.

Addressing the requirements and comments:

ad a) The chapters on transport in this Documentation (B.II.6. Requirements for transport and other infrastructure, C.II.10. Transport and other infrastructure, D.I.10. Impacts on transport and other infrastructure) are based on the Traffic Study, which quantifies traffic volumes during both construction and operation of the Project. During construction of the SMR ETE Project, road II/138 is expected to be closed to public traffic in the section between roads II/105 and II/141 (i.e. within the SMR ETE construction site and the associated construction facilities). Existing traffic will be diverted via roads II/141 and II/105; the closed section of road II/138 will only remain accessible to traffic associated with construction of SMR ETE and to Integrated Rescue System vehicles.

ad b) The impact of traffic associated with both construction and operation of the SMR ETE Project in the built-up area of the town of Týn nad Vltavou is included in the traffic model and has been assessed. The assessment also includes an evaluation of noise and impacts on air quality.

15.14. Cumulative impacts:

a) take into account the cumulative industrial burden in the microregion – the current projects referred to above (two Temelín power plant units (ETE1,2), the spent nuclear fuel storage facility (SVJP), the fresh nuclear fuel storage facility forming part of the ETE1,2 auxiliary service building for primary systems (BAPP), the Hněvkovice and Kořensko waterworks, and the Kočín substation), current projects not referred to above (QUAIL s.r.o. – waste removal and processing, the Býšov retention reservoirs, the MAPE Mydlovary settling ponds (286 ha), and the Řídká Blana waste landfill), the planned projects referred to above (the New Nuclear Power Plant at the Temelín site (New NPP ETE, or ETE3,4), expansion of the storage capacity of the spent nuclear fuel storage facility (SVJP), and the new SMR ETE nuclear power plant), and planned projects not referred to above (a deep geological repository for VJP, photovoltaic power plants on arable land (PV parks and wind parks) – Amendment No. 10 to the Spatial Development Principles of the South Bohemian Region) – this industrial and environmental burden is excessive for such a small and relatively densely populated microregion,

b) take into account concurrent construction of SMR ETE and ETE3,4, including with regard to the cumulative influx of workers, for whom housing provision, availability of medical care, availability of kindergartens and schools, etc. have not been defined,

c) potential synergistic impacts with the deep geological repository for high-level radioactive waste at the Janoch site (one of the four sites under consideration) are not taken into account; if this site were selected, construction of the underground laboratory after 2032 would overlap with construction of the modular reactor,

d) an assessment of combinations of external events is requested, including consideration of the larger number of facilities at the site,

e) an assessment of interactions between facilities is requested, including effects such as turbine missiles (e.g. in accordance with NRC RG 1.115),

f) an analysis of potential events affecting a larger number of units at the site is requested,

g) an assessment is requested of the impacts on operation and safe shutdown of other units where radioactive material has been released to the environment from one or more units (making access and/or communication more difficult and/or impossible),

h) since two additional large nuclear power units are planned at the Temelín site (the site was originally intended for 4 large units), the new additional power plant represents a change requiring reassessment or redetermination of all parameters (water supply, compliance with wastewater limits, airborne discharges, heat emissions, etc.).

Addressing the requirements and comments:

ad a) Information on the cumulative impacts of the SMR ETE Project with other projects and on the method used to assess cumulative impacts is discussed in Chapter B.I.4.2, Potential for cumulative impacts with other projects, of this Documentation. The assessment of combined (cumulative) effects focuses primarily on all nuclear facilities whose impacts overlap both in substance (characteristic impacts of nuclear facilities, specifically ionizing radiation) and spatially (location at the Temelín site). In addition, notified (planned) projects in the affected territory are taken into account, although their impacts are predominantly of a different nature from those of nuclear facilities. Lastly, the overall environmental background of the affected territory is taken into account, i.e. the state of the environment in the affected territory and its development trends. This includes, among other things, the impacts of other existing projects in the immediate or wider surrounding area. In this way, all combined/cumulative impacts for which sufficient supporting information is currently available are taken into account. A further important consideration in this respect is that development of the territory is coordinated by spatial planning documentation at various levels (regional development principles and municipal spatial plans), which always includes an assessment of the sustainable development of the territory. In this way, significant combined/cumulative impacts are limited at the conceptual level; at the same time, spatial plans constitute a "social agreement" on the use of the territory.

The deep geological repository at the Janoch site is a specific project in this respect that has not yet progressed beyond the stage of public discussion. No decision has been taken on its implementation (it is one of four potential sites), and its environmental effects have not been assessed in an EIA process. Relevant supporting data are therefore not available for assessing the combined/cumulative impacts of this repository. If the site is selected, the impacts of this repository will be assessed in a separate EIA process, to which the repository is subject by law and in which its combined/cumulative impacts with other projects in the area will also be assessed (including the SMR ETE Project and other nuclear and non-nuclear facilities at the site). This approach corresponds to standard assessment methodology, under which each project that enters the area "last" must take into account the existing level of impacts in the area and adapt its technical design and the design of appropriate impact mitigation measures accordingly.

ad b) Construction of SMR ETE is assessed in combination with construction of New NPP ETE. Socioeconomic impacts, and specifically the preparedness of the area for the demands associated with construction of nuclear power sources, are assessed in Chapter D.I.1.1.4.2. Social and economic impacts; in principle, however, this issue is, or will be, addressed at the conceptual level, i.e. in spatial planning documentation and other conceptual documents. See, for example, the current preparations for construction of New NPP EDU and the associated requirements relating to transport, security, integration and crisis management, housing and public infrastructure, business and the labor market, education and training, healthcare and social services, and other cross-cutting measures addressed through action plans at government, regional, and local levels.

ad c) No supporting data are available for taking the deep geological repository at the Janoch site into account that could provide a basis for assessing synergistic impacts. For further details, see the response to point a) above.

ad d) Consideration of possible combinations of external events for nuclear facilities is required by Czech legislation and IAEA recommendations and will form part of the SMR ETE design basis.

For external events of natural origin, which constitute the main source of possible combinations of events, the approach is described in Chapter B.I.6.3.2.3.5.2. Combination of loads. All important buildings and free-standing structures will be designed to withstand combinations of external hazards without impairment of the fundamental safety functions. Consideration of multiple facilities at the site is based primarily on their spatial and functional separation and on the requirement that each individual facility be resistant to failures and events at another facility. Similar rules for resistance to combinations will also be applied to internal hazards and events (Chapter B.I.6.3.1.14. Internal hazards). The internal hazard assessment process will also consider highly unlikely combinations of internal hazards, including situations in which a primary hazard causes a secondary hazard or multiple hazards are caused by the same initiating cause. Meaningful combinations of internal and external hazards will also be considered. Evidence of the assessment performed and demonstrations of resistance to external and internal hazards and their combinations will be submitted in the safety documentation as part of the licensing proceedings under the Atomic Act.

ad e) Assessment of interactions between facilities, including effects such as turbine missiles, falls within the scope of internal hazards, the comprehensive assessment of which is required by Czech legislation, specifically SÚJB Decree No. 329/2017 Coll. (in particular Section 10(1), Section 12(1) and (7), and Section 20(5)). A description of the approach to internal hazard assessment is provided in Chapter B.I.6.3.1.13. Internal hazards. Internal hazards also include internally generated missiles; a turbine blade acting as a missile falls within the subcategory of missiles generated by rotating components and is routinely assessed in the safety analysis reports of operating nuclear power plants in the Czech Republic. When assessing a turbine blade as a missile, all risks that the missile could pose to the affected unit are considered, including possible secondary effects, such as rupture of another pipeline or tank causing flooding or fire, depending on the medium present in the affected system. The assessment of turbine missiles therefore considers both the risk to other equipment and the ability to ensure fulfillment of

the safety functions at the affected nuclear facility, as well as the possibility of affecting other nuclear facilities at the site. The turbine missile assessment for SMR ETE will be performed in accordance with current internationally used methods, with protection against turbine missiles provided primarily by appropriate siting of safety-related buildings and by redundancy and spatial separation of safety systems. The possibility of SMR ETE being affected by a turbine missile from ETE1,2 and, where applicable, New NPP ETE will also be assessed unless it can be deterministically excluded (by the layout, possible missile trajectories, distance, terrain obstacles, etc.).

Evidence of the assessment performed and demonstrations of the resistance of SMR ETE to internal hazards, including turbine missiles, will be submitted in the safety documentation as part of the licensing proceedings under the Atomic Act.

ad f) Assessment of potential events affecting multiple units or nuclear facilities at the site is explicitly required by Czech legislation, specifically SÚJB Decree No. 329/2017 Coll. (Section 12(5)). A description of the approach to assessing potential events affecting multiple units or nuclear facilities at the site is provided in Chapter D.II.1.4.1. Main principles of protection against common cause failure and ensuring protection in the event of a radiation extraordinary event at another nuclear facility at the site.

A fundamental requirement for limiting possible interactions between SMR ETE and ETE1,2 or New NPP ETE is therefore that, under any accident sequence, including a severe accident at one of the reactors at the site, normal shutdown, cooling, and residual heat removal are ensured for the other reactors. The principal means are technological independence, separation of safety systems, the ability of each individual unit to manage all conditions, including severe accidents, independently, and high resistance and adequate margins against extreme external events (earthquakes, windstorms or tornadoes, extreme temperatures and precipitation, blizzards, etc.; the requirements for SMR ETE resistance to external hazards are described in Chapter B.I.6.3.1.14. External hazards.

To minimize effects on SMR ETE safety in the event of accident conditions at one of the ETE1,2 units or New NPP ETE, the SMR ETE safety systems will be technologically completely independent of the other nuclear facilities at the site and will at the same time be capable of managing accident conditions independently over the long term, without support from other units. Both technical and personnel-related safety provisions for SMR ETE will be fully self-sufficient. The same principles are, or will be, applied to the other nuclear facilities at the site. It is currently demonstrated that no accident sequence, including a severe accident, at one of the ETE1,2 units can jeopardize fulfillment of the safety functions of the other unit. The arrangements for ensuring the nuclear safety of other nuclear facilities at the site are described in Chapter B.I.6.4.3. Methods for ensuring the nuclear safety of other facilities at the site.

Evidence of the assessment performed and demonstrations of the resistance of SMR ETE to events with the potential to affect multiple units at the site (typically external hazards of natural origin), as well as demonstrations of resistance in the event of an accident at another unit at the site from any cause, including a severe accident, will be submitted in the safety documentation as part of the licensing proceedings under the Atomic Act.

ad g) Assessment of the effects on operation and safe shutdown of other units where radioactive material has been released to the environment from one or more units at a nuclear facility site is required by Czech legislation, specifically SÚJB Decree No. 329/2017 Coll. (Section 5). A description of the approach to ensuring safe shutdown of SMR ETE where radioactive material has been released to the environment from another unit at the Temelín site is provided in Chapter D.II.1.4.1. Main principles of protection against common cause failure and ensuring protection in the event of a radiation extraordinary event at another nuclear facility at the site.

The SMR ETE autonomy concept also includes long-term habitability of the main control room and other backup locations so as to enable personnel to perform their duties under all conditions, including severe accident conditions, both at the unit itself and at another nuclear facility at the site. Both technical and personnel-related safety provisions for SMR ETE will be fully self-sufficient so that fulfillment of the safety functions does not require support from other nuclear facilities at the site. Only sharing of the water supply from the ETE1,2 gravity-fed reservoir is envisaged; however, this is not essential for fulfillment of the safety functions. Similar autonomy is also required for New NPP ETE and ETE1,2; for ETE1,2, the provisions are described in Chapter B.I.6.4.3. Methods for ensuring the nuclear safety of other facilities at the site.

To date, the approach applied in safety assessments of existing nuclear facilities in the Czech Republic has been to prepare the demonstration of resistance for a single severe accident at the facility's own unit, a neighboring unit, or another unit at the site. In view of the qualification of nuclear facilities against external hazards and the margins against cliff-edge effects, only organizational measures are adopted for multiple simultaneous accidents at different nuclear facilities and releases of radioactive substances to the environment; explicit resistance of the remaining nuclear facilities to such conditions is not required.

Evidence of the assessment performed and demonstrations of the resistance of SMR ETE to an event involving a release of radioactive material to the environment up to the level of a severe accident at any unit at the Temelín site will be submitted in the safety documentation as part of the licensing proceedings under the Atomic Act.

ad h) The combined impacts of all facilities at the site, including their current input and output requirements, are considered and assessed in this Documentation.

15.15. Others:

a) disagreement with the proposal of the South Bohemian Region (Amendment No. 10 to the Spatial Development Principles), under which the South Bohemian Region intends to designate areas for photovoltaic and wind power plants, particularly on agricultural land; this constitutes a further major industrial and environmental burden on our region and, by extension, on the cadastral area of the municipality of Temelín,

b) support for national energy self-sufficiency, support for nuclear power as a fully fledged source of electricity after the shutdown of coal-fired power plants, and support for construction of SMR ETE, subject to the proviso that not all nuclear facilities can be located within the cadastral area of the municipality of Temelín; categorical opposition to the construction of another nuclear facility, i.e. a deep geological repository for VJP,

c) the SMR ETE Project is financially risky; similar projects are being abandoned because they are economically unviable,

d) state the reason why the municipality of Temelín is not a party to the concluded Memorandum of Understanding when all the nuclear facilities referred to above will be constructed predominantly within its cadastral area,

e) depending on the cooling method selected, the Project may affect the established landscape silhouette and consequently the landscape character,

f) add information on the nearest cultural monuments to the Documentation,

g) the Project will be implemented in an area with archaeological finds; a rescue archaeological excavation must be ensured,

h) a new spent nuclear fuel storage facility should already be considered at this stage because it forms an integral part of the overall chain,

i) a 40-year decommissioning period for ETE is envisaged; how much will have to be covered from public funds over this period; it is recommended to halve the period and increase contributions for decommissioning purposes,

j) include in the final opinion of MŽP a condition requiring continued provision and exchange of information under the relevant intergovernmental agreement and cooperation program with the Slovak Republic,

k) until at least the SAR covering DEC-A and DEC-B and a full-scope Level 2 PSA have been completed, it is not possible to prepare a complete EIA assessing radiological impacts both near the site and at long distances (i.e. across national borders); in order for these documents to be prepared at a sufficient level of detail to enable their results to be used in a comprehensive dispersion analysis, the detailed SMR design must first be completed; preparation of the EIA should therefore be postponed until the detailed design of the SMR to be selected for the Temelín site has been completed and the principal safety documents (SAR and PSA) have been prepared, reviewed, and accepted by SÚJB,

l) the EIA report should contain detailed information on the scope and schedules of the relevant licensing processes with SÚJB, including the expected approval of: 1) the SMR site at Temelín (site license), 2) approval of the design, and 3) the anticipated issue of a construction license,

m) the EIA report must distinguish between information (particularly facility-specific technical data) that constitutes assumptions and information based on a detailed design that is ready for construction,

n) the EIA report should describe how communication with the public in the Czech Republic and neighboring countries would take place, given that the SMR design would not have been completed at the time of the EIA and the actual safety parameters would not be known, i.e. whether assumptions adopted during the EIA could (as a result of an incomplete design) lead to a radiological impact analysis that might underestimate the impact or probability of such events,

o) the EIA process is an appropriate opportunity to assess external risks,

p) experience with previous nuclear power plant construction projects shows cost overruns by a factor of three to four; the Project must be canceled because of unforeseen costs and because it is likely to be a poor investment.

Addressing the requirements and comments:

ad a) The issue of designating areas for photovoltaic and wind power plants in spatial planning documentation is in no way related to the subject matter of this EIA Documentation.

ad b) Support for nuclear power is not the subject of the EIA process (although public opinion forms one partial component of the assessment of impacts on the population and public health). Likewise, the issue of siting and constructing a deep geological repository at the site is not the subject of this EIA Documentation and cannot be made subject to any conditions within its framework.

ad c) The financial feasibility of the SMR ETE Project is not the subject of the EIA process.

ad d) Contractual relationships and memoranda concluded between the investor and individual municipalities are not the subject of the EIA process. The surrounding local authorities, including the municipality of Temelín, are kept continuously informed about the Project.

ad e) The assessment of impacts on landscape character is provided in Annex 3.2 to this Documentation (Assessment of impacts on landscape character); its results and conclusions are summarized in Chapter D.I.8. Impacts on landscape of this Documentation. The results show that the Project will reinforce the existing image of the industrial complex of the Temelín power plant and will therefore not introduce a new element that is not already present. In the context of other power sources in the area (the existing ETE1,2 and the planned New NPP ETE), the SMR ETE Project is of a substantially smaller scale and lacks prominent vertical elements, and will therefore have relatively little effect on the visibility of the Temelín site from the wider surrounding area. In the immediate vicinity, however, this change will be significant.

ad f) Information on cultural monuments is provided in Chapter C.II.9. Material assets and cultural heritage of this Documentation.

ad g) This is a reminder of a statutory obligation. This is a necessary condition that does not need to be imposed separately in the EIA process.

ad h) A spent nuclear fuel storage facility is not part of the SMR ETE Project and will not be required at the time operation commences. It will constitute a separate nuclear facility and, for the purposes of Act No. 100/2001 Coll., on Environmental Impact Assessment, as amended, a separate project subject to environmental impact assessment. This assessment will take into account the state of knowledge and the technical level of the storage facility at the time of its preparation and will assess the feasibility of implementing the storage facility from an environmental perspective, including with regard to the current combined impacts in the area.

ad i) Financing of the decommissioning of the SMR ETE Project or the other ETE units is not the subject of the EIA.

In general, under the applicable legislation, the operator creates a decommissioning reserve to cover activities associated with decommissioning nuclear facilities by making contributions to escrow accounts, and these funds must be available for the preparation and implementation of decommissioning. The envisaged decommissioning period of approximately 40 years for the Temelín Nuclear Power Plant does not constitute an unjustified prolongation of the process or deferral of costs to the state, but corresponds to internationally recognized technical and economic practice. Decommissioning a nuclear facility is not an administrative act that can be shortened arbitrarily, but a long-term physical and technical process whose pace is determined primarily by radiological considerations. For this reason, IAEA and OECD/NEA recommendations commonly refer to a period of 30 to 60 years as a standard and safe approach. Halving the decommissioning period as proposed would not in itself reduce overall costs, but would instead concentrate them into a shorter period. International experience also shows that accelerated decommissioning tends to be associated with higher unit costs and greater fiscal risks rather than savings. A longer time horizon, by contrast, allows costs to be spread over time and cash flow to be planned and managed more effectively in individual years.

ad j) A condition requiring continued exchange of information under an existing international agreement does not fall within the EIA process in any way (it is not a condition for subsequent proceedings) and therefore cannot be included in the EIA opinion. It is expected to be addressed within the framework of standard international relations.

ad k) The EIA Documentation defines and assesses the envelope of environmental impacts, including radiological impacts. The determination of radiological impacts of accidents at DEC-B level (and also DBA level) is significantly influenced by the source term, duration of the release, release height, and assumptions regarding containment leakage. The method used to determine the source term is described in Chapter D.II.1.2.2. Determination of the source term for assessment of the radiological consequences of radiation extraordinary events.

The derivation of the bounding source term for both DBA and DEC-B is based on EUR requirements for limiting the economic consequences of accidents, which are applied as a requirement to be met, and US NRC recommendations contained in NUREG-1645, NUREG-1940, and 1.183 concerning modeling of radionuclide behavior in containment, which reflect the physical and chemical reality established through operating experience, experiments, and models. Containment leakage is assumed at an increased value of 0.2% of containment volume per 24 hours. The duration of the release is conservatively assumed such that the same absolute quantity of radionuclides is released to the environment more rapidly than would actually be the case. The release is assumed to occur at ground level, resulting in higher doses. In determining the source terms, account is taken of the ratio between the core sizes of the RR SMR reference project and large units, as well as the results for releases of radioactive substances into the containment environment according to the safety analysis reports for large units.

In subsequent stages of the licensing proceedings under the Atomic Act, the Safety Analysis Reports (SARs) should demonstrate that the actual source term to the environment for DBA and DEC-B will be lower and the radiological consequences less severe. A similar approach has been applied to large units that first underwent an EIA process using conservative assumptions and were subsequently subject to licensing proceedings (e.g. an EPR-type New NPP at the Olkiluoto site), and the results of safety analyses at later stages of preparation confirmed the validity of this approach.

ad l) The Environmental Impact Assessment Act requires the anticipated dates for commencement and completion of Project implementation to be stated. These dates are provided in Chapter B.I.7. of this Documentation. Further information on the scope and schedules of licensing processes under the Atomic Act involving SÚJB is irrelevant for the purposes of the EIA process and cannot be made subject to any conditions within that process. For indicative purposes, the following time horizons may be assumed: issue of the permit for siting the nuclear facility in 2028, issue of the permit for construction of the nuclear facility in 2029, and issue of the permit for commissioning the nuclear facility in 2034 (or, expressed in relative terms, issue of the construction permit +5 years).

It should be added that, for the purposes of assessing combined/cumulative impacts with other nuclear facilities at the site, the schedule for their construction, operation, and decommissioning is material. This is provided in Chapter B.I.6.4. of this Documentation and forms the basis for specifying the temporal development of combined impacts and defining the time horizon of the maximum (bounding) combined impact.

ad m) For environmental impact assessment documentation (EIA Documentation), the environmental characteristics of the Project are material, irrespective of whether they are obtained using a computational model, measurements performed for a specific design, or by other means.

An important point in this context is that, in subsequent stages of Project preparation (before the construction permit is issued), the environmental characteristics of the specific Project under preparation are checked (verified), i.e. compared with the environmental characteristics of the Project used for the environmental impact assessment. If deviations were identified that could have a significant adverse impact on the environment, the environmental impact assessment process would have to be repeated. This procedure, which is enshrined in the Environmental Impact Assessment Act, ensures that impacts cannot be underestimated as a result of incorrect input assumptions in the EIA process.

ad n) The question of whether assumptions adopted during the EIA could lead to a radiological impact analysis that underestimated the impact or probability of accident events is, in practical terms, answered in the preceding point. The assumptions used in the EIA process are verified in subsequent stages of Project preparation using procedures under the Environmental Impact Assessment Act, and if deviations were identified that could have a significant adverse impact, the environmental impact assessment process would have to be repeated. This procedure ensures that impacts cannot be underestimated as a result of incorrect input assumptions in the EIA process.

ad o) The EIA process provides an opportunity to assess environmental risks; in this respect, the requirement can be agreed with, and the risks are assessed in accordance with the requirements of the Environmental Impact Assessment Act (Chapter D.II. of this Documentation).

ad p) Neither the economic assessment nor the decision on implementation is the subject of the EIA process. Experience from previous construction projects implemented in a different environment (i.e. abroad) cannot automatically be transferred to the present Project.

PART A
(INFORMATION ON THE DEVELOPER)

PART A INFORMATION ON THE DEVELOPER

A.I. Business Name

1. Business Name

ČEZ, a. s.

A.II. ID No.

2. ID No.

45274649

A.III. Registered office

3. Registered Office (Residence)

Duhová 2/1444
140 53 Praha 4

A.IV. Developer's Authorized Representative

4. Name, surname, residence and telephone number of the Developer's authorized representative

Ing. Jan Jílek
Section Manager, Quality, Safety and Licensing

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140 53 Praha 4

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email: smr@cez.cz
Data box ID: yqkcds6

PART B
(PROJECT INFORMATION)

PART B PROJECT INFORMATION

B.I.
BASIC INFORMATION

I. Basic information

B.I.1. Project name and classification

1. Project name and classification pursuant to Annex No. 1

B.I.1.1. Project name

New SMR power plant at the Temelín site

B.I.1.2. Project classification

Pursuant to Annex No. 1 to Act No. 100/2001 Coll., on Environmental Impact Assessment, as amended, the Project is classified[1] as follows:

article:	8
Project:	Nuclear power plants and other nuclear reactors, including the dismantling or final closure of such power plants or reactors, except for research installations for the production and conversion of fissile and fertile materials whose maximum power does not exceed 1 kW of continuous thermal power.
category:	I (always subject to assessment)
limit:	no limit is specified
competent authority:	MŽP

The Project falls under Section 4(1)(a) of the Act as a project listed in Category I of Annex No. 1 to the Act and as changes to such projects where the project change, by its own capacity or scope, reaches the applicable limit value, if specified; such projects and project changes are always subject to an environmental impact assessment.

The authority competent to conduct the environmental impact assessment process for the Project is the Ministry of the Environment of the Czech Republic.

B.I.2. Project capacity

2. Project capacity (scope)

The basic Project capacity data are as follows:

net electrical output:	up to 500 MW_e

More detailed information on the Project parameters is provided in Chapter B.I.6. Description of the technical design of the Project (page 79 of this Documentation).

[1] The Project classification applies to the Project as a whole. Individual structures and/or operating units that form part of the Project or the related and induced investments could be classified differently if assessed separately.

B.I.3. Project location

3. Project location (region, community, cadastral area)

The Project is located within the following administrative units:

State	*Region*	*District*	*ORP*	*Municipality*	*Cadastral area*
Czech Republic	South Bohemian	České Budějovice	Týn nad Vltavou	Temelín	cad. area Křtěnov cad. area Kočín cad. area Temelínec cad. area Březí u Týna nad Vltavou
				Dříteň	cad. area Chvalešovice

The Project location is shown in the following figures.

Fig. B.1: Wider Project location

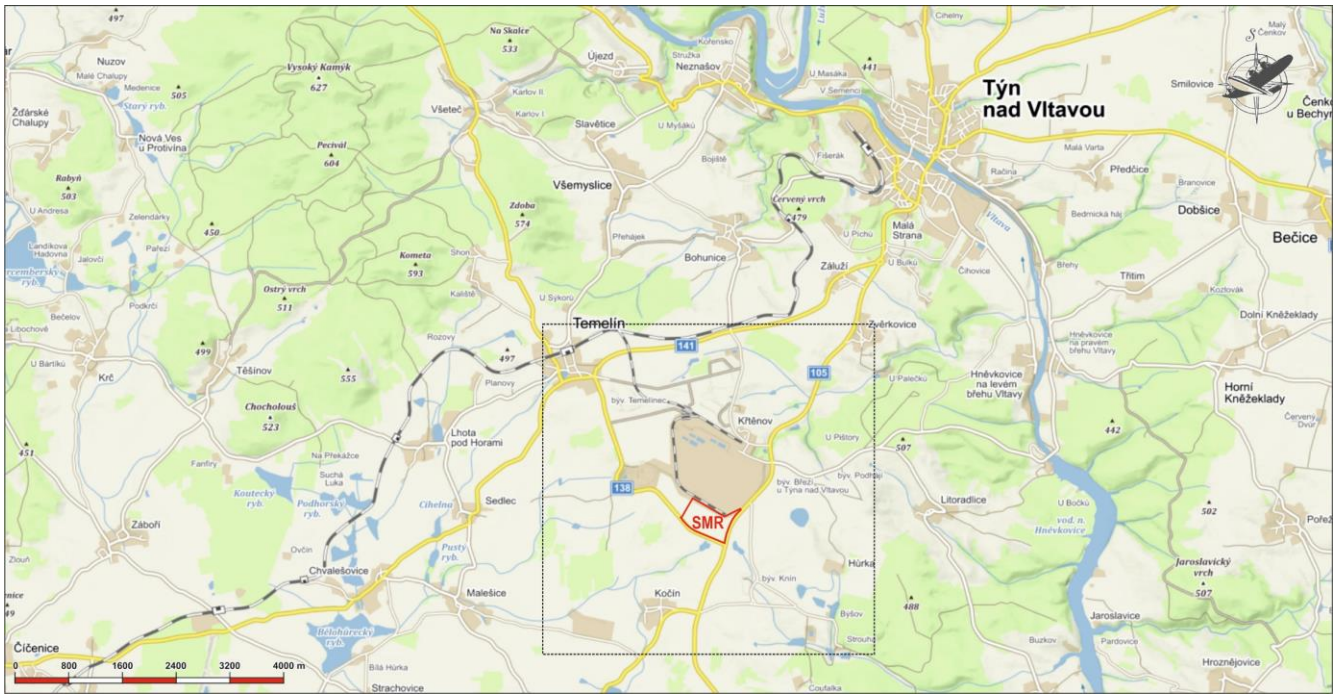
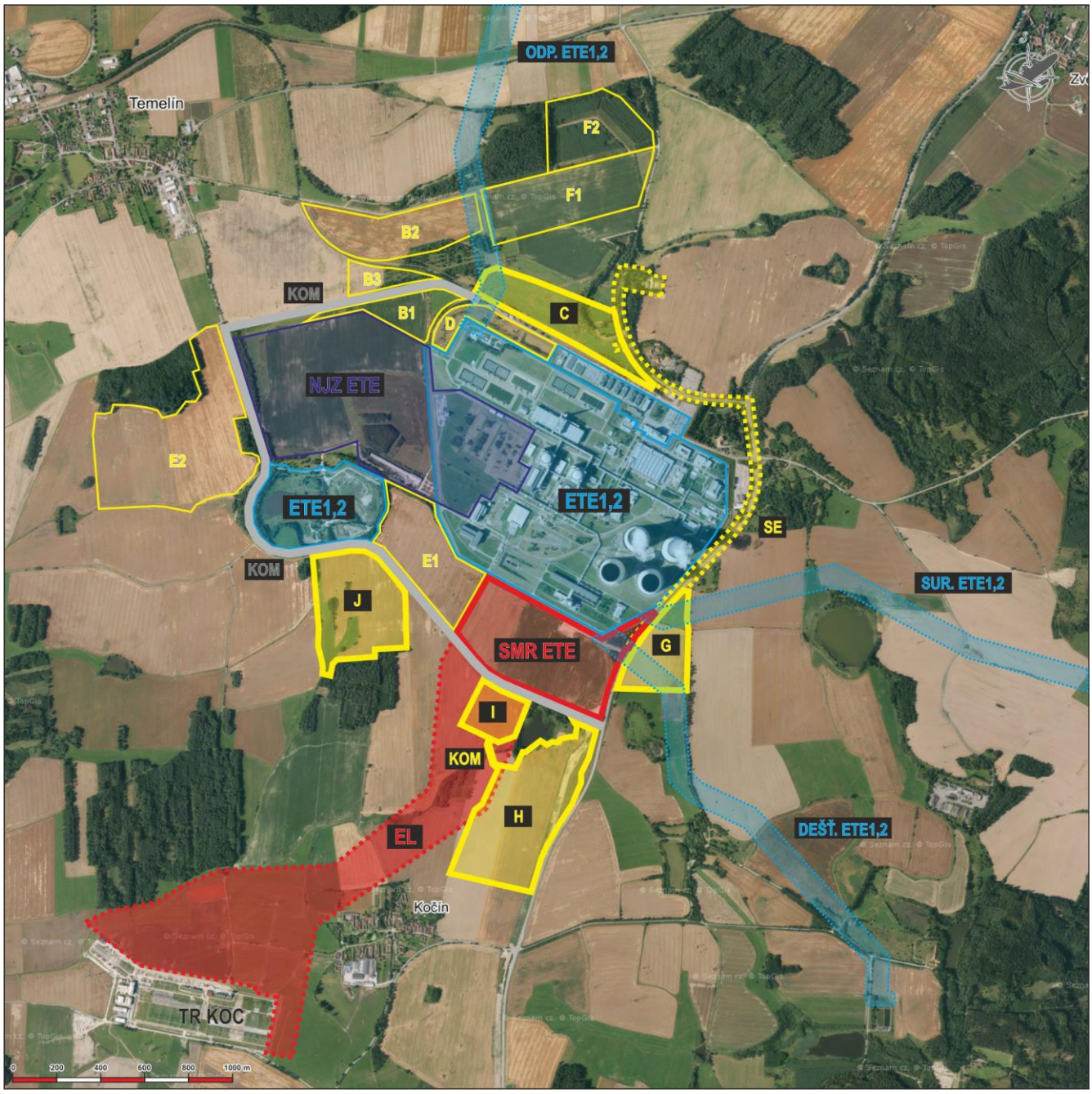


Fig. B.2: Layout of the Temelín site, overview of the Project location



Legend:

Main areas and corridors:

SMR ETE	SMR ETE siting area - main construction site
C, G, H, I, J	temporary construction site facility areas for SMR ETE construction
KOM	corridor for widening Road II/138, corridor for widening/modifying the service road, corridor for the temporary connection between areas H and I
EL	SMR ETE power evacuation and backup power-supply corridor to the Kočín transformer station
SE	construction site power supply corridor

Other areas and corridors:

ETE1,2	areas of the existing ETE1,2 units
SUR. ETE1,2	corridor of the existing raw water supply line for ETE1,2
ODP. ETE1,2	corridor of the existing wastewater discharge pipeline for ETE1,2
DEŠŤ. ETE1,2	corridor of the existing stormwater sewer for ETE1,2
New NPP ETE	area for siting New NPP ETE
B1, B2, B3, D, E1, E2, F1, F2	other/reserve temporary construction-site facility areas
TR KOC	existing Kočín transformer station (ČEPS, a.s.)

Note: The figure does not delineate the power evacuation corridors for ETE1,2 and New NPP ETE to the Kočín transformer station, which have no operational connection to the SMR ETE Project.

The Project layout is documented in Annex 1.1 to this Documentation.

The Project is located adjacent to the existing Temelín power plant site (the ETE1,2 site), which is owned by the Project developer and used to generate electricity and heat and with which it shares infrastructure connections, particularly water-management infrastructure.

The Project will be located in the SMR ETE area - main construction site (approximately 29.7 ha). The Project's electrical output will be evacuated through the EL corridor to the Kočín transformer station, which will also provide backup power for the Project's own consumption.

Five temporary construction site facility areas will be established for Project construction:

- area C (approximately 13.9 ha) - temporary construction site facilities, temporary material transshipment area,
- area G (approximately 9.5 ha) - temporary construction site facilities, temporary high-capacity parking lot,
- area H (approximately 25.8 ha) - temporary construction site facilities, temporary technological structures, temporary topsoil stockpiles, temporary construction material storage areas, temporary recycling facility,
- area I (approximately 5.6 ha) - temporary administrative buildings, temporary parking lot/reserve area,
- area J (approximately 19.2 ha) - temporary construction site facilities, temporary concrete mixing plant, temporary technological structures, temporary construction material storage areas.

The construction site facilities also include a corridor for supplying electricity to the construction site from the Křtěnov substation (SE) and a temporary connection between areas H and I by means of a bridge over Dvorčický Stream (KOM), which will be dismantled after construction is completed. Other modifications in the KOM corridor (widening Road II/138 and widening/modifying the service road) implemented for construction traffic will be retained after construction is completed.

The other designated temporary construction site facility areas (B1, B2, B3, D, E1, E2, F1, F2) are considered reserve areas.

The Project will share the existing water-management infrastructure of ETE1,2, i.e., the existing raw water supply line (SUR. ETE1,2), the existing wastewater discharge pipeline (ODP. ETE1,2) and the existing stormwater sewer (DEŠŤ. ETE1,2). Some of the pumped groundwater and stormwater from the SMR ETE area will be discharged into the Dvorčický Stream basin (not delineated graphically; direct contact).

For the purposes of preparing this Documentation, the Project area and its surroundings are referred to as the affected territory.

B.I.4. Nature of the Project and potential for cumulative impacts with other projects

4. Nature of the Project and potential for cumulative impacts with other projects

B.I.4.1. Nature of the Project

Construction of a new SMR nuclear power plant.

The Project consists of the construction and operation of a new SMR nuclear power plant comprising one power-generating unit with one nuclear reactor, including all related structures and operating units (technological equipment) used to generate and evacuate electricity and to ensure the safe operation of the nuclear installation.

B.I.4.2. Potential for cumulative impacts with other projects

Potential cumulative impacts result from interaction with other existing[1] or planned projects in the area. The Project is being sited within the Temelín energy complex area (i.e., the area connected to the Temelín power plant, the Hněvkovice and Kořensko water-management facilities, and the Kočín transformer station), which has long been used for energy purposes (electricity and heat generation) and is equipped with all necessary infrastructure connections.

The following operating nuclear installations are located at the Temelín power plant site:

- two units of the Temelín Nuclear Power Plant (ETE1,2),
- spent nuclear fuel storage facility (SVJP),
- fresh nuclear fuel storage facility as part of the auxiliary service building for primary systems of ETE1,2 (BAPP),

the following facilities are also being prepared:

- New NPP ETE (or ETE3,4) (new nuclear installation, project code in the EIA Information System: MZP230).

[1] In substantive terms, the term "existing project" ("stávající záměr") means the same as "existing installation/facility". The Ministry of the Environment uses the term in this sense in its methodological procedures, distinguishing between "existing projects" (i.e., projects that already exist) and "planned projects". Under Directive 2011/92/EU of the European Parliament and of the Council on the assessment of the effects of certain public and private projects on the environment, as amended by Directive 2014/52/EU, the term "záměr" is equivalent to the term "Project".

- Spent nuclear fuel storage facility at the Temelín site - storage capacity expansion (SVJP) (expansion of the existing nuclear installation, project code in the EIA Information System: MZP518).

Further details of these facilities are provided in Chapter B.I.6.4. Specific information on other facilities at the site (page 188 of this Documentation).

The combined impact of these facilities is the decisive cumulative impact and is fully taken into account in the Project assessment. The same applies to the related infrastructure connections (raw water pipelines from the Hněvkovice profile, wastewater pipelines to the Kořensko profile, and power evacuation and backup supply for own consumption to/from the Kočín transformer station) and their environmental demands. The following Czech transmission system projects connected to the Kočín transformer station are planned in the area:

- V432 Kočín - Přeštice - duplication of the existing 400 kV line (project code: MZP374): Reinforcement of the transmission profile between the Kočín and Přeštice transformer stations by duplicating the existing line. Project developer: ČEPS, a.s.
- V433/833 - line duplication (project code in the EIA Information System: OV2069): Reinforcement of the transmission profile between the Dasný, Slavětice, and Kočín transformer stations by duplicating the existing line. Project developer: ČEPS, a.s.
- V406/V407 Kočín - Mírovka, new 400 kV line (project code in the EIA Information System: MZP281). Construction of a new double-circuit 400 kV line between the Kočín and Mírovka transformer stations. Project developer: ČEPS, a.s.

All the listed Czech transmission system projects have received a favorable opinion from the Ministry of the Environment and are being prepared to strengthen the transmission capacity and reliability of the Czech transmission system, including in connection with the development of generating facilities at the Temelín site. The potential for cumulative impacts with the SMR ETE Project will be evident primarily in visual impacts (impacts on the landscape and landscape character) and is fully taken into account.

The following additional projects in the surrounding area have been notified in the EIA Information System:

- Industrial waste incineration plant at the Hůrka site (project code in the EIA Information System: JHC1223): Industrial waste incineration plant with a capacity of 20,000 t/year, located at the existing site of QUAIL spol. s r.o. in Hůrka. Distance to the SMR ETE area: approximately 1.5 km; distance to the nearest construction site facility area (G): approximately 1.2 km. This is a Category I project that is always subject to environmental impact assessment. The project underwent the screening and scoping procedure pursuant to the Act, the conclusion of which established several requirements for preparing the EIA documentation, including elaborating, further assessing, or providing a more detailed justification of the cumulative and synergistic impacts with other projects at the site, with an emphasis on transport during construction and operation, emissions of pollutants and heat, and their dispersion. The EIA documentation had not yet been submitted when this Documentation was prepared.
- Temelín concrete mixing plant and recycling facility (project code in the EIA Information System: JHC1238, JHC1253): Mobile concrete mixing plant with a capacity of 112,000 t/year and a recycling/crushing facility with a capacity of 3,500 t/year, located at the existing industrial site of Š + H Bohunice, s.r.o. on the southern edge of the municipality of Temelín, along Road II/138. Distance to the SMR ETE area: approximately 2.0 km; distance to the nearest construction site facility area (J): approximately 1.5 km. At the project developer's request, the environmental impact assessment process was terminated before the conclusion of the screening and scoping procedure was issued. The project was subsequently resubmitted to the screening and scoping procedure under a new code with the same name, capacity, and location. The screening and scoping procedure had not been completed when this Documentation was prepared.
- Hůrka u Temelína – composting plant (project code in the EIA Information System: JHC1259): Facility for treating biodegradable waste by aerobic fermentation (composting plant), with a capacity of 27,000 t/year, located at the existing site of QUAIL spol. s r.o. in Hůrka. Distance to the SMR ETE area: approximately 1.5 km; distance to the nearest construction site facility area (G): approximately 1.2 km. The screening and scoping procedure had not been completed when this Documentation was prepared.

Given the distances between these projects and the SMR ETE Project and the different nature of their dominant impacts (air quality impacts versus ionizing radiation impacts), the potential for cumulative impacts is low and will be evident primarily in related transport and associated impacts (air quality impacts and noise impacts). This Documentation takes it into account to the extent possible given the stage of preparation of these projects and, consequently, the available information on their environmental impacts. In all cases, each individual project must itself comply with the required limits, taking the existing background levels into account. Each project that enters the area "last" must therefore take account of the existing level of impacts in the area and adapt its technical design and proposed impact-mitigation measures accordingly.

A specific potential project is the deep geological repository for high-level radioactive waste at the Janoch site, which would be located approximately 2.8 km from the SMR ETE area (center of the delineated repository polygon) or approximately 1.0 km from the SMR ETE area (adjacent edge of the delineated repository polygon). No decision has been made on the implementation of this repository, which is one of four potential sites in the Czech Republic, and its environmental impacts have not been assessed through the EIA process. Information from the Czech Radioactive Waste Repository Authority (SÚRAO), a state organizational body responsible for activities associated with radioactive waste disposal, concerning the preparation of the repository is provided in Annex 6.3 to this Documentation. If the site is selected, the combined/cumulative impacts of this repository with other projects in the area, including the SMR ETE Project and other nuclear and non-nuclear facilities at the site, will be assessed in a separate EIA process to which the repository is subject by law. Here too, each project that enters the area "last" must take account of the existing level of impacts in the area and adapt its technical design and proposed impact-mitigation measures accordingly.

No other factors or projects with the potential for significant cumulative impacts with those of the notified Project were identified. The environmental impacts of the SMR ETE Project are therefore examined against the background of the projects listed above and the overall environmental baseline and development trends in the affected territory.

The SMR ETE Project is, or will be, consistent with spatial planning documentation at the various levels (spatial development principles and municipal spatial plans) that coordinate development in the area. From this perspective, the occurrence of significant combined/cumulative impacts is limited at the conceptual level.

The further development of the affected territory will not be static, and it is reasonably assumed that any new projects sited in the area will also be assessed in terms of their impacts on the environment and public health. Based on current knowledge, it cannot be ruled out that a new SMR ETE spent nuclear fuel storage facility will be added at the site when needed and if a decision is made to locate it there. It will be located within the SMR ETE siting area or at another selected site. Its preparation will also include an environmental impact assessment; pursuant to Act No. 100/2001 Coll., on Environmental Impact Assessment, the facility constitutes a separate project subject to assessment (Category I, item 12 of Annex No. 1 to the Act). This assessment will reflect the current state of knowledge and the technical standard of the storage facility at the time of its preparation and will assess whether the facility can be implemented from an environmental perspective, including with regard to the current combined impacts in the area. The same applies to a new spent nuclear fuel storage facility for New NPP ETE. However, the potential combined impacts of these storage facilities are considered at the conceptual level in this Documentation.

B.I.5. Justification of the Project location and description of the options considered

5. Justification of the Project location and description of the options considered by the Project developer, including the main reasons for selecting the proposed solution, including a comparison of environmental impacts

B.I.5.1. Justification of the Project location

B.I.5.1.1. Information justifying the Project location

The selection of the Temelín site reflects the current availability of the necessary land and infrastructure and operational connections in the Czech Republic, including the statutory requirements for siting a nuclear energy facility.

The Project is being sited in an area immediately adjacent to the existing Temelín power plant site (the ETE site). The reasons for this location are both the site's spatial planning readiness and the availability of land for siting the Project, including the necessary temporary construction site facility areas, and its connection to essential infrastructure systems, particularly water supply and wastewater discharge, which will be shared with the existing Temelín power plant, as well as power evacuation and backup power supply through the existing Kočín transformer station. These parameters effectively determine the Project's location at the site.

The areas for siting the Project do not directly affect any specially protected parts of nature; they consist predominantly of ecologically poor, intensively farmed land, mostly without landscape vegetation, that was also used in the past as construction site facilities for the construction of ETE. Impacts on areas of greater ecological significance are minimized. This location is optimal from an environmental perspective.

The Project location is consistent with the following strategic documents:

- Spatial Development Policy of the Czech Republic (consolidated version binding from October 1, 2025).
- Spatial Development Principles of the South Bohemian Region (as amended by Updates Nos. 1, 2, 3, 4a, 5, 6, 7, 8, 9, 11, and 13 and judgment No. 1 As 15/2016-85 of the Supreme Administrative Court, 2024).
- Spatial Development Plan (Amendment No. Z1b, in progress during 2025–2027 (expected)).
- Spatial plans of the affected municipalities (in preparation).
- National Energy and Climate Plan of the Czech Republic (2024).
- Update of the State Energy Policy (2024, in preparation).

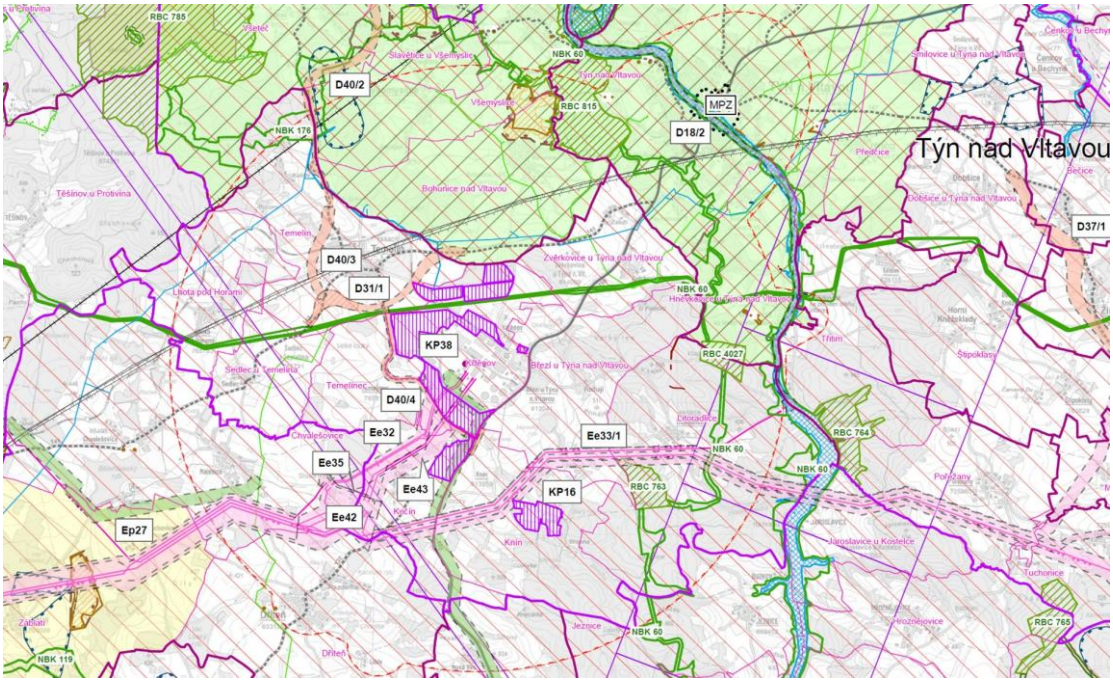
The Spatial Development Policy of the Czech Republic delineates the "E4a Expansion and evacuation of the electrical and thermal output of the Temelín, Ledvice, Počerady, Prunéřov, Tušimice, Dětmarovice, Mělník, Tisová, Vřesová, Litvínov, Neratovice, Kralupy nad Vltavou, and Dukovany power plants, including a water reservoir to ensure the long-term operation of Dukovany, if necessary, and connection to the nearest substation" electricity infrastructure project. According to the Spatial Development Policy, the reason for the delineation is the "Need to replace existing generating facilities or delineate new ones at sites with suitable spatial conditions, the necessary public infrastructure, and conditions for evacuating their output to the transmission system".

The siting of the SMR Project at the Temelín site respects the purpose of this delineation, which is also incorporated as a binding requirement in the Spatial Development Principles of the South Bohemian Region (see the following item).

The Spatial Development Principles of the South Bohemian Region, as amended by Update No. 13 (ZÚR JčK), approved and issued by the South Bohemian Regional Assembly (Resolution No. 216/2024/ZK-34 of June 20, 2024, which took effect on July 18, 2024), include the delineation of the KP38 Temelín production and industrial area of international and national significance so as to allow the implementation of New NPPs, consisting of the completion of Units 3 and 4 of the Temelín Nuclear Power Plant and small and medium-sized modular reactors (SMRs), including related structures, technological facilities, and construction site facility areas. At the same time, the Ee43 corridor for power evacuation from New NPP ETE to the Kočín substation is delineated in the ZÚR, and area Ee42 for connecting ZVN and VVN lines to the Kočín substation has been expanded.

The spatial layout under the ZÚR JčK, as amended by Update No. 13, is shown in the following figure.

Fig. B.3: Excerpt from the coordination drawing of the ZÚR JčK, as amended by Update No. 13



According to the applicable Temelín Spatial Plan (ÚPT), areas G and J, which are not shown in the updated ZÚR, are located in a stabilized area of undeveloped agricultural land where technical and transport infrastructure, including technical and transport infrastructure for the purposes of the Temelín Nuclear Power Plant, is permitted.

Spatial Development Plan:

As the requirements, areas, structures, and other parameters have been refined, new needs of the SMR ETE Project have gradually emerged since 2024, creating a concurrent need to further modify and expand the areas defined by Update No. 13 to the ZÚR JčK. During discussions with MMR, ÚÚR, and MPO on the next steps and the method of implementation, it was decided to incorporate further project changes and identified sites into the National Spatial Development Plan of the Czech Republic in accordance with the applicable Spatial Development Policy, as amended. For this purpose, the ongoing Z1b Amendment to the Spatial Development Plan is being used; it includes all New NPPs, including SMR ETE, and their land requirements as public-benefit projects. The Government of the Czech Republic approved the assignment for this Amendment on April 16, 2025 (Government Resolution No. 271/25). The amendment planner is preparing a comprehensive draft, expected to be completed in the summer of 2026. An SEA covering all changes throughout the Czech Republic should be prepared during the autumn of 2026. The public hearing on Amendment Z1b should take place in the spring of 2027. Amendment Z1b should be discussed and approved by the Government of the Czech Republic by the end of 2027. Negotiations between the investors and the authority responsible for procuring/preparing the Amendment concerning its final form are ongoing. The latest working draft of the underlying material and changes was submitted to the amendment planner in early April 2026. The final form of the proposed changes will be refined further. The first results will be known during the coming summer or fall months.

Spatial plans of the affected municipalities:

The spatial plans of the affected municipalities must always be consistent with the superior regional documentation. The above ZÚR JčK areas and corridors will therefore, pursuant to Section 80, subsection (3), of Act No. 283/2021 Coll., the Building Act, as amended, be incorporated into the spatial plans of the affected municipalities of Temelín and Dříteň, after any appropriate refinement.

After Amendment Z1b to the National Spatial Development Plan has been discussed and approved (expected December 2027), the subsequent lower-level spatial planning documentation will be prepared, discussed, and

approved at the level of the South Bohemian Region (ZÚR amendment: authority responsible for procurement, South Bohemian Regional Authority) and the affected municipalities of Temelín and Dříteň (Temelín spatial plan amendment: authority responsible for procurement, Týn nad Vltavou municipality with extended powers; Dříteň spatial plan amendment: authority responsible for procurement, České Budějovice municipality with extended powers).

Following Update No. 13 to the ZÚR JčK, Amendment No. 5 to the Temelín Spatial Plan has already been initiated. It is currently under preparation and is being converted to the uniform digital standard pursuant to the applicable Building Act. The Týn nad Vltavou Municipal Authority, acting as the spatial planning authority for the administrative district of the Municipality of Temelín, is responsible for procuring this amendment. The application to procure standardized Amendment No. 5 was submitted to the Municipal Authority in the autumn of 2024, the Temelín Municipal Assembly approved the official assignment for the amendment on January 30, 2025, and the planner completed the proposed amendment in full in the spring of 2025. A combined joint meeting and public hearing was then initiated, during which the authorities concerned and the public provide comments on the documentation. Amendment No. 5 will thus serve as a local instrument that converts the regional delineation of areas for nuclear energy development into specific building plots and limits directly within the territory of the Municipality of Temelín. The current wording, coordination drawings, and graphic annexes to the amendment are published on the official notice boards/websites of the Municipality of Temelín and the Týn nad Vltavou Municipal Authority. Amendment No. 5 to the Temelín Spatial Plan directly refines and provides a detailed layout of the newly expanded energy complex area (KP38 Temelín in the ZÚR JčK). This permits the actual use of the affected cadastral areas (Temelín, Temelínec, and Křtěnov) for the planned construction of SMRs and associated structures and technological facilities. This amendment to the Temelín Spatial Plan also incorporates the newly delineated South Bohemian Region corridor for power evacuation to the Kočín substation.

The Update of the State Energy Policy (2024) and the National Energy and Climate Plan of the Czech Republic (2024) include among their priorities for decarbonizing the energy mix a stronger role for nuclear energy and the construction of New NPPs based on the forecast balance of energy generation and consumption, making maximum use of the existing Dukovany and Temelín nuclear sites, which are ready for the construction of additional new nuclear units. The National Action Plan for the Development of Nuclear Energy in the Czech Republic addresses the implementation of nuclear energy development. With a view to ensuring energy security and the overall social benefits, it considers it desirable from the State's perspective to begin preparing the construction of New NPPs at the Temelín and Dukovany sites without delay.

The siting of the SMR Project at the Temelín site respects these priorities.

Consistent with these policy documents, an infrastructure-ready site has therefore been selected for the SMR Project at the Temelín site, with water supply, wastewater discharge, evacuation of generated electricity to the transmission system, transport connections, and other infrastructure, and with an existing nuclear power plant. The site has been monitored over the long term and, based on the analytical results, is also suitable for siting an SMR. The siting of the SMR ETE Project is therefore consistent with spatial planning objectives and represents an efficient and environmentally and socially optimal use of the available resources. At the same time, in terms of the applied environmental parameter envelope and the current assumption that New NPP ETE will comprise two units, each with a net electrical output of up to 1,200 MW_e, implementation of the SMR ETE Project with an output of up to 500 MW_e will not exceed the 2 × 1,700 MW_e envelope for which New NPP ETE was previously assessed through the EIA process.

The siting of the SMR ETE Project at the Temelín site is therefore based both on consideration of the expected development of energy balances (see Chapter B.I.5.1.2 below, Information Justifying the Need for the Project) and on safety requirements for the siting and operation of nuclear energy facilities and the availability of the necessary areas and infrastructure, operational, personnel, and social connections. From these perspectives, the Temelín site represents an efficient and environmentally and socially optimal use of the available resources.

In 2022, a Memorandum of Understanding was concluded between the Project developer (ČEZ, a. s.), the South Bohemian Region, and ÚJV Řež, a.s. to achieve more significant progress in SMR development through synergies among these entities, with each party contributing specific expertise or otherwise helping to achieve the above objectives. Following this memorandum, a memorandum of association was concluded to establish the subsidiary South Bohemian Nuclear Park, s.r.o., one of whose objectives is to create a platform for consultation and resolution of problematic areas during the preparation and implementation of the pilot SMR project at the Temelín site.

In July 2026, the Ministry of Industry and Trade of the Czech Republic, ČEZ, a. s., and Rolls-Royce SMR signed a memorandum building on previous nuclear energy agreements between the Czech Republic and the United Kingdom and focusing on the preparation of SMR projects at up to three sites in the Czech Republic, which together will enable the construction of up to six small modular reactors with a total electrical output of up to 3 GW. ČEZ, a. s., entered into a strategic partnership with Rolls-Royce SMR in 2024, through which it is directly involved in the development and preparation of small modular reactor technology. At the same time, ČEZ, a. s., acquired an approximately 20% interest in the British company and is therefore a strategic investor with significant rights.

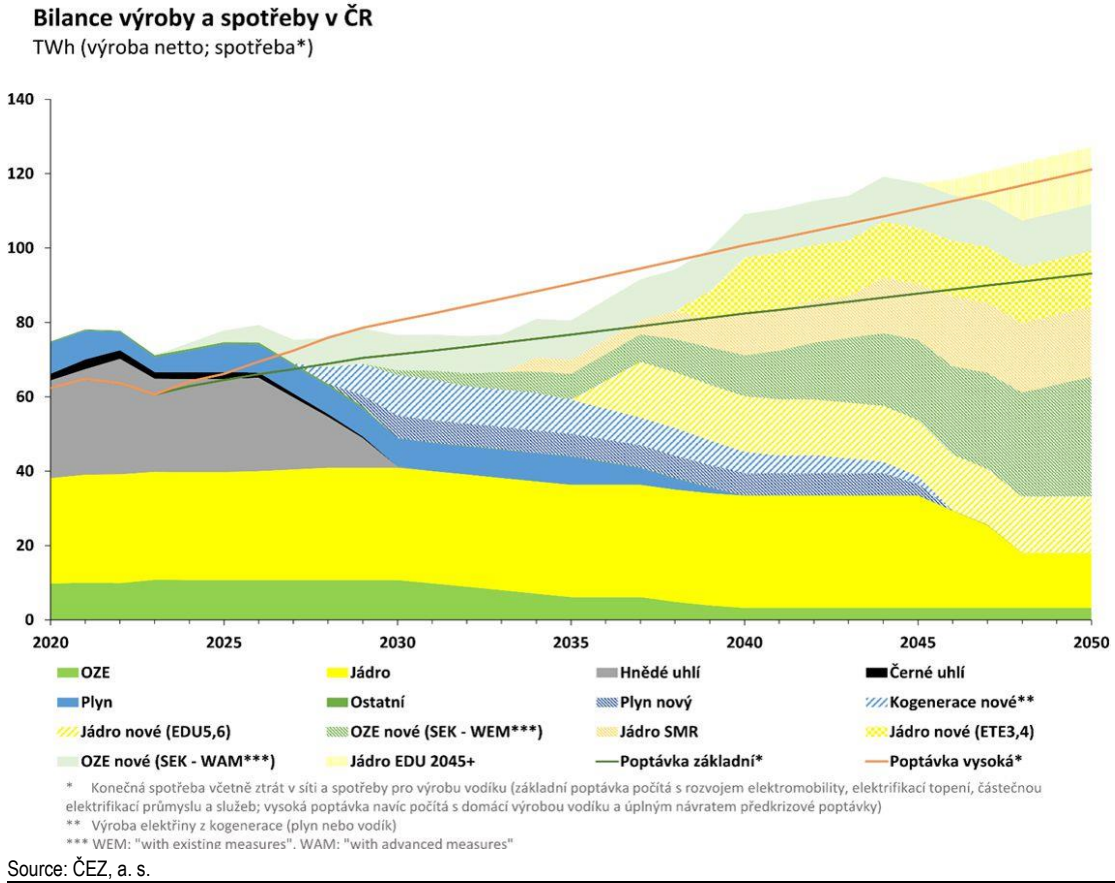
B.I.5.1.2. Information justifying the need for the Project

The SMR ETE construction Project is based on the Policy Statement of the Government of the Czech Republic of January 2022 (updated in March 2023), the Policy Statement of the Government of the Czech Republic of January 2026, and the Plan for Small and Medium-Sized Reactors in the Czech Republic - Applications and Economic Development (MPO, May 2023), approved by Government Resolution No. 808 of November 1, 2023. The Project is consistent with the objectives of the National Action Plan for the Development of Nuclear Energy in the Czech Republic (NAP JE, 2015), the National Energy and Climate Plan of the Czech Republic (VPEK, 2024), and the planned Update of the State Energy Policy (ASEK, 2024, draft[1]).

These policy documents express society's demand for reliable electricity generation and supply and establish the main trends in energy infrastructure development. Current energy trends are aimed at achieving a low-carbon energy sector, security of energy supply in terms of fuel supply, environmentally sustainable development, reduced energy intensity in all consumer sectors, and, last but not least, national self-sufficiency in electricity generation.

The above factors and increasing electricity consumption have a major influence on the future development of the electricity generation and consumption balance in the Czech Republic. Demand for electricity will increase significantly due to electric mobility, the electrification of the heating sector, and hydrogen production. As a result of the "Green Deal" initiated by the European Commission and the objectives of the EU's "Fit for 55" legislative package, a set of measures intended to achieve a 55 % reduction in emissions, the Czech energy mix will change significantly from 2030 toward 2050, as shown in the following figure.

Fig. B.4: Electricity generation and consumption balance in the Czech Republic



Source: ČEZ, a. s.

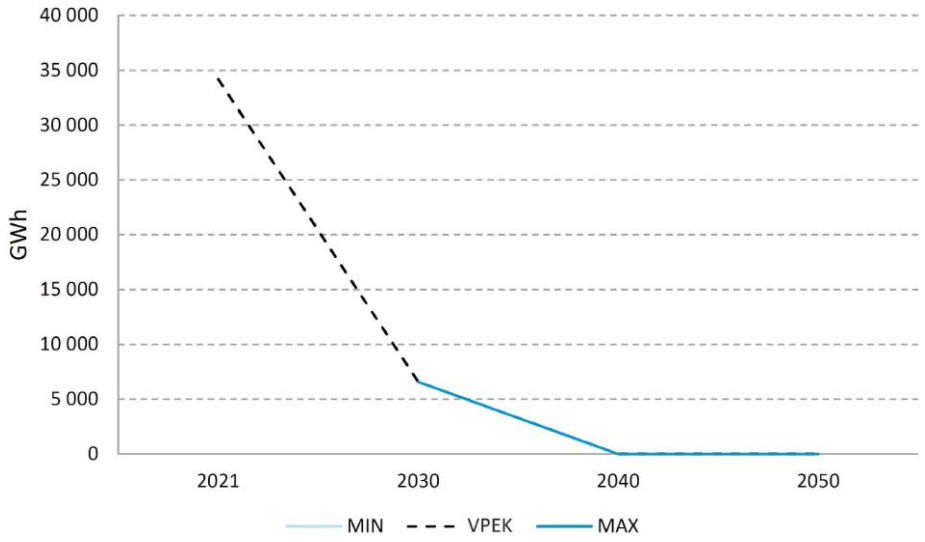
Bilance výroby a spotřeby v ČR	Generation and consumption balance in the Czech Republic
TWh (výroba netto; spotřeba*)	TWh (net generation; consumption*)
OZE	OZE
Jádro	Nuclear
Hnědé uhlí	Brown coal
Černé uhlí	Black coal
Plyn	Gas
Ostatní	Other

[1] The planned Update of the State Energy Policy is based on the same models and assumptions as the aforementioned National Energy and Climate Plan of the Czech Republic.

Plyn nový	New gas
Kogenerace nové**	New cogeneration**
Jádro nové (EDU5,6)	New nuclear (Dukovany Units 5 and 6)
OZE nové (SEK - WEM***)	New OZE (SEK - WEM***)
Jádro SMR	SMR nuclear
Jádro nové (ETE3,4)	New nuclear (ETE3,4)
OZE nové (SEK - WAM***)	New OZE (SEK - WAM***)
Jádro EDU 2045+	Dukovany nuclear 2045+
Poptávka základní*	Baseline demand*
Poptávka vysoká*	High demand*
* Konečná spotřeba včetně ztrát v síti a spotřeby pro výrobu vodíku (základní poptávka počítá s rozvojem elektromobility, elektrifikací topení, částečnou elektrifikací průmyslu a služeb; vysoká poptávka navíc počítá s domácí výrobou vodíku a úplným návratem předkrizové poptávky)	* Final consumption including grid losses and consumption for hydrogen production (baseline demand assumes the expansion of electric mobility, electrification of heating, and partial electrification of industry and services; high demand additionally assumes domestic hydrogen production and a full return to pre-crisis demand levels)
** Výroba elektřiny z kogenerace (plyn a vodík)	** Electricity generation from cogeneration (gas and hydrogen)
*** WEM: "with existing measures". WAM: "with advanced measures"	*** WEM: "with existing measures". WAM: "with advanced measures"

As an EU Member State that adopted the "Green Deal" and the "Fit for 55" legislative package, the Czech Republic must respect and appropriately implement the established objectives. According to the updated VPEK, the Czech Republic's strategic objective is to reduce the share of fossil fuels used without CO_2 capture technology in primary energy consumption to 50 % by 2030 and 0 % by 2050, and to phase out coal use for electricity and heat generation entirely by 2033. The following figure shows the expected decline in electricity generation from coal and coal derivatives based on the corridors defined in the draft ASEK.

Fig. B.5: Development corridor for gross electricity generation from coal and coal derivatives (relative expression)



Source: MPO, ASEK 2024 (draft)

The development of nuclear energy, whose share of energy consumption will increase, is an important element of the decarbonization strategy. This will be achieved by constructing both large nuclear reactors and small modular reactors (SMRs). The established objectives will therefore result in a shift away from fossil fuels toward OZE and nuclear power plants, while respecting efficiency and environmental protection requirements.

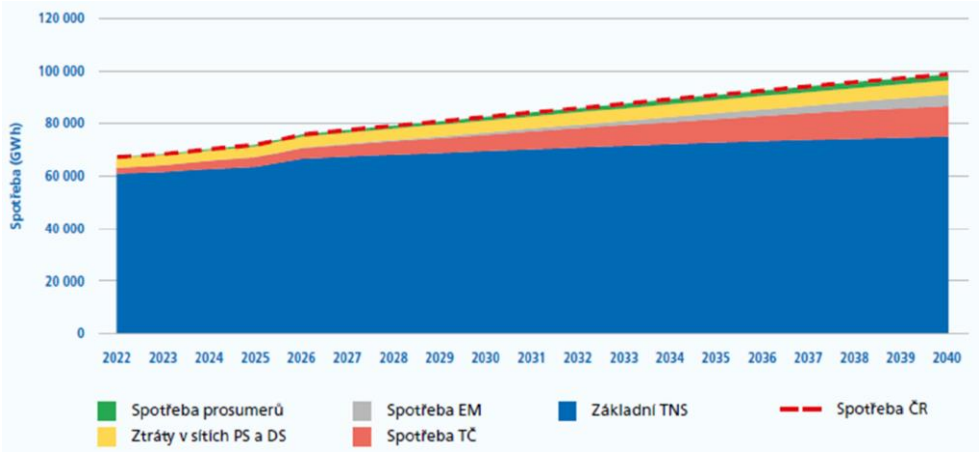
Generation by nuclear power plants will thus gradually replace coal-fired generation, which has historically been the mainstay of electricity generation but is expected to be phased out in view of the above climate objectives. The planned construction of the New NPP at the Dukovany site (Dukovany Units 5 and 6) will not by itself be sufficient to meet future demand, even taking into account the current growth in installed OZE capacity. According to the Plan for Small and Medium-Sized Reactors in the Czech Republic - Applications and Economic Benefits, the Czech Electricity System Resource Adequacy Assessment to 2040 (MPO, ČEPS, 2023) concluded that the construction of renewable energy sources together with new large reactors would not meet the Czech Republic's need for self-sufficiency in electricity supply and that up to an additional 3 GW_e of capacity would need to be installed by 2050. For this reason, SMR development is being considered as part of an appropriate replacement for coal-fired units, with the VPEK setting the goal of commissioning the first SMR in the mid-2030s.

The SMR ETE Project is therefore consistent with the above Czech strategic energy documents, in which it is considered part of a broadly diversified mix of electricity generating facilities based on the efficient use of all available energy sources, the maintenance of an adequate power

balance reserve in the electricity system, and the maintenance of available strategic reserves of domestic forms of energy. Nuclear power plants are also a cornerstone of the Czech Republic's energy security and will be essential to maintaining electricity system stability and reducing system costs in the future. Self-sufficiency in electricity generation will be based primarily on advanced conventional technologies with high energy conversion efficiency and an increasing share of renewable energy sources.

According to the planned Update of the State Energy Policy (draft, 2024), electricity generation is expected to increase gradually from approximately 85.9 TWh/year to between 109.1 and 114.7 TWh/year. This development is subject to numerous uncertainties, particularly regarding the development of electricity consumption, but also the possibility of importing/exporting electricity. The trend in electricity consumption in the Czech Republic indicates an increase. The expected development under the progressive scenario considered in the Czech Electricity System Resource Adequacy Assessment to 2040 is shown in the following figure.

Fig. B.6: Development of electricity consumption in the Czech Republic - progressive scenario



Explanation of abbreviations: PS - transmission system, DS - distribution system, EM - electric mobility, TČ - heat pumps, TNS - domestic net consumption

Source: ČEPS, a.s., 2023

Spotřeba (GWh)	Consumption (GWh)
Spotřeba prosumerů	Prosumer consumption
Spotřeba EM	EM consumption
Základní TNS	Baseline TNS
Spotřeba ČR	Consumption in the Czech Republic
Ztráty v sítích PS a DS	Losses in the PS and DS grids
Spotřeba TČ	TČ consumption

To cover both the generation shortfall and growing consumption, a full range of available measures is being considered, consisting of the use of a portfolio of available electricity sources, including energy-saving measures and the development of renewable sources. In this context, the SMR ETE Project is one component of a multi-source energy mix in which it will represent a high-output, stable, exceptionally reliable, and environmentally favorable, virtually carbon-free, electricity generating facility. However, it is not a direct mutually exclusive alternative to other energy sources or other energy policy measures. Those sources and measures are and will continue to be developed in the relevant contexts.

The planned Update of the State Energy Policy of the Czech Republic envisages strengthening the role of nuclear energy in the energy mix and constructing New NPPs on the basis of the forecast energy generation and consumption balance, making maximum use of the existing Dukovany and Temelín nuclear sites, which are ready for the construction of additional new nuclear units. Under the approved WAM3 scenario, the draft ASEK provides for the construction of three new large units and one SMR, as well as a maximum of 26.1 GW_e of installed photovoltaic power plant capacity in 2050, a maximum of 5.5 GW_e of wind power plant capacity in 2050, and a net import balance of 10 TWh/year.

Within the Czech energy strategy, the resulting direction is determined by developments within acceptable limits established by fulfillment of the priorities formulated in the planned ASEK. Fulfillment of the priorities depends on actual social and economic developments, measures adopted at EU level, and geopolitical developments, and therefore represents the desired and simultaneously expected direction of the energy sector, taking account of the relevant constraints and defined input assumptions arising from related sectors. As basic indicators for meeting the strategic objectives, the planned ASEK therefore defines corridors for the composition of a diversified primary energy source mix and for a balanced and decarbonized mix of electricity generating sources. The corridors for gross electricity generation, as a proportion of total annual generation, in 2030, 2040, and 2050 are shown in the following table.

Table B.1: Corridors for gross electricity generation (as a proportion of total annual generation)

Type of energy	2030		2040		2050	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
Coal and coal derivatives	10 %		0 %	0 %	0 %	0 %
Natural gas	7 %		1 %	5 %	0 %	0 %
Nuclear power	45 %		47 %	65 %	36 %	50 %
Renewable resources	37 %		33 %	47 %	43 %	56 %
Other	1 %		1 %	2 %	7 %	8 %

Source: MPO, ASEK 2024 (draft)

In this context, the SMR ETE Project is fully consistent with the above Czech strategic energy and climate documents, and its implementation will help achieve the objectives set out in those documents and thereby meet the Czech Republic's commitments regarding the European objectives of the "Green Deal" and the "Fit for 55" legislative package.

B.I.5.2. Description of the options considered

The Project is not presented in multiple options in terms of location, capacity, or technical design. It is proposed as a single implementation option consisting of the construction of a new single-unit SMR nuclear power plant at the Temelín Nuclear Power Plant site. The selection of this option is based on consideration of the following potential options:

Location options within the Czech Republic: The selection of the Temelín site reflects the current availability of the necessary land and infrastructure and operational connections in the Czech Republic, including the statutory requirements for siting a nuclear energy facility. The efficient use of the existing infrastructure and personnel resources at the Temelín site is also taken into account. From these perspectives, siting the SMR Project at the Temelín site represents the technically, environmentally, and socially optimal solution.

The preparation of other SMR projects at other sites in the Czech Republic is not affected.

Location options within the Temelín site: The selection of the location within the Temelín site is based on spatial planning documents, specifically the Spatial Development Principles of the South Bohemian Region and the spatial plans of the affected municipalities of Temelín and Dříteň, which take into account the spatial, urban, environmental, and infrastructure options for siting a new power plant at the site, including the statutory requirements for siting a nuclear energy facility. From this perspective, the Project's location within the Temelín site is optimal.

Capacity options: The selected capacity, or installed electrical output, of the new power plant reflects the output of commercially available SMRs and the constraints imposed by the site characteristics. From this perspective, the Project capacity makes efficient use of the available resources.

Technical design options: The selection of a Generation III+ LWR is based on consideration of the best commercially available solutions. LWRs are the most widely used type of nuclear power plant worldwide and the only type used in the Czech Republic, offering numerous safety advantages and extensive operating experience, including more than 200 reactor-years of operation in the Czech Republic. From these perspectives, the Project represents the best available technical solution.

The following technologies were considered when shortlisting an SMR technology partner:

- AP300 (Westinghouse),
- BWRX-300 (GE Hitachi),
- NUWARD (EDF),
- RR SMR (Rolls-Royce).

The AP300, NUWARD, and RR SMR projects use Generation III+ pressurized water reactor technologies that operate on the same principle and are structurally very similar to the reactors operated at the existing Temelín and Dukovany sites. The BWRX-300 project differs in design, operation, and operating parameters; it uses a boiling water reactor, a type not yet operated in the Czech Republic.

Discussions were held with the prioritized companies regarding the terms of partnership and cooperation. The projects were assessed using multiple technological and economic criteria, as well as in terms of partnership and technology readiness. In addition to technological aspects such as design maturity, output optimization, modularity, operational reliability, and the safety concept, strategic factors were also considered, including the possibility of establishing a partnership with the technology supplier and the potential for an equity investment in the project. The extent to which other ČEZ Group entities and the broader Czech industry would participate in the supply chain was also assessed. The expected commissioning date of the first unit and the progress of the licensing process are also important factors. Based on the results of assessments by external consulting firms and the Project developer's internal assessment, the RR SMR project from Rolls-Royce was identified as the most suitable partner

for the SMR program. It was therefore also selected as the reference project for the environmental impact assessment.

However, the selection of a specific reactor design or its supplier is not subject to environmental impact assessment (EIA). All environmentally significant Project parameters, constituting the environmental parameter envelope, are available for the environmental impact assessment even without knowing the specific reactor supplier. These parameters are based on a conservatively defined envelope of the parameters of the above RR SMR reference project. The SMR supplier may therefore be either the manufacturer of the reference reactor type or another manufacturer whose project meets all statutory conditions, particularly those required for nuclear energy facilities, while also complying with the envelope parameters used for the environmental impact assessment.

Reference options (other methods of electricity generation and/or electricity savings): The decision to generate electricity in a New NPP is based on the demand for this type of generating facility established by the relevant Czech strategic documents, specifically the State Energy Policy and the National Action Plan for the Development of Nuclear Energy, and reflects the continuity of nuclear energy at the site. From this standpoint, the Project represents part of the nuclear portion of the fuel mix. Other energy policy sources and instruments, including energy savings, are not affected and are addressed in the relevant contexts.

Options for associated systems (connections to infrastructure): The selection of the associated systems (infrastructure connections) for the New NPP is based on the existing site conditions, where the locations of infrastructure resources and existing networks are fixed. From this perspective, the method of connecting the Project to infrastructure is effectively predetermined.

Zero option: The zero option represents non-implementation of the small modular reactor Project at the Temelín site (SMR ETE)[1]. Selecting this option would mean that the potential of the Temelín site would not be used and that the required capacity would instead have to be provided at another site by the same or a different means. From this perspective, the zero option is considered the reference option, with its environmental impacts describing the current state of the environment in the affected territory and its development trends.

As follows from the information presented, the selected implementation option is optimal. The above facts justify presenting the Project as a single option.

B.I.6. Description of the technical design

6. Description of the technical design of the Project, including any demolition work required to implement the Project; for projects subject to the Integrated Pollution Prevention Act, including comparison with the best available techniques, the associated emission levels, and other parameters

The Project's technical design is described to an extent that is complete for environmental impact assessment purposes and provides all relevant information. The technical design will be further refined and specified during subsequent stages of Project preparation. In subsequent proceedings, the consistency of the current Project design with the design assessed in the environmental impact assessment will always be verified pursuant to Section 9a of Act No. 100/2001 Coll., on Environmental Impact Assessment, as amended. The decisive factors are the environmental parameters of the equipment, not specific equipment types made by specific manufacturers or their trade names.

B.I.6.1. Scope of the Project

The Project consists of the construction and operation of SMR ETE, comprising one power-generating unit with one nuclear reactor, including all related structures and operating units (technological equipment) used for electricity generation and power evacuation, including the line, and to ensure the safe operation of the nuclear installation.

The Project will be implemented so as not to restrict the operation of the existing nuclear installations at the site (see Chapter B.I.6.4. Specific information on other facilities at the site, page 188 of this Documentation) or affect the level of their nuclear safety, radiation protection, security, or radiation extraordinary event management.

The Project includes the following components:

Nuclear unit:	number of units:	one unit (comprising one nuclear reactor)
	type:	light-water-moderated pressurized water reactor (PWR)
	generation:	III+ with a high degree of passive safety features
	net electrical output:	up to 500 MW_e
	design life:	60–80 years

[1] The zero option relates exclusively to the SMR ETE Project. It therefore in no way implies the operation or preparation of other nuclear installations at or outside the Temelín site, for example at the Dukovany site.

The power-generating unit includes all necessary structures and technological equipment of the primary, secondary, and tertiary (cooling) circuits and auxiliary structures and operations, including all related and induced investments required for Project construction and operation.

The area for siting the power units and associated structures and operations is delineated in the drawing in Annex 1.1 to this Documentation.

Electric connection:	electric power transmission:	overhead 400 kV line
	backup power supply for own consumption:	overhead/underground 110 kV line

The electrical connection includes all components necessary for the construction and operation of the Project's connection to the Czech electricity system. The Project's electrical output is to be evacuated to the Kočín transformer station, and backup power for own consumption will be supplied from the Kočín transformer station.

The corridor for the electrical connection is delineated graphically in Annex 1.1 to this Documentation.

Water system connection:	water supply:	underground pipe mains
	waste water discharge:	underground pipe mains
	stormwater discharge:	underground pipe main, extension of existing infrastructure

The water-management connection includes all water-management facilities necessary to supply the Project with raw water and potable water and to discharge sanitary and process wastewater and stormwater.

Raw water will be supplied through the existing raw water supply system for ETE1,2 from the Hněvkovice Reservoir on the Vltava River.

The potable water supply will be provided by connection to the existing potable water supply system.

Treated sanitary and process wastewater will be discharged by connecting to the existing infrastructure of ETE1,2, including final discharge via the Kořensko water-management facility into the Vltava River.

Stormwater will be discharged by connecting to the existing storm sewer network that conveys stormwater from the ETE1,2 site to the Strouha receiving watercourse and onward to the Vltava River. Some stormwater will be discharged through a separate dedicated stormwater drainage network to Dvorčice Pond and onward to Dvorčický Stream.

The Project also includes areas and facilities for construction, i.e., the main construction site and construction site facilities, including areas considered for expanding the construction site support facilities and temporary construction site facility areas, comprising all elements required by the Project contractors during building or construction work, excluding public infrastructure. The areas for siting the construction site facilities are delineated graphically in Annex 1.1 to this Documentation.

The Rolls-Royce product (RR SMR) has been selected as the reference project; its technical and safety features are described in the publicly available *Environment, Safety, Security and Safeguards Case Version 3, Tier 1*[1].

B.I.6.2. General

This chapter describes generally applicable information and requirements relating to nuclear energy and nuclear power plants with LWRs (PWRs or BWRs).

B.I.6.2.1. Basic information on nuclear power plants

B.I.6.2.1.1. Nuclear energy

Energy is the capacity to perform work over a certain period of time. Electricity is used to a significant extent to perform work. In essence, it is a decentralized source of energy: it is generated through the interaction of many generating facilities, consumed at a location other than where it is generated, and can be consumed across a relatively broad output range wherever a distribution network is available. It is environmentally clean at the point of final consumption, because its use produces no pollutants, and it has universal applications because it can be converted into other forms of energy. The functioning of all sectors of the economy and the living conditions of the population depend on the availability of electricity; any shortages or disruptions in the electricity supply affect society as a whole and may have serious consequences.

However, electricity is not a primary energy source and does not arise by itself in a usable form. It must be generated, transmitted to the point of final consumption, and consumed at the same time. In essence, electricity therefore serves merely as a transmission medium, or "conveyor belt", transferring energy between the place of generation and the place of consumption.

In most cases, electricity is generated using electrical generators that convert mechanical energy into electrical energy by excitation based on the principle of electromagnetic induction[2]. The source of mechanical energy is usually a turbine driven by various media (pressurized steam in thermal power plants, water in hydroelectric power plants, and wind in wind power plants). Pressurized steam for the turbine is produced using thermal energy contained in primary energy sources (coal, gas, nuclear fuel, etc.).

The principle of electricity generation at a nuclear power plant is the same as at any other thermal (steam) power plant. In simplified terms, it can be described by the following chain, with nuclear power plant components shown in italics:

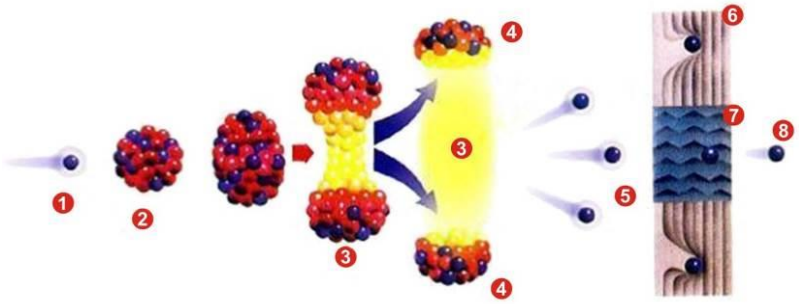
[1] The Rolls-Royce "E3S Case" documentation is available at https://gda.rolls-royce-smr.com/documents.

[2] Another possible method of generating electricity is to use the photoelectric effect in photovoltaic cells.

- primary energy source - fuel (coal, oil, gas, *nuclear fuel*, geothermal energy, etc.),
- use of fuel to generate thermal energy (coal-fired boiler, burners, *nuclear reactor*, etc.),
- use of thermal energy to generate steam (boiler, *steam generator*, etc.),
- use of steam to generate kinetic energy (*turbine*),
- use of kinetic energy to generate electricity (*electrical generator*).

The basic component of nuclear power plants is the *nuclear reactor*, in which the energy contained in *nuclear fuel* is released through a nuclear reaction that produces heat. This heat is subsequently used for steam generation. Nuclear reactors currently available worldwide use exclusively the nuclear fission reaction[1]. The principle of the fission reaction is shown in the following figure.

Fig. B.7: Schematic representation of the fission reaction



1	Slow neutron	**5**	Fast neutrons
2	Uranium ^{235}U nucleus	**6**	Absorber
3	Fission with heat release	**7**	Moderator
4	Fission products	**8**	Slow neutron

A nuclear fission reaction consists of splitting an atomic nucleus, typically a uranium-235 nucleus, using a slow, or thermal, neutron. During fission, the nucleus usually divides into two fragments. Part of its binding energy is released as heat, which is subsequently used to generate steam, while usually two or three additional neutrons are released. These neutrons can split other nuclei, which is why the reaction is called a chain reaction. When nuclear energy is used to generate power, the process is controlled so that one neutron released by fission is always slowed and causes another U-235 nuclear fission reaction. In this case, the fission reaction proceeds at a steady rate because the number of fissions per unit of time neither increases nor decreases. The other neutrons released during fission are absorbed in the materials of the reactor core. The intensity of the fission chain reaction is controlled by changes in the geometry and composition of the reactor core materials in which neutrons are captured; this is used to change reactor output or shut down the reactor completely.

Nuclear fuel is used in the reactor as the source of fissile material. The *reactor core* is the part of the reactor comprising the *fuel assemblies* in which a controlled fission chain reaction takes place. A *moderator* is used to slow the neutrons, an *absorber* to absorb them, and a *coolant* to remove heat from the core.

Light water reactors (LWRs) are the most widespread type of nuclear reactor in the world. An LWR is a heterogeneous thermal reactor with solid nuclear fuel that operates using thermal neutrons. Light water is used as the neutron moderator and also serves as the coolant.

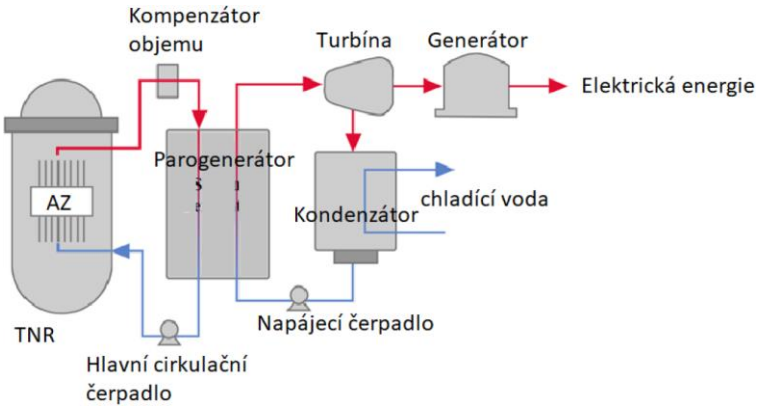
Light water reactors are further divided into:

- pressurized water reactors (PWRs) and
- boiling water reactors (BWRs).

Pressurized water reactors (PWRs): Pressurized water reactors are nuclear reactors cooled and moderated by light water at high pressure. The water circulates in the primary circuit from the reactor core to the steam generator, where it transfers thermal energy to the secondary circuit. The water in the secondary circuit is converted into steam by the heat and drives the turbine and its connected electrical generator to generate electricity.

[1] The use of the nuclear fusion reaction is the subject of research.

Fig. B.8: Diagram of a typical PWR



Source: Types of Nuclear Reactors (atomicarchive.com)

Kompenzátor objemu	Pressurizer
Turbína	Turbine
Generátor	Generator
Elektrická energie	Electricity
Parogenerátor	Steam generator
Kondenzátor	Condenser
chladící voda	Cooling water
TNR	TNR
Hlavní cirkulační čerpadlo	Reactor coolant pump
Napájecí čerpadlo	Feedwater pump

Basic advantages of PWRs:

- very low sensitivity to changes in coolant temperature,
- the turbine is separated from the primary circuit, is not contaminated, and does not require shielding,
- control rod assemblies are inserted from above, enabling passive, gravity-driven reactor shutdown even without electrical power,
- the largest number of reactors in operation, providing the most extensive operating experience,
- boric acid is commonly used as a component of the primary circuit coolant, particularly in large PWR units, providing a more uniform power distribution in the reactor core.

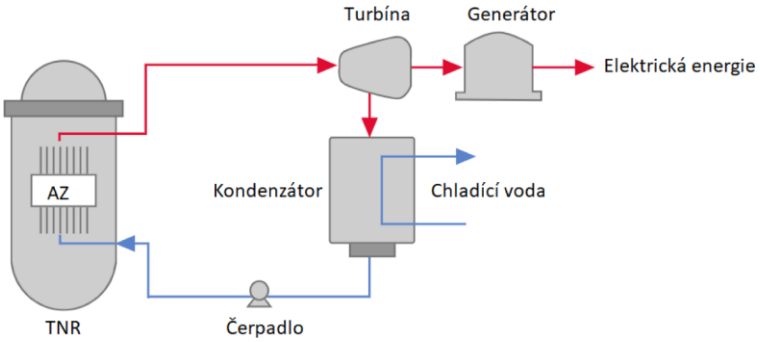
Other characteristics of PWRs:

- high coolant pressure, placing greater demands on materials and fuel,
- high core power density, requiring the reactor pressure vessel to be shielded against embrittlement,
- boric acid is commonly used in the primary circuit coolant for reactivity control, particularly in large PWR units, resulting in a more corrosive environment, increased tritium production, and greater demands on primary circuit chemistry control and material selection,
- water radiolysis and, under potential accident conditions involving loss of cooling and overheating of the fuel assemblies, the reaction between steam and the zirconium fuel cladding produce hydrogen, which must subsequently be recombined.

The reference reactor type for SMR ETE (RR SMR) is a pressurized water reactor (PWR).

Boiling water reactors (BWRs): Boiling water reactors are also nuclear reactors cooled and moderated by light water. The main difference from a PWR is that the cooling water in the reactor core is heated at a lower pressure than in a PWR and turns into steam, meaning that the reactor also performs the function of a steam generator. The steam produced then flows directly to the steam turbine, where the connected electrical generator generates electricity.

Fig. B.9: Diagram of a typical BWR



Source: Types of Nuclear Reactors (atomicarchive.com)

Turbína	Turbine
Generátor	Generator
Elektrická energie	Electricity
Kondenzátor	Condenser
Chladící voda	Cooling water
TNR	TNR
Čerpadlo	Pump

Basic advantages of BWRs:

- operation at lower pressure and temperature, reducing the risk of a loss-of-coolant accident and placing lower demands on the materials and fuel used,
- typically a single-circuit design with fewer components, making it less expensive and simpler,
- the coolant does not contain boric acid during normal operation, simplifying primary circuit material selection and chemistry control and reducing tritium production,
- lower core power density than in a PWR, resulting in a longer reactor vessel service life,
- more robust residual heat removal,
- a large negative reactivity temperature coefficient due to boiling in the reactor,
- control rod assemblies are usually inserted from below, allowing fuel to be added during an outage without disconnecting their drives.

Other characteristics of BWRs:

- Two-phase flow in the reactor, resulting in more complex reactor core design calculations and greater demands on instrumentation,
- lower core power density than in a PWR, requiring a larger reactor vessel for the same output,
- the turbine and condensate and feedwater systems are contaminated by radionuclides and therefore require continuous shielding,
- control rod assemblies inserted from below, preventing the use of gravity for emergency insertion,
- lower output stability than PWRs, placing greater demands on operators,
- higher plutonium production in spent nuclear fuel than in a PWR.

Nuclear power plants with LWRs, whether PWRs or BWRs, use low-enriched uranium as nuclear fuel, in which enrichment locally increases the concentration of the uranium isotope U-235. The basic element in which heat is released in the reactor is called a *fuel rod*. It consists of uranium dioxide (UO_2) pellets enclosed in a zirconium tube. Fuel rods are arranged into *fuel assemblies*, which are inserted as a whole into the reactor core.

In PWR technology, demineralized water with controlled chemistry is used as the coolant. The water simultaneously serves as the neutron moderator and removes heat from the reactor core. As it passes through the reactor, the coolant is heated and enters several cooling loops in which it is circulated by reactor coolant pumps. It passes through the primary side of the steam generators, where it transfers part of its thermal energy through the heat-transfer surface to the secondary side, and then returns to the reactor. This cooling circuit is called the *primary circuit*. In this circuit, including the reactor, the cooling water is maintained at high pressure so that it remains liquid even at temperatures of approximately 320 to 330 °C, hence the term pressurized water reactor. In the steam generators, which function as heat exchangers, heat from the primary circuit is used to heat the water in the *secondary circuit*. On the secondary side of the steam generators, the water in this circuit is converted into pressurized steam. It is conveyed to the *turbine*, which it rotates as it passes through and expands. After transferring its energy, the steam condenses back into water in the condenser, and the condensate is pumped back to the steam generator.

BWR technology also uses demineralized water with controlled chemistry as the coolant and moderator. The main difference is that in BWR technology the reactor also serves as the steam generator; this technology uses the properties of water at a lower pressure than in a PWR, approximately 7.5 MPa at a temperature of 285 °C. As the water passes through the reactor core, it boils and changes phase into steam. The steam leaving the reactor pressure vessel then flows through one or more loops directly to the steam turbine. Downstream of the steam turbine is a condenser in which the steam condenses into cooling water; condensate and feedwater pumps then return it to the reactor.

In both PWRs and BWRs, the rotational energy of the turbine drives an *electrical generator*, and the electricity generated is evacuated to the electricity system.

In both PWRs and BWRs, a *tertiary (cooling) circuit* is used to condense steam in the condenser; the cooling water circulates through cooling towers or another ultimate heat sink, such as a river or the sea. Unusable low-grade heat is released from these systems into the atmosphere or the surrounding aquatic environment. Losses of tertiary-circuit water, primarily through evaporation, are replenished with treated raw water from a suitable source, which for SMR ETE is the Vltava River.

Given the safety requirements for nuclear power plants, the principal reactor equipment is located within the *containment*, whose primary safety function is to prevent the release of radioactive substances into the environment in the event of an accident. The containment combines the functions of a leaktight space that prevents hazardous substances from escaping into the external environment and mechanical protection of the reactor against external hazards of natural or human-induced origin. The containment provides radiation shielding during both normal operation and an accident. The containment structure therefore helps protect plant personnel and the public against radiation from radioactive substances present within the containment and its systems. PWR containment is usually a single- or double-wall structure made of prestressed or reinforced concrete, or steel. Its geometry is usually spherical or cylindrical, connected to the basemat at the bottom and terminated by a spherical or ellipsoidal dome at the top. The internal arrangement of BWR containment differs in design. It consists of a drywell and a wetwell. The reactor and reactor cooling systems are located in the containment drywell. The drywell collects steam released under accident conditions, thereby pressurizing the containment. Vent piping carries steam from the drywell to the wetwell and discharges it below the surface of the water present there, condensing the steam and reducing containment pressure. Both sections are housed within the secondary containment. Containment is subject to extremely stringent quality requirements and, in addition to protection against internal hazards, also provides protection against external hazards such as extreme meteorological conditions or the consequences of human activities, including pressure waves and aircraft crashes.

B.I.6.2.1.2. Statistical information on nuclear power plants

At present, according to World Nuclear Association data from August 2026, 441 operable nuclear power reactors, including 382 LWRs, are located in 32 countries worldwide, with a total net installed electrical capacity of more than 404 GW_e. In 2024, nuclear power plants generated more than 2,667 TWh of electricity, representing approximately 9 % of global electricity generation.

A total of 79 additional units are currently under construction in 16 countries. Pressurized water reactors (PWRs) account for more than 85 % of all units under construction. These include, in particular, the Chinese Hualong One and CAP1000 designs, the Russian VVER-1200, the South Korean APR-1400, and the European EPR. Other types under construction include PHWRs, FBRs, and SMRs, both PWRs and BWRs.

As of August 2026, four new reactors had been commissioned in 2026, all Hualong One PWRs in China. As of August 2026, construction had begun on nine new reactors in 2026: six PWRs, two PHWRs, and one BWR, comprising three PWRs in China, two PHWRs in India, one PWR in South Korea, one PWR in Russia, one PWR in Hungary, and one BWR in Canada (BWRX-300).

The first RR SMR reference project is expected to be commissioned at the Wylfa site in the United Kingdom, on the island of Anglesey in North Wales. Three RR SMR units are planned for the Wylfa site, and the power plant will have a capacity of approximately 1.5 gigawatts (GW). Great British Energy - Nuclear, a British government organization, confirmed the selection of the site, which previously hosted a nuclear power plant, in 2025.

The commissioning of new nuclear units is accompanied by the gradual shutdown of older nuclear power plants. Over the past 20 years, 111 reactors have been shut down and 101 new reactors have entered operation. However, the average capacity of reactors commissioned during this period was greater than that of the reactors shut down, so total installed nuclear power plant capacity increased by approximately 21 GW_e.

The reference scenario in the 2025 edition of The Nuclear Fuel Report (World Nuclear Association) anticipates an increase in installed nuclear power plant capacity from the current level of just under 400 GW_e to 746 GW_e by 2040, nearly doubling it.

B.I.6.2.1.3. Generations of nuclear reactor technology

The generation of electricity from energy released by the fission of uranium and other suitable isotopes has a history of nearly 80 years since the first demonstration power plants were commissioned. The nuclear reactor technology used in commercial nuclear power plants is usually categorized according to its level of technological development into categories known as generations.

The basic general characteristics of the individual generations are as follows:

Generation I: Generation I includes reactors designed between 1950 and 1960. This generation included, for example, the first Czechoslovak nuclear power plant, A1 at Jaslovské Bohunice in Slovakia. The last reactor of this generation in operation was Unit 1 of the Wylfa Nuclear Power Plant in the United Kingdom, which ceased operation in 2015.

Generation II: The design and construction of nuclear power plants with Generation II reactors began in the 1970s. Nuclear power plants with Generation II reactors currently account for the largest share of electricity generation by nuclear power plants. Pressurized water reactors (PWRs) account for more than half of these power plants. This generation also includes VVERs, the original Russian designation for PWRs, built and operated in the former Czechoslovakia and its successor states, the Czech Republic and the Slovak Republic. Compared with Generation I reactors, plants with Generation II reactors are at a significantly higher standard, particularly in terms of safety systems.

Generation III: Generation III includes reactors designed since the 1990s. These designs, which build on proven experience gained in the construction and operation of Generation II reactors, use the best available technology. The improvements focus on more efficient use of nuclear fuel, higher thermal efficiency, and standardized designs intended to shorten construction time and reduce operation and maintenance requirements throughout the operating period. The safety characteristics of Generation III reactors include, for example, more extensive use of passive features in safety system design, robust containment with increased resistance to external hazards, and specific systems designed to manage severe accidents.

Generation III+: In terms of development, Generation III+ directly follows Generation III reactors. Designs of this generation offer both improved economic indicators, through a simplified standardized design intended to shorten future implementation times and reduce construction and operating costs for subsequent replications of nuclear units of the same type, and other significant safety benefits through implementation of the latest safety requirements and operating experience, as well as lower radioactive waste production. This generation also includes reactors built and commissioned in recent years, such as the EPR (Finland, China), AP1000 (China, United States), Hualong One (China), APR1400 (United Arab Emirates, South Korea), VVER-1200/392M and VVER-1200/491 (Russia, Belarus), and PHWR-700 (India). This generation also includes selected SMR designs considered for SMR ETE.

Generation IV: Generation IV designs remain under development along several different conceptual paths. These are mostly fast-neutron reactors with a closed fuel cycle, enabling more efficient use of nuclear fuel while reducing the amount of radioactive waste. However, this generation also includes some technologies using thermal neutrons and an open fuel cycle. An HTR-PM demonstration reactor has been operating in China since 2021. It is a 210 MW_e SMR and the first Generation IV reactor. It entered commercial operation in 2023.

B.I.6.2.1.4. Safety and economic characteristics of Generation III/III+ LWRs

Generation III/III+ designs use the best available technologies based on proven Generation II types. The main differences compared with Generation II are as follows:

- a standardized design that reduces the time required to license individual power plants, the necessary investment costs, and the construction period,
- a simplified but more robust design enabling easier operation and greater operating margins,
- higher availability (90 % or more), higher net efficiency (up to 37 %), and a longer service life (at least 60 years),
- lower risk of accidents involving severe core damage (CDF $<10^{-5}$/year),
- passive safety systems for preventing and mitigating the consequences of severe accidents,
- higher fuel burnup (greater utilization of up to 70 GWd/tU) and a reduction in the amount of radioactive waste produced,
- longer intervals between refueling outages and fuel replacement through the use of burnable absorbers, up to 48 months,
- improved operating economics,
- a passive emergency reactor shutdown system; in PWRs, the control rods are held in their upper position by electromagnets and, when necessary, are inserted into the reactor core by gravity, safely stopping the fission chain reaction,
- improved containment and increased resistance to external hazards.

They also offer the general advantages of PWRs:

- fission reaction stability due to negative power feedback, which counteracts a rapid increase in reactivity,
- separation of the primary and secondary circuits; the secondary circuit is separated from the primary circuit, so the water in the secondary circuit contains no radioactive substances, reducing the potential for radionuclide releases into the environment,

or the general advantages of BWRs:

- an improved emergency core cooling system through an increased number of independent safety system divisions and increased capacity,
- improved reactor pressure vessel overpressure protection through an increased number of valves in the automatic reactor depressurization system.

B.I.6.2.1.5. Small modular reactors

Small modular reactors (SMRs) are new Generation III+ or potentially Generation IV nuclear reactor designs whose electrical output ranges from single-digit values to hundreds of MW_e. They use a broad range of reactor technologies and a modular approach to designing key components and systems. The modular approach to design, manufacturing, and construction means that individual structural modules are manufactured and assembled separately at manufacturing plants, transported to the construction site in that form, and then installed and assembled into larger units.

SMRs generally have an electrical output of up to 300 MW_e, or up to 500 MW_e for modern designs that are classified as SMRs because they follow the principle of modular manufacturing and have a substantially lower electrical output than large nuclear units, which commonly have an output of 1,000–1,700 MW_e. The designation SMR therefore describes not only the size and output, but above all the modular method of manufacturing and construction. Compared with conventional nuclear power plants, SMRs are smaller and more flexible, and they may be constructed more quickly. Compared with existing large reactors, small modular reactors are generally simpler, and their safety concept often relies more heavily on passive systems and inherent reactor safety characteristics. They therefore represent a promising direction for the development of nuclear energy.

B.I.6.2.2. Basic requirements for nuclear power plants

B.I.6.2.2.1. General requirements

The SMR ETE Project is subject to all binding legal regulations applicable in the Czech Republic, particularly those governing the use of nuclear energy and environmental protection. A basic overview of the legal regulations is provided in Chapter D.V.3.3. Legislative source documents (page 491 of this Documentation). At the same time, the SMR ETE Project will use proven technologies, reflect the current state of science and technology, and employ the best available techniques (BAT).

The Project is specific in its use of nuclear energy. The principal legal regulation governing the conditions for the use of nuclear energy is Act No. 263/2016 Coll., the Atomic Act, as amended. Under this Act, nuclear energy may be used only for peaceful purposes. The principles governing the peaceful use of nuclear energy and ionizing radiation can be summarized as follows:

- Anyone who uses nuclear energy or performs activities in exposure situations is required to:
  - prevent a radiation extraordinary event and, if one occurs, ensure compliance with radiation extraordinary event management procedures and mitigate its consequences,
  - ensure that these activities are performed safely and that individuals and the environment are protected from the effects of ionizing radiation; and
  - act so that the risk to individuals and the environment is as low as reasonably achievable, taking into account the current state of science and technology and all economic and social considerations.
- Anyone who uses nuclear energy, handles a nuclear item, or performs activities in exposure situations is required to:
  - give priority to ensuring nuclear safety, the safety of nuclear items, and radiation protection, while respecting the current state of science and technology and good practice,
  - assess the project to perform an activity and its expected results in terms of its benefits to society and individuals (hereinafter "justification"),
  - as part of the justification, also consider methods that do not use nuclear energy and ionizing radiation and that can achieve a comparable result,
  - perform only an activity whose benefit to society and individuals outweighs the risk arising during or as a result of that activity; such an activity is considered justified; and
  - reassess the justification for their actions if new and important information becomes available on the effectiveness or possible consequences of the activity performed, or new and important information on other technical procedures or technologies becomes available.
- Anyone who uses nuclear energy or performs activities in exposure situations is required to:
  - upon obtaining new significant information on the risks and consequences of these activities, assess the level of nuclear safety, radiation protection, technical safety, radiation extraordinary event management, and security, and adopt measures to meet the requirements of the Act; and
  - continuously and comprehensively assess compliance with the principles of the peaceful use of nuclear energy and ionizing radiation in light of the current state of science and technology, and ensure that the assessment results are applied in practice.
- Anyone who uses nuclear energy, performs activities involving nuclear material, or performs activities in exposure situations is required to ensure the security of the nuclear installation and nuclear materials.
- Anyone who uses nuclear energy is required, when ensuring nuclear safety, radiation protection, technical safety, radiation monitoring, radiation extraordinary event management, and the security of the nuclear installation and materials, to collect, classify, analyze, document, and use experience and safety-significant information through an experience-feedback system, and to take into account the significance of interactions among personnel, equipment, and organizational arrangements.

- When ensuring nuclear safety, radiation protection, technical safety, radiation situation monitoring, radiation extraordinary event management, and the security of nuclear installations and nuclear materials, every person using nuclear energy or carrying out activities in exposure situations must apply an approach graded according to the magnitude of potential exposure and its possible consequences (graded approach).

The method of ensuring and verifying compliance with these conditions is specified in the Act and its implementing decrees, which are consistent with international safety standards.

Basic information on nuclear safety, radiation protection, security, and radiation extraordinary event management requirements is provided below.

B.I.6.2.2.2. Requirements for nuclear safety

For the purposes of Act No. 263/2016 Coll., the Atomic Act, as amended, nuclear safety means the *"state and capability of a nuclear installation and of natural persons operating the nuclear installation to prevent an uncontrolled development of a fission chain reaction or the release of radioactive substances or ionizing radiation into the environment and to mitigate the consequences of accidents"*.

The conditions for the peaceful use of nuclear energy in the Czech Republic are established by the above-mentioned Atomic Act, which defines the conditions and obligations under which legal and natural persons may use nuclear energy and establishes the obligation to exercise nuclear safety supervision. This supervision is exercised by the State Office for Nuclear Safety (SÚJB).

The future operator must obtain permits specifically for the siting, construction, commissioning, and operation of the nuclear power plant, as well as for its decommissioning. The content and scope of the documentation for licensing proceedings that will be assessed during the permit-issuing process are defined in the annex to the Atomic Act and in the SÚJB implementing decrees. At each assessment stage before the applicable permit is issued under the Atomic Act ("licensing"), the operator must submit documentation containing a safety assessment confirming the required safety level, prepared in a level of detail corresponding to the current stage of preparation of the nuclear power plant project.

Detailed nuclear safety requirements whose fulfillment must be documented and verified during licensing are specified in binding decrees issued by SÚJB, particularly Decree No. 329/2017 Coll. SÚJB decrees are amended and harmonized with the safety recommendations of the Western European Nuclear Regulators Association (WENRA), the requirements of European Atomic Energy Community (Euratom) regulations, and the nuclear safety recommendations issued by the IAEA in its Safety Standards Series. Before they are issued, these decrees are also submitted to EU Member States for comment in accordance with European Commission rules.

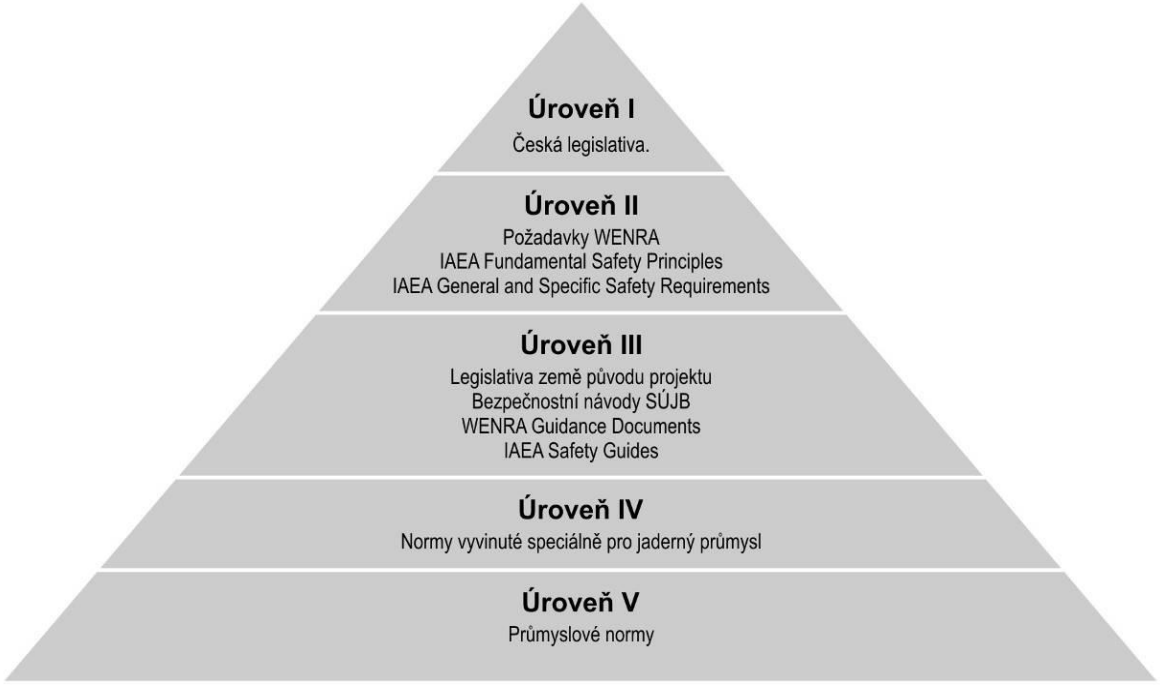
The IAEA Safety Standards serve as a global reference for protecting the public and the environment and contribute to a harmonized high level of safety worldwide. Through two working groups, the Reactor Harmonization Working Group (RHWG) and the Working Group on Waste and Decommissioning (WGWD), WENRA issues reference levels, or safety requirements, and assesses the current status of their implementation in WENRA member countries.

In addition to decrees, the State Office for Nuclear Safety issues safety guides (a series of documents designated BN-JB), which contain recommendations on how to properly comply with the requirements of the decrees. When the BN-JB guides are prepared, use is made of relevant guidance issued by WENRA or the IAEA (Safety Guides), as well as proven experience from the approaches of reputable countries that have long used nuclear energy.

The conclusions drawn from analysis of the Fukushima Nuclear Power Plant radiation accident will also be applied as essential safety enhancement requirements in the SMR ETE design. These conclusions are currently reflected in WENRA and IAEA safety standards and, in the EU, also arise from the stress tests. They include greater resistance to external hazards such as earthquakes and flooding, greater autonomy, increased redundancy and reliability of safety systems for managing design basis accidents, the use of diverse alternative means for managing multiple failures and severe accidents, and the option of using mobile equipment to perform safety functions in extreme situations.

The hierarchy of requirements that SMR ETE must generally meet is shown in the following figure.

Fig. B.10: Hierarchy of regulations and standards



Úroveň I	Level I
Česká legislativa	Czech legislation
Úroveň II	Level II
Požadavky WENRA	WENRA requirements
Úroveň III	Level III
Legislativa země původu projektu	Legislation of the country of design origin
Bezpečnostní návody SÚJB	SÚJB safety guides
Úroveň IV	Level IV
Normy vyvinuté speciálně pro jaderný průmysl	Standards developed specifically for the nuclear industry
Úroveň V	Level V
Průmyslové normy	Industrial standards

Level I: The first level contains the requirements arising from all relevant acts, particularly the Atomic Act, decrees, particularly decrees of the State Office for Nuclear Safety, and Government Regulations of the Czech Republic relating to activities associated with the use of nuclear energy, including the siting, construction, commissioning, operation, and decommissioning of a nuclear power plant.

This level also includes the requirements of European Union directives relating to the use of nuclear energy that have been transposed into Czech legislation.

The requirements of Level I regulations will be fully binding on the SMR ETE design.

Level II: The second level includes generally accepted international documents that define the basic requirements for nuclear safety:

WENRA documents contain recommendations for ensuring nuclear safety at both operating and planned nuclear power plants in WENRA member countries, including the Czech Republic. In particular, the documents are WENRA Safety Reference Levels for Existing Reactors, WENRA Statement on Safety Objectives for New Nuclear Power Plants, and WENRA RHWG Report on Safety of New NPP Designs.

The IAEA Fundamental Safety Principles (SF-1) document defines the fundamental safety objective for the use of nuclear energy as protecting people and the environment from the harmful effects of ionizing radiation and further elaborates it into more detailed objectives and principles for ensuring nuclear safety. The safety objectives defined in IAEA SF-1 are elaborated into a comprehensive system of internationally recognized requirements and guides addressing the safe use of nuclear energy that the IAEA issues and maintains in its Safety Standards and Safety Requirements series. These may be further specified, for example, as specific to different types of nuclear installations or as general.

The IAEA General Safety Requirements documents directly build on the above document and define the above objectives and principles in greater detail for legislation and regulatory oversight, safety management, radiation protection, safety assessment, radiation extraordinary event management, and radioactive waste management.

The IAEA Specific Safety Requirements documents contain specific requirements for evaluating a nuclear power plant site, nuclear power plant design and operation, nuclear fuel, and the transport of nuclear materials. It is a comprehensive system of internationally recognized requirements and guides, focused on safe utilization of nuclear energy.

The requirements of Level II regulations will be fully binding on the SMR ETE design.

Level III: The third level of requirements for nuclear safety comprises the safety requirements applicable in the design's country of origin. These requirements will also be binding on the SMR ETE design if they are consistent with higher-level documents and are incorporated into the nuclear installation quality requirements approved by SÚJB or become part of the licensing basis for the SMR ETE design.

This level also includes SÚJB safety guides, WENRA Guidance Documents, and IAEA safety recommendations, specifically the Safety Guides in the IAEA Safety Standards series, which also contain detailed recommendations for ensuring nuclear safety.

Level IV: The fourth level of requirements comprises a set of codes and standards, including national standards, standards used in the licensing process in the country of origin, and internationally recognized nuclear codes and standards such as ISO, EN, IEC, and IEEE standards.

At the supplier's discretion, any proven and internationally recognized system of technical codes and standards may be used in power plant design, equipment supply, and construction, provided it does not conflict with existing Czech legislation. This system must be consistent, clearly defined in advance by the supplier, and approved by both the permit applicant and SÚJB. Wherever possible and reasonable, the Czech and European standards will be preferred.

Level V: The fifth level consists of applicable industry standards, particularly standards harmonized in Europe (the so-called Euronorms).

The selected technology supplier will provide its standard design, so the design will be modified only where stricter requirements imposed by Czech legislation apply or where modifications are necessary to integrate the design into the Temelín site. A licensing basis defining all applicable codes and standards and their scope of application will be prepared as part of the SMR ETE design. The codes and standards defined in Levels I and II of the above hierarchy will be binding on the entire design; the remaining codes and standards will be binding on the design of selected systems, structures, and components in accordance with the licensing basis.

Requirements arising from the relevant regulations will relate not only to the regulations applicable at the time of nuclear power plant preparation, design, and construction, but will also reflect and incorporate any new requirements for nuclear safety, radiation protection, the security of nuclear installations and nuclear materials, and radiation extraordinary event management at any stage of the plant's life cycle. Periodic safety reviews conducted pursuant to Decree No. 162/2017 Coll., as amended, will continuously take account of safety objectives and requirements arising from current Czech legislation and international regulations, particularly EU regulations and WENRA and IAEA recommendations, as well as industry-standard requirements reflecting the development of the best available technology, including lessons learned from any abnormal operating events or accident conditions at nuclear installations in the Czech Republic and worldwide. The statutory safety requirements will then be elaborated in detail in the siting, preliminary and operational safety analysis reports as part of the relevant licensing processes, including the siting permit, construction permit, commissioning, and operation.

Nuclear safety must be ensured throughout the service life of SMR ETE, both in all operational states and in the event of accident conditions (design basis accidents and design extension conditions, including severe accidents), exceptional natural events and human-induced events (including an aircraft crash). Requirements for nuclear safety apply to the entire nuclear installation, including the irradiated/spent nuclear fuel storage pool.

An important principle that will be applied to the SMR ETE Project is defense in depth. The concept of defense in depth in nuclear power plants is based on the use of multiple physical barriers that prevent radioactive substances from being released into the surroundings. The integrity of these barriers is maintained by a system of technical and organizational measures arranged in five levels and designed to be independent of one another to the maximum reasonably achievable extent through the use of specific systems for each level of defense in depth. If measures at one level fail, measures at the next level take effect. The application of defense in depth ensures that even multiple equipment or personnel failures do not endanger the public or the environment.

The use of the defense-in-depth concept is one of the requirements of SÚJB Decree No. 329/2017 Coll., on Nuclear Installation Design Requirements, particularly Sections 6 and 7. The approach to defense in depth under Czech legislation is identical to the IAEA approach (SSR-2/1 Rev. 1) and the WENRA approach (WENRA Report Safety of New NPP Designs). Defense in depth will ensure nuclear safety, radiation protection, radiation situation monitoring, radiation extraordinary event management, and nuclear installation security at SMR ETE. Defense in

depth is a fundamental safety principle and philosophy currently applied to nuclear installations and encompasses all activities associated with siting, design, construction, commissioning, operation, and decommissioning. Defense-in-depth has two key functions:

- Accident prevention.
- Mitigation of accident consequences.

The application of defense-in-depth requirements will ensure the following for all activities associated with the use of nuclear energy at SMR ETE:

- Establishment of a series of redundant physical safety barriers between radioactive substances and the surroundings of the nuclear installation.
- Systems, structures, components, and procedures for performing safety functions to protect the integrity and functionality of physical safety barriers at each level of defense in depth.
- Prevention of a radiation extraordinary event by means of physical safety barriers.

Implementation of defense in depth in the SMR ETE design will ensure that no single technical, human, or organizational failure can result in significant harmful effects and that combinations of failures with potentially significant effects have a very low probability.

The technical and organizational levels of defense in depth are as follows:

First level of defense (DiD 1): The objective of the first level of defense is to prevent deviations from normal operation and failures of plant equipment and systems. This requires the plant to be designed, sited, constructed, maintained, operated, and shut down in accordance with the applicable reliability and quality requirements and good engineering practice.

Second level of defense (DiD 2): The objective of the second level of defense is to detect and control deviations from normal operation so that failures and other anticipated operational occurrences do not allow abnormal operation to develop into accident conditions. Failures or abnormal operating events include events associated with a reduction or loss of plant output, such as the failure of operating pumps, turbine-generator trips, outages of less important electrical substations, and similar events. At the second level of defense, the design must include specific control and limitation systems to prevent abnormal operation and failures or minimize their consequences in order to restore the facility to a safe state. These systems regulate unit output or other significant parameters such as pressure, temperature, and flow, or limit reactor output through a limitation system that does not completely shut down the reactor.

Third level of defense (DiD 3 a, b): The third level of defense in depth addresses the management of accident conditions. Under Decree No. 329/2017 Coll., accident conditions comprise all nuclear installation states that are not a normal operational state (DiD 1) or an abnormal operational state (DiD 2). Under WENRA recommendations, the third level of defense in depth is divided into two sublevels. The first sublevel (DiD 3a) comprises means for managing design basis accidents (DBAs), such as events involving a loss of primary coolant due to a breach of the integrity of the primary circuit or piping connected to the primary piping; a breach of the heat-transfer surface in a steam generator and leakage of primary coolant into the secondary circuit; rupture of a steam line or feedwater line; failure of several or all primary circuit reactor coolant pumps; or loss of the plant's normal and backup electrical power sources. If certain events not managed at DiD 3a escalate, or if multiple postulated failures occur under design extension conditions without fuel melting, such as a primary coolant leak combined with the failure of all safety system divisions due to a common-cause failure, or a steam generator tube rupture followed by the failure of the relevant steam generator safety valve to close, sublevel DiD 3b is introduced. In the SMR ETE design, both DiD 3a and DiD 3b will be postulated as design basis accidents or multiple failures, and the following will be provided to manage them:

- For DiD 3a, design provisions, consisting of inherent safety characteristics and/or safety systems and procedures for managing accident conditions, that will prevent severe core damage, prevent radioactive releases to the external environment above permitted limits, and enable the facility to be brought to a safe state if postulated design basis accidents occur.
- For DiD 3b, design provisions, consisting of diverse safety systems and special procedures for managing serious events, that will prevent multiple failures from causing the SMR ETE state to develop in a manner that would lead to severe core damage.

Fourth level of defense (DiD 4): The objective of the fourth level of defense in depth is to mitigate the consequences of severe accidents resulting from the failure of safety systems or procedures used at the third level of defense in depth. The most important task at this level is to retain radioactive substances within the containment. The fourth level of defense in depth includes design provisions for managing severe accidents under design extension conditions (DEC), i.e., accidents involving severe damage to the fuel system through fuel melting. DiD 4 primarily focuses on maintaining containment integrity and leaktightness and cooling the severely damaged fuel system. For SMR ETE, the strategy will be in-vessel retention of the molten material in the reactor pressure vessel, and therefore within the second barrier against releases of radioactive substances into the environment. The containment thus remains an additional backup barrier against releases into the environment. SMR ETE core-melt accidents that could lead to early or large releases must be practically eliminated. Under Decree No. 329/2017 Coll., a practically eliminated

condition means a condition, state, or event whose occurrence is considered physically impossible or is highly unlikely with a high degree of confidence.

Fifth level of defense (DiD 5): The objective of the fifth level of defense in depth is to mitigate the radiological consequences of significant releases of radioactive substances that could occur under accident conditions if all previous DiD levels failed. Measures at this level include protecting nuclear installation workers, implementing protective measures for the public and the environment, and applying emergency response management procedures. Events at the fifth level of defense in depth are managed using appropriately equipped emergency response centers, including trained personnel, special procedures for crisis situations, and special mobile equipment for managing the situation. Events at DiD 5 would be managed in cooperation with external response units and state administrative authorities.

The following table describes the five levels of defense in depth under the WENRA recommendations (WENRA Report Safety of New NPP Designs, Study by the Reactor Harmonization Working Group (RHWG), March 2013).

Table B.2: Characteristics of the levels of defense in depth (DiD)

DiD level	Objective	Measures required for management	Radiation consequences	Associated plant states
DiD 1	Prevention of failures and abnormal operation	Conservative design, high construction and operating quality, and maintenance of basic operating parameters within the specified limits	No radiological impacts in the vicinity of the power plant	Normal operation
DiD 2	Management of abnormal operation and failures	Control and limitation systems and surveillance programs		Abnormal operation
DiD 3a	Accident management to limit radioactive releases and prevent severe accidents	Reactor protection system, safety systems, accident management	No radiological impacts or only negligible radiological consequences in the vicinity of the power plant	Design basis accident (DBA)
DiD 3b		Additional safety features, accident management		Multiple failure under design extension conditions (DEC-A)
DiD 4	Management of severe accidents to limit releases to the surroundings	Additional safety features to mitigate the consequences of core melt, severe accident management	Radiological consequences in the vicinity of the plant may lead to the declaration of protective measures limited in scope and duration	Severe accident under design extension conditions (DEC-B)
DiD 5	Mitigation of radiological consequences caused by significant releases of radioactive substances	Emergency response organization, intervention levels	Radiological effects in the vicinity of the power plant requiring the implementation of protective measures	-

In accordance with the defense-in-depth concept meeting the requirements of Decree No. 329/2017 Coll., the SMR ETE design will include physical barriers intended to prevent the release of radioactive substances into the external environment. In addition to the nuclear fuel material structure, which has high chemical stability and retention capacity that prevents the release of fission products, these barriers are as follows:

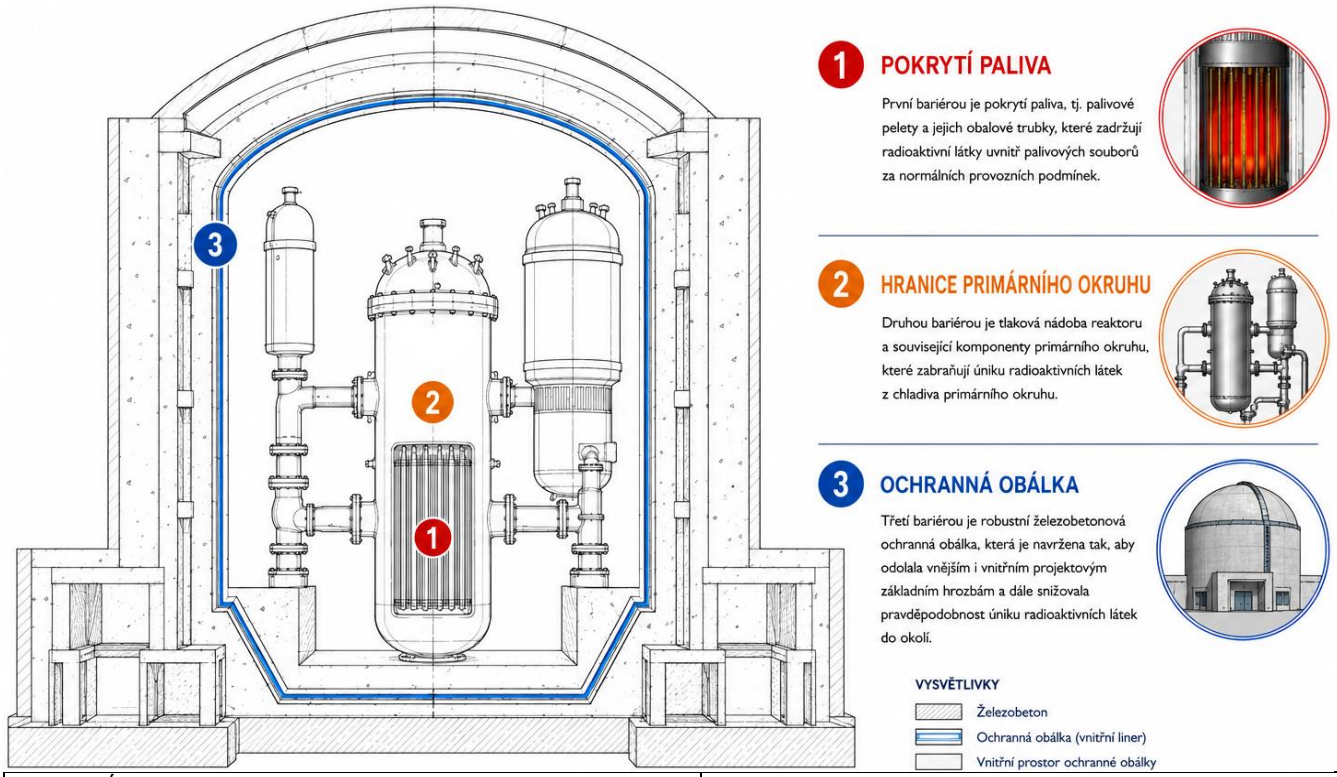
First barrier: Fuel element cladding.

Second barrier: Primary circuit pressure boundary.

Third barrier: Containment.

For the schematic representation of physical barriers in the PWR-reactor power plant design, see the following figure.

Fig. B.11: Illustrative diagram of multilevel protection



POKRYTÍ PALIVA	FUEL CLADDING
První bariérou je pokrytý paliva, tj. palivové palety a jejich obalové trubky, které zadržují radioaktivní látky uvnitř palivových souborů za normálních provozních podmínek.	The first barrier is the fuel cladding, i.e., the fuel pellets and their cladding tubes, which retain radioactive substances within the fuel assemblies under normal operating conditions.
HRANICE PRIMÁRNÍHO OKRUHU	PRIMARY CIRCUIT BOUNDARY
Druhou bariérou je tlaková nádoba reaktoru a související komponenty primárního okruhu, které zabraňují úniku radioaktivních látek z chladiva primárního okruhu.	The second barrier is the reactor pressure vessel and the associated primary circuit components, which prevent radioactive substances from escaping from the primary circuit coolant.
OCHRANNÁ OBÁLKA	CONTAINMENT
Třetí bariérou je robustní železobetonová ochranná obálka, která je navržena tak, aby odolala vnějším i vnitřním projektovým základním hrozbám a dále snižovala pravděpodobnost úniku radioaktivních látek do okolí.	The third barrier is a robust reinforced-concrete containment designed to withstand external and internal design-basis hazards and further reduce the probability of radioactive substances being released into the surroundings.
VYSVĚTLIVKY	LEGEND
Železobeton	Reinforced concrete
Ochranná obálka (vnitřní liner)	Containment (inner liner)
Vnitřní prostor ochranné obálky	Containment interior

The purpose of the physical barriers is to prevent radioactive material from progressively passing from its point of origin, the nuclear fuel, into the external environment. Each physical barrier is conservatively designed (with considerable design reserves against damage) and its condition is continuously monitored in operation. All barriers must maintain their integrity during normal operation and, in other plant states, to the extent necessary to meet the safety objectives. This will be demonstrated during the licensing processes under the Atomic Act.

The first barrier is the fuel element cladding, which is designed for radiation, mechanical, thermal-hydraulic, and cyclic material loading conditions. The barrier will be designed to maintain its integrity during normal and abnormal operation while minimizing damage under accident conditions. The nuclear fuel cladding will be required to maintain integrity and leaktightness throughout its residence in the reactor, approximately 5 years, throughout storage in spent nuclear fuel pools, approximately 10 years, and throughout storage of the spent nuclear fuel in packages in a dry storage facility, usually for 40 to 60 years.

The second barrier, the primary circuit pressure boundary, will be designed to maintain its integrity during normal and abnormal operation throughout the service life of SMR ETE. The long service life, integrity, and leaktightness of the primary circuit will be achieved through high manufacturing and assembly quality of the individual components. All primary circuit components whose failure would require safety system actuation will therefore be classified as Safety Class 1.

The third barrier, the containment, will be designed to maintain its integrity and leaktightness in all SMR ETE states, including accident conditions. As the final barrier against radioactive releases, it will withstand all external and internal hazards up to and including design extension conditions.

During SMR ETE operation, the integrity of the first barrier, the fuel element cladding, will be verified by continuous measurement and analysis of radioactive fission product concentrations in the primary circuit coolant using radiochemical analysis and, during outages, where appropriate, by measuring potentially damaged fuel assemblies using online or offline sipping. The integrity of irradiated/spent nuclear fuel stored in the storage pool will subsequently be verified on a similar principle. Nuclear fuel integrity will be inspected during factory manufacture at the fuel supplier's plant, and the nuclear fuel delivery will include the necessary documentation confirming manufacturing quality.

During SMR ETE operation, the integrity of the second barrier, the primary circuit pressure boundary, will be monitored continuously by diagnostic systems. During manufacture and assembly, primary circuit component quality will be verified using nondestructive testing methods, and the delivery will include the necessary documentation confirming that high quality has been ensured. After assembly has been completed, primary circuit leaktightness will be verified by pressure tests during commissioning testing, supplemented by appropriate nondestructive testing methods. During regular unit refueling outages, primary circuit integrity will be periodically inspected using nondestructive testing methods and verified by primary circuit pressure tests.

The integrity of the third barrier, the containment, will be ensured by conservative calculations of its resistance and by high manufacturing, construction, and assembly quality of the individual components. During SMR ETE commissioning, containment integrity and leaktightness will be verified by strength and leaktightness tests supplemented by appropriate nondestructive testing methods. Particular attention will be paid to the leaktightness of penetrations for process, electrical, and I&C systems through the containment leaktight boundary, specifically process and cable penetrations, and to the leaktightness of structural penetrations required for future operation, including leaktight doors. During SMR ETE operation, containment leaktightness and strength will be periodically verified using appropriate methods, generally after refueling outages.

To ensure effective defense in depth in protecting the individual barriers against radioactive releases, SMR ETE will be equipped with safety systems and systems for managing states corresponding to design extension conditions. Their functions will cover both fundamental tasks of defense in depth: preventing accidents and mitigating their consequences if an accident occurs. The capacity and design, including resistance, of the safety systems used will meet the requirements imposed on them at the individual levels of defense in depth, as will the scope of their functions. The design will ensure that the relevant safety systems for the individual levels of defense in depth are independent of one another where reasonably practicable. Emergency electrical power will be provided for active safety systems and I&C instrumentation. SMR ETE will also be equipped with sufficient mobile equipment to prevent serious nuclear installation states and mitigate their consequences.

Systems, structures, and components (SKK) important to nuclear safety will be systematically classified according to their contribution to nuclear installation safety, in accordance with the requirements of the Atomic Act and its implementing regulations. The classification will be performed using a deterministic approach, supplemented by probabilistic methods as appropriate. A graded approach will be applied to classification, meaning that the more important equipment is to nuclear safety, the more stringent the requirements for its reliability, qualification, quality assurance, and associated documentation. Specific requirements will be established for each category in terms of:

- codes and standards used in design, manufacture, and construction,
- environmental qualification, including accident conditions,
- seismic qualification,
- quality assurance,
- in-service inspections and periodic testing,
- other specific aspects, such as reliability.

Classification is a significant factor affecting the design, manufacture, assembly, commissioning, and operation of systems, structures, and components, as well as the overall system architecture. Under Czech legislation, nuclear power plant systems, structures, and components are categorized as selected equipment; equipment affecting nuclear safety that is not selected equipment; and SKK not affecting nuclear safety. Selected equipment is further divided into safety systems and selected equipment that is not a safety system. To ensure a graded approach to quality assurance, selected equipment will be assigned to one of the three safety classes defined by Decree No. 329/2017 Coll., on Nuclear Installation Design Requirements, based on the category of the safety function to which it contributes:

- selected equipment forming the primary circuit pressure boundary will be included in Safety Class 1; it is subject to the most stringent design requirements, which must guarantee resistance and quality ensuring that its failure is a practically eliminated condition,
- equipment subject to the most stringent reliability requirements, typically safety systems (BS), will be included in Safety Class 2,
- other selected equipment, typically safety-related systems (SSB) and diverse systems, will be included in Safety Class 3.

If an SKK performs multiple safety functions, it will be assigned to the safety class corresponding to the function with the greatest effect on nuclear safety. Classification will follow the principle that where performance of a safety function requires the applicable system to remain functional, the functionality of its support systems, providing items such as power, media, and lubrication, will also be required. All relevant technical safety requirements will be applied to selected equipment in accordance with Decree No. 358/2016 Coll. The necessary degree of independence will be ensured between SKK assigned to different categories so that failure of an SKK with a lower safety classification does not cause the loss of function of equipment with a higher safety classification.

Electrical power will be provided by independent sources so as to eliminate the possibility of failure to the extent reasonably practicable and ensure that a fault in the electrical distribution system outside the nuclear installation does not affect the functionality of the nuclear installation's own-

consumption power supply systems. During operational states, power will be supplied by the normal and backup power supply systems, i.e., from the SMR ETE electrical generator or the external grid. In addition to these systems, an emergency electrical power source will be available to supply other systems of the same safety classification. These systems, including the emergency power source, will be classified and qualified as safety systems. Safety systems are basic design provisions intended to reliably perform the fundamental safety functions during abnormal operation and a design basis accident. Safety system functionality must be ensured during:

- extreme climatic hazards with an intensity corresponding to a return period of once in 10,000 years,
- earthquakes up to the SL-2 level for the site, but at least 0.1 g,
- human-induced events, including a design-basis aircraft crash,
- failures, outages, and accidents involving other systems at the nuclear installation,
- fires inside and outside the nuclear installation,
- a single failure in a safety system, including while that system is undergoing repairs, inspection, or testing.

The resistance and protection of safety systems against internal and external hazards will be ensured by the properties of the safety system design and construction or by other measures, such as protection through distance; spatial, physical, and electrical separation; or location in a resistant structure. These requirements apply to the actuating systems that perform the relevant safety function, as well as to their support systems and the protection systems that monitor the nuclear installation state and, where necessary, automatically initiate actuation of the actuating systems and potentially their support systems. The emergency electrical power source will have sufficient capacity and be capable of supplying all SKK required to manage situations established by the design basis for a sufficient period.

Batteries will be installed to supply loads requiring an uninterrupted power supply. Their capacity will be determined conservatively with regard to the required supply duration and power so as to ensure the performance of safety functions until the batteries can be recharged.

Additional diverse and alternative electrical power sources for SKK will also be available to manage situations caused by extreme hazards and events falling within design extension conditions. Diverse means are generally subject to more stringent requirements for resistance and protection against extreme internal and external hazards. Alternative means are usually mobile, and their process connection to permanent systems will be addressed in the design through suitable connection points.

Requirements for nuclear safety arising from the relevant regulations will reflect not only the regulations applicable at the time of nuclear power plant preparation, design, and construction, but will also take account of and incorporate any new requirements for nuclear safety, radiation protection, the security of nuclear installations and nuclear materials, and radiation extraordinary event management at any stage of the plant's life cycle. Periodic safety reviews will continuously take account of safety objectives and requirements arising from current Czech legislation and international regulations, particularly EU regulations and WENRA and IAEA recommendations, as well as industry-standard requirements reflecting the development of the best available technology, including lessons learned from any abnormal operating events or accident conditions at nuclear installations in the Czech Republic and worldwide. As described above, the statutory safety requirements will then be elaborated in detail in the siting, preliminary and operational safety analysis reports as part of the relevant licensing processes, including the siting permit, construction permit, commissioning, and operation.

B.I.6.2.2.3. Radiation protection requirements

For the purposes of the Atomic Act, radiation protection means a *"system of technical and organizational measures to limit the exposure of a natural person and protect the environment against the effects of ionizing radiation"*. The public and the environment are protected against the impacts of ionizing radiation by shielding ionizing radiation and preventing releases of radioactive substances present in the SMR ETE technology.

Radiation protection requirements are based on the Atomic Act, which stipulates that every person carrying out an activity in a planned exposure situation must limit the exposure of a natural person so that the total exposure caused by the combined exposures from such activities is justified and optimized and does not exceed the exposure limits in total:

- An activity in exposure situations is justified where its benefit to society and individuals outweighs the risk arising during or as a result of the activity (the principle of justification under the ICRP and IAEA).
- Optimization of radiation protection means an iterative process to achieve and maintain a level of radiation protection at which the exposure of natural persons and the environment is as low as reasonably achievable, taking all economic and societal factors into account (the principle of optimization under the ICRP and IAEA).
- An exposure limit is a quantitative indicator for limiting the total exposure of a natural person from activities in planned exposure situations. The total dose to any individual from regulated sources in planned exposure situations, other than medical exposures, must not exceed the applicable limits (the principle of dose limits under the ICRP and IAEA).

Application of these radiation protection principles limits the radiation exposure of personnel and, by minimizing the activity and quantity of radioactive substances discharged, limits public exposure from the operation of nuclear installations. The SMR ETE design will therefore ensure that all exposures are maintained at the minimum reasonably achievable level. The relevant exposure limits established by the competent regulatory authorities will be observed.

The SMR ETE design is required to meet the basic radiation protection acceptance criteria defined by SÚJB and WENRA as follows:

Criterion K1: During normal and abnormal operation, authorized limits on radionuclide discharges from the New NPP into the environment will not be exceeded for the critical group of the population, and the dose optimization constraint relating to exposure from discharges from all operating units at a single site will not be exceeded.

Criterion K2: No accident not involving nuclear reactor core melt or damage to irradiated nuclear fuel in storage pools will result in a radionuclide release requiring the implementation of protective measures consisting of sheltering, iodine prophylaxis, or public evacuation anywhere in the vicinity of the New NPP.

Criterion K3: For postulated accidents involving nuclear reactor core melting or damage to irradiated nuclear fuel in storage pools, design provisions will be adopted so that public evacuation is not required in the immediate vicinity and long-term restrictions on food consumption do not have to be introduced.

Criterion K4: Accidents involving core melt that could lead to early or large releases must be practically eliminated. An early release means a release that, for postulated core-melt accidents, would not allow the timely introduction of protective measures consisting of sheltering and iodine prophylaxis. A large release means a release that would require measures precluded by this criterion.

The radiation protection optimization process will be applied during the SMR ETE design and construction phases. Further optimization of protection will be ensured during SMR ETE commissioning and operation.

Experience with the application of the general principles of radiation protection at operating nuclear power plants in the Czech Republic and abroad shows that, if the justification of activities and optimization of radiation protection are implemented effectively, cases in which individual dose limits must be applied are rare. Occupational and public exposure limits are selected so that, in the event of lifetime exposure:

- eliminate the possibility of deterministic health effects,
- maintain the probability of stochastic health effects at a generally acceptable low level.

The exposure limit for a member of the public is established by SÚJB Decree No. 422/2016 Coll., on Radiation Protection and Security of a Radionuclide Source, which sets 1 mSv/year as the general effective dose limit in each calendar year and defines it as the sum of effective doses from external exposure and committed effective doses from internal exposure arising from all permitted or registered activities. Doses arising from natural exposure or from a person's medical exposure as a patient are therefore not included in this limit.

Under the Atomic Act, every person carrying out a radiation activity must ensure that radiation protection optimization uses a dose optimization constraint for the representative person of 0.25 mSv per year as a result of that activity, including any accumulation of radioactive substances released from the workplace, and, in the case of a nuclear power installation, simultaneously 0.2 mSv/year for atmospheric discharges and 0.05 mSv/year for discharges to surface water. This dose constraint, including its allocation between exposure pathways from discharges to air and surface water, is also considered the dose limit for the design of nuclear installations. If a single site contains multiple nuclear installations that affect public doses, this value applies to total exposure from all nuclear installations in the area where the nuclear installation is sited.

Based on a radiation protection optimization study, SÚJB establishes the authorized exposure limit for the relevant nuclear installation, in this case SMR ETE. An authorized limit is a quantitative indicator resulting from the optimization of radiation protection for an individual activity involving radiation or an individual source of ionizing radiation, and is generally lower than the dose constraint. SÚJB establishes the authorized limits in the permit for activities in exposure situations. The operator's continuous demonstration of compliance with the authorized limits also demonstrates compliance with the exposure limits.

B.I.6.2.2.4. Requirements for the security of nuclear facilities and nuclear material

Requirements for the security of nuclear installations and nuclear materials are established by Act No. 263/2016 Coll., the Atomic Act, as amended, and its implementing Decree No. 361/2016 Coll., on the Security of Nuclear Installations and Nuclear Materials, as amended. International WENRA and IAEA recommendations will also be taken into account during preparation of the New NPP Project, particularly the recommendations in IAEA NSS No. 13 (INFCIRC/225/Rev. 5) and the related implementing guides in the IAEA Nuclear Security Series (NSS).

Physical protection of a nuclear installation means a system of technical and organizational measures preventing unauthorized activities involving a nuclear installation or nuclear material. The physical protection of the nuclear installation and nuclear material is a specific activity governed by the applicable legislation; selected areas are subject to secrecy and controlled access to classified information. This fact is reflected in legislation governing physical protection of the New NPP and in Act No. 412/2005 Coll., on the Protection of Classified Information and Security Eligibility, as amended, and its implementing decrees. The list of classified matters relating to physical protection and directly associated with ensuring it is established by the annex to Government Regulation No. 440/2024 Coll., on the List of Classified Information Areas, as amended (Section 08).

For these reasons, this Documentation, which is a public document, cannot state any specific measures relevant to SMR ETE for the security of nuclear installations and nuclear materials, other than the general requirements arising from Czech legislation and WENRA and IAEA recommendations.

For nuclear installation security purposes, nuclear material will be classified in Category I, II, or III pursuant to the annex to Decree No. 361/2016 Coll., on the Security of Nuclear Installations and Nuclear Materials, as amended. Based on the categorization of nuclear material and an analysis of the potential nuclear safety consequences of unauthorized activities, areas with restricted and controlled access and vehicle entry will be delineated and physically bounded at the nuclear power plant as follows:

- guarded area,
- protected area,
- inner area, where Category I nuclear material is used or stored, and
- vital area, where deliberate damage to systems and equipment important to nuclear safety located in that area could directly or indirectly result in a radiation accident.

The basic function of implementing the security system is to prevent unauthorized activities involving nuclear installations, nuclear materials, and ionizing radiation sources. The system performs its function primarily by:

- Allowing entry into the guarded area, protected area, inner area, and vital area only to persons or vehicles that meet the established requirements, including good character, psychological profile, and security eligibility, and that have been issued a permit to enter the relevant area.
- Ensuring that authorized persons entering the guarded area, protected area, inner area, and vital area do not misuse this access to carry out unauthorized activities.
- Using a combination of the electronic security system and mechanical barriers to ensure timely detection of intruders and delay their progress, enabling the response unit to stop intruders before they begin any unauthorized activity.
- Inspecting items brought into and removed from the guarded area to prevent hazardous items from being brought in and nuclear material and ionizing radiation sources from being removed without authorization.

Technical measures will be represented by a technical physical protection system comprising detection equipment, access and vehicle-entry control equipment, camera systems, and communication systems. Organizational measures will primarily include rules governing the entry of persons and vehicles. They will also prohibit weapons and other hazardous items from being brought in, while detection of incoming items will form part of the technical physical protection measures. Technical and organizational measures will also include inspecting items removed from the guarded area.

The individual delineated areas, specifically the guarded area, protected area, inner area, and vital area, will be separated by physical barriers consisting of appropriate mechanical barrier equipment. The physical barriers will be supplemented by suitable technical equipment so that any attempt to breach them without authorization is promptly detected and signaled. Entry into the individual areas delineated within the SMR ETE site will be permitted only to persons who meet the requirements for entry into the specific area.

The specific administrative and technical measures of the SMR ETE security system, to the extent established by the Atomic Act and its implementing Decree No. 361/2016 Coll., on the Security of Nuclear Installations and Nuclear Materials, as amended, will be the responsibility of the license holder.

The method of securing the nuclear installation and nuclear material will correspond to the hazard arising from the design basis threat established by SÚJB decision on the basis of binding opinions from the Ministry of the Interior, the Ministry of Defence, and the Ministry of Industry and Trade, together with the rights and obligations associated with securing nuclear material. A design basis threat means a set of characteristics and capabilities of a natural person located inside or outside a nuclear installation or near nuclear material who is capable of intentionally handling such an item unlawfully. At the highest level of the Czech Republic, the security system will be provided by the security services and armed forces.

If the design basis threat changes during future SMR ETE operation, the method of ensuring physical protection will be analyzed and, where necessary, appropriate measures will be implemented to effectively eliminate the newly established design basis threat.

Throughout SMR ETE construction, administrative and technical measures for ensuring physical protection during nuclear installation construction will be implemented pursuant to Section 20 of SÚJB Decree No. 361/2016 Coll., on the Security of Nuclear Installations and Nuclear Materials, as amended. In particular, the SMR ETE construction site will be fenced and physically guarded, and the entry of natural persons and vehicles will be controlled. From the start of technological equipment installation, a structure containing part of the nuclear installation with a delineated protected, inner, or vital area will be protected to the level required for a nuclear installation with a delineated guarded area. The scope of security will correspond to the progress of nuclear installation construction, with operating parts of the nuclear installation, including the existing units, separated from the parts under construction. Fully functional administrative and technical physical protection measures for SMR ETE operation will be in place at least 3 months before nuclear fuel loading into the reactor begins.

Cybersecurity requirements are established by Act No. 264/2025 Coll., on Cybersecurity, as amended. Technical details will be established by the subsequent implementing decree to this Act. International WENRA and IAEA recommendations will also be taken into account during SMR ETE preparation, particularly IAEA NSS No. 17-T (Rev. 1, Computer Security Techniques for Nuclear Facilities, Vienna 2021).

According to IAEA NSS No. 17-T, the objective of cybersecurity at a nuclear installation is to protect the confidentiality, integrity, and availability attributes of electronic data, computer systems, and processes used, i.e., to protect computer systems against cyberattacks, manipulation, or data falsification. The security objective will be met if data used to ensure nuclear safety and nuclear installation security are identified and protected.

A security policy will be prepared to optimize the SMR ETE cybersecurity management system, and the configuration of that system will comply with the applicable provisions of the legislation in force. Cybersecurity will be based on a cybersecurity policy, a cybersecurity assurance program, and specific security for individual components. The cybersecurity policy will establish the organization's high-level cybersecurity objectives. The policy will meet the applicable requirements of the legislation then in force. The cybersecurity policy requirements will be reflected in lower-level documents used to implement and verify the policy. The cybersecurity policy will be enforceable, achievable, and auditable.

The cybersecurity program for safety-significant components will implement this policy through organizational roles, responsibilities, and procedures. The program will specify and describe in detail the means for achieving the cybersecurity objectives of individual items of equipment and will form part of the operator's overall cybersecurity program. The program will contain primary security measures addressing component susceptibility to vulnerabilities. It will also contain protective measures, an analysis of the potential consequences of a cyberattack, and mitigating measures that will establish and maintain an acceptable level of cyber risk for the nuclear installation. Measures will also be adopted to facilitate restoring the facility to a safe operational state.

Based on the established cybersecurity policy, each individual component of the cybersecurity program will achieve its specific objectives. The minimum content and itemization of this program are specified in IAEA NSS No. 17-T (paragraph 7.20) as follows:

a) Organization and description of responsibilities and authorities:
   - Organizational chart.
   - Responsible persons and responsibilities for information transfer.
   - Process for periodic review and approval of potential changes.
   - Links to other programs, such as human resources, personnel security, physical protection, and training.

b) Risk, vulnerability, and compliance assessment:
   - Cyber risk management at nuclear installation level.
   - Cyber risk management system, including the digital asset classification and identification process.
   - Frequency of reviewing and reassessing the cybersecurity plan.
   - Self-assessment, including procedures for penetration testing of potential external cybersecurity breaches.
   - Audit procedures and the monitoring and remediation of identified weaknesses.
   - Methods and situations for initiating or repeating risk and vulnerability assessments.
   - Compliance with binding regulations and legislation.

c) System security design and configuration management:
   - Basic IT architecture and IT system design principles.
   - Basic approach to security.
   - Assignment of basic computer security measures to the individual computer security levels.
   - Formalization of computer security requirements for suppliers.
   - Cybersecurity management throughout the facility life cycle.

d) Operator company asset management:
   - Digital asset attributes, including identification, computer security level, zone, location, and other particulars.
   - Configuration management, including hardware, operating systems, firmware, software applications, equipment status, and related configurations.
   - Data flow diagrams and network diagrams identifying all external interconnections with other systems.
   - Supplier information for individual assets.

e) Operational security procedures against cyber threats:
   - Security incident response.
   - Business continuity assurance.
   - System and data backup.
   - Supply chain.
   - Access management.
   - Information flow and communication management.
   - Platform and application security.
   - System monitoring, including access monitoring.

f) Personnel management:
   - Personnel screening.
   - Personnel training.
   - Personnel qualification.
   - Reporting security incidents, including protection of employees who report them.
   - Method for terminating the employment/transferring key personnel.

The cybersecurity program will be developed by IT specialists in close cooperation with nuclear safety specialists, site physical protection specialists, and nuclear installation operation specialists. Cybersecurity threats will be assessed regularly in connection with the rapid development of IT technologies, such as the use of artificial intelligence and progress in quantum computer development. If another cyber threat arising from the development of IT technologies is identified, appropriate measures will be implemented to eliminate it based on the latest scientific and research findings.

Systems that must be protected against cyber threats will be classified according to their nuclear safety and security significance pursuant to the applicable legislation, particularly Decree No. 361/2016 Coll. Components that contain IT equipment and may be subject to a cyberattack will be protected in proportion to their importance. Protection of safety systems, including protection systems and their support systems, will receive the highest priority. At the second level, systems affecting nuclear safety will be secured accordingly. The third level comprises systems required for plant operating functions, specifically generation.

An appropriate level of cybersecurity assurance will be precisely defined for these levels, and any interaction or potential overlap between their safety functions will also be taken into account. The SKK function that is most significant to nuclear safety at the relevant level of defense in depth will always determine the level of cybersecurity assurance.

The safety classification of technological systems will be performed pursuant to the applicable legislation (Decree No. 329/2017 Coll.). The subsequent IT security classification will be performed pursuant to Annex No. 2 to Decree No. 361/2016 Coll. in conjunction with IAEA NSS No. 17-T, which classify equipment into five security levels:

- important protection and safety systems (Level 1),
- control systems and other protection and safety systems (Level 2),
- support information systems (Level 3),

systems that are not a direct part of the technological process of electricity or heat generation will also be subject to cybersecurity rules, specifically:

- communication and plant-wide information systems (Level 4),
- office systems (Level 5).

IT systems used to ensure nuclear installation security will also be subject to cybersecurity management. Pursuant to Section 19 of Decree No. 361/2016 Coll., IT systems for nuclear safety management, nuclear material accounting, physical protection, and radiation extraordinary event management will be secured against disruption in accordance with defense-in-depth principles and by dividing these systems into the same security levels as systems connected to the technological process. In both cases, the level of security for IT systems at the respective levels will be the same.

B.I.6.2.2.5. Requirements for radiation extraordinary event management

For the purposes of Act No. 263/2016 Coll., the Atomic Act, as amended, a radiation extraordinary event means an event that results or may result in exposure limits being exceeded and requires measures to prevent the exposure limits from being exceeded or to prevent deterioration of the situation in terms of radiation protection. Circumstances in which natural persons or the environment may be exposed to ionizing radiation or contaminated by a radioactive substance are referred to as exposure situations.

An exposure situation is:

- a planned exposure situation associated with the intentional use of an ionizing radiation source,
- an emergency exposure situation that may arise during a planned exposure situation or be caused by a malicious act and requires immediate measures to prevent or mitigate the consequences, or
- an existing exposure situation that already exists when a decision is made on its regulation, including a long-lasting consequence of an emergency exposure situation or a completed activity in a planned exposure situation.

An emergency exposure situation therefore begins when a radiation extraordinary event is declared and continues until the radiation extraordinary event is terminated. Natural persons may be subject to emergency exposure during an emergency exposure situation. Such emergency exposure must be limited through individual protection, restrictions on the movement and presence of natural persons in the affected territory, and the introduction of urgent protective measures, particularly:

- sheltering,
- use of iodine prophylaxis,
- evacuation, and

the introduction of subsequent protective measures, including:

- relocation of the population,
- restrictions on the use of food and water contaminated by radionuclides,
- restrictions on the use of feed contaminated by radionuclides.

When deciding whether to introduce protective measures in an emergency exposure situation, consideration is given to factors affecting the feasibility of the protective measures, the magnitude of the exposure of natural persons that would be averted by introducing the protective

measure, and the consequences of introducing the protective measures, in accordance with the criteria established by SÚJB Decree No. 422/2016 Coll., on Radiation Protection and Security of a Radionuclide Source.

Depending on its severity, a radiation extraordinary event is classified in the following categories pursuant to Act No. 263/2016 Coll., the Atomic Act, as amended:

Level 1 radiation extraordinary event: A radiation extraordinary event that can be managed using the forces and resources of the operators or personnel working the current shift of the entity during whose activity the radiation extraordinary event arose.

Radiation incident: A radiation extraordinary event that cannot be managed using the forces and resources of the operators or employees working the current shift of the person whose activity caused the radiation extraordinary event, or that arises as a result of the discovery, misuse, or loss of a radionuclide source, and that does not require urgent protective measures for the public.

Radiation accident: A radiation extraordinary event that cannot be managed using the forces and resources of the operators or employees working the current shift of the person whose activity caused the radiation extraordinary event, or that arises as a result of the discovery, misuse, or loss of a radionuclide source, and that requires urgent protective measures for the public.

Depending on the magnitude of the potential effects of a radiation incident or radiation accident in the Czech Republic, a nuclear installation, workplace with ionizing radiation sources, or activity in exposure situations is classified in Hazard Category A to E. Under this classification, a nuclear power installation is assigned to Hazard Category A, and the scope of requirements imposed on it corresponds to that category.

For this reason, ensuring radiation extraordinary event response is an integral part of nuclear installation design and licensing. It comprises measures for managing a situation associated with the occurrence of a radiation extraordinary event, intended primarily to regain control over the situation and prevent or mitigate its consequences. It constitutes the fifth and final level of the defense-in-depth system.

Accordingly, the license holder is also required to ensure response preparedness, meaning a set of organizational, technical, material, and personnel measures prepared on the basis of the probable course of a radiation extraordinary event to prevent or mitigate its effects and documented as response instructions, an on-site emergency plan, emergency rules, and a plan for rescue and recovery operations in the vicinity of the hazard source. The response preparedness system will comply with the National Radiation Emergency Plan approved by the Government of the Czech Republic.

Requirements for the above measures, their preparation and approval, including organizational arrangements, procedures, and technical requirements, are established primarily by Act No. 263/2016 Coll., the Atomic Act, as amended, and the related implementing decrees, particularly Decree No. 359/2016 Coll., on details of ensuring radiation extraordinary event management, as amended; Decree No. 329/2017 Coll., on Nuclear Installation Design Requirements; Decree No. 360/2016 Coll., on Radiation Situation Monitoring, as amended; and Decree No. 422/2016 Coll., on Radiation Protection and Security of a Radionuclide Source, as amended, as well as by the Integrated Rescue System Act and the Crisis Management Act.

Nuclear installation licensing includes the preparation of the necessary documentation, particularly:

- Concept for ensuring radiation extraordinary event management (during the nuclear installation siting stage).
- Radiation extraordinary event analysis and assessment.
- On-site emergency plan.
- Determination of the emergency planning zone.

Because ensuring radiation extraordinary event management is one of the fundamental obligations associated with the use of nuclear energy, this area receives particular attention and is subject to regular, systematic, and comprehensive assessment throughout the entire nuclear installation life cycle.

B.I.6.3. Project-specific information

This chapter describes specific information and requirements relating to the SMR ETE Project.

B.I.6.3.1. Safety concept and basic safety criteria

B.I.6.3.1.1. Introductory information

The SMR ETE design will comply with all requirements and principles applied in Czech legislation, WENRA and IAEA requirements, and generally applicable technical regulations for nuclear installations. A detailed description of the hierarchy of the individual legislative and normative documents is provided above in Chapter B.I.6.2.2. Basic requirements for nuclear power plants (page 86 of this Documentation). Within the hierarchy of these regulations, the principal legislative document is Act No. 263/2016 Coll., the Atomic Act, as amended.

The fundamental safety objective is to protect individuals, society, and the environment from the harmful effects of ionizing radiation.

To achieve this objective, the following fundamental safety requirements will be met continuously:

- Prevent uncontrolled exposure of individuals and releases of radioactive substances into the environment.
- Minimize the probability of events that could lead to loss of control over the reactor core, the fission chain reaction, a radioactive source, or any other source of radiation.
- If such events occur, manage them so as to minimize their consequences.

Compliance with the fundamental safety objective will be considered at all stages of the SMR ETE Project life cycle, including planning, siting, design, manufacture, construction, commissioning, operation, and decommissioning, as well as the transport of radioactive substances and radioactive waste management.

The SMR ETE safety concept will be based on the application of general principles for designing nuclear installation systems, structures, and components. It will also include methods for verifying the performance and quality of the individual structural parts of the nuclear installation for all operating modes and accident states. These principles and procedures are intended to ensure nuclear safety and compliance with security principles throughout the nuclear installation life cycle, including the design, construction, commissioning, operation, and decommissioning phases. All principles and processes will be based on proven experience and best practices.

The SMR ETE safety concept and design will be developed using a process comprising the initial requirements, an explanation of how they are met, and subsequent demonstrations, such as safety analyses, documenting how the initial safety requirements are met.

B.I.6.3.1.2. General principles for the SMR ETE design

The fundamental objective of the safety concept is to protect people and the environment against potential harm caused by operation of the nuclear installation. Such harm may be caused by exposure to ionizing radiation (nuclear damage) or may be conventional, such as the release of chemicals. This objective is consistent with the requirements of Act No. 263/2016 Coll., the Atomic Act, as amended, specifically Section 5, Principles Governing the Peaceful Use of Nuclear Energy and Ionizing Radiation. These requirements are specifically set out above in Chapter B.I.6.2.2. Basic requirements for nuclear power plants (page 86 of this Documentation).

SMR ETE will be designed, constructed, commissioned, operated, and decommissioned so that the hazards from both potential types of harm are as low as reasonably achievable (the ALARA principle). The principle of applying the best available and proven techniques (the BAT principle) will also be applied, and the nuclear installation security and protection requirements will be met.

To achieve the fundamental objective of the SMR ETE safety concept, a hierarchical concept of principles will be established to provide a framework for design assessment and potential future development. The individual components of the safety concept are expressed through the functions of systems, structures, and components.

B.I.6.3.1.3. Fundamental and high-level safety functions (nuclear safety)

Under the WENRA and IAEA principles also applied in the Atomic Act, three fundamental safety functions are defined and must be fulfilled at all stages of the SMR ETE life cycle. The SMR ETE safety concept adds a fourth fundamental safety function, an approach that is fully consistent with the Atomic Act. The wording of the fundamental safety functions differs slightly, but their technical meaning is identical. All four fundamental safety functions used are defined as follows:

- Reactivity control (Section 45(2)(a), (b), and (c) of the Atomic Act).
- Nuclear fuel cooling (Section 45(2)(d) of the Atomic Act).
- Ensuring the confinement of radioactive substances (Section 45(2)(e) of the Atomic Act).
- Radiation exposure control (Section 45(2)(e) of the Atomic Act).

In the SMR ETE safety concept, the individual fundamental safety functions are decomposed into high-level safety functions (HLSFs), referred to in standard Czech terminology as specific safety functions, and these high-level safety functions are categorized according to their effect on nuclear safety pursuant to Decree No. 329/2017 Coll., on Nuclear Installation Design Requirements. High-level safety functions are performed by systems, structures, and components that are assigned to the individual safety classes according to the level of the high-level safety function they perform (Section 9 of Decree No. 329/2017 Coll.). In the SMR ETE design, high-level safety functions will be linked through the design requirements management database to the individual systems, structures, or components that perform them. Safety measures will also include the human actions required to manage operating and emergency states. The SMR ETE safety concept makes maximum use of passive features to ensure high-level safety functions (Section 12(2)(b) of Decree No. 329/2017 Coll.).

B.I.6.3.1.4. Environmental protection functions (environmental safety)

All systems, structures, and components will be integrated into the SMR ETE design so as to ensure environmental protection to the maximum extent. A method for identifying and fulfilling environmental functions during normal operation, meaning operation without releases of radioactive substances to the surroundings, including abnormal states, has been developed for the SMR ETE design. Fulfillment of the environmental functions

is necessary to prevent or minimize adverse environmental impacts from nuclear installation operation. Identifying environmental functions and designing measures during the design phase will enable the future operator to meet environmental and public protection requirements. In the SMR ETE design, environmental functions will be linked through the design requirements management database to the individual systems, structures, or components that perform them.

B.I.6.3.1.5. Security functions

A methodology for defining security functions will be established for the SMR ETE design. This methodology will comply with Czech regulations, particularly Decree No. 361/2016 Coll., on the Security of Nuclear Installations and Nuclear Materials, as amended, and international documents, and will establish the fundamental physical protection principles:

- deter,
- detect,
- assess,
- minimize risk.

The fundamental cybersecurity principles will also be established:

- identify,
- protect,
- detect,
- recover.

The details of these principles are classified and are therefore not discussed further.

B.I.6.3.1.6. Provision of radiation protection

The radiation protection strategy will protect personnel and the surrounding population against exposure exceeding permitted limits in all nuclear installation states. Radiation protection of the public and personnel comprises a broad range of processes, while the SMR ETE safety concept specifies primarily the design provisions. Radiation protection is based on the above fundamental safety function of "radiation exposure control" (Section 45(2)(e) of the Atomic Act).

The radiation exposure control safety function will focus on limiting the ionizing radiation source, increasing the distance between operators and the ionizing radiation source, reducing exposure time, and shielding the ionizing radiation source. The SMR ETE design will therefore take into account the statutory requirements of Decree No. 422/2016 Coll., on Radiation Protection and Security of a Radionuclide Source, as amended. This Decree establishes target doses for normal and abnormal operation and target doses under accident conditions.

The SMR ETE radiation protection principles are based on delineating areas where personnel are present (the controlled area), minimizing doses received during equipment maintenance, controlling radiation exposure during refueling, controlling gaseous and liquid discharges, and preparing nuclear installation decommissioning processes.

The fundamental radiation protection principles in the RR SMR reference design are described in Chapter B.I.6.3.2. Technical and technological design (page 116 of this Documentation), specifically Subsection B.I.6.3.2.4. Radiation protection in the RR SMR design.

B.I.6.3.1.7. Implementation of defense in depth

The SMR ETE safety concept includes the implementation of defense in depth. The objective of implementing defense-in-depth principles is to prevent accident conditions and mitigate the consequences of an event if such a condition occurs. The general principles of defense in depth under Czech legislation and WENRA and IAEA requirements are described above in Chapter B.I.6.2.2. Basic requirements for nuclear power plants (page 86 of this Documentation). For the RR SMR reference design, the general concept is elaborated in greater detail but is generally consistent with the Czech national and international WENRA and IAEA approaches described above. The division into individual levels of defense in depth in the SMR ETE design will be defined in accordance with Act No. 263/2016 Coll., the Atomic Act, as amended, and Decree No. 329/2017 Coll., on Nuclear Installation Design Requirements:

Design basis conditions (DBC):

- DBC-1: normal operation (Section 4(3)(e) of the Atomic Act)
- DBC-2i: abnormal operation (Section 4(3)(f) of the Atomic Act)
- DBC-2ii, DBC-3i, DBC-3ii, DBC-4: accident conditions (Section 4(3)(h) of the Atomic Act)

Design extension conditions (DEC):

- DEC-A: design extension conditions without significant nuclear fuel damage (Section 4(3)(j) of the Atomic Act)
- DEC-B: severe accident (Section 2(k) of Decree No. 329/2017 Coll.)

Under the RR SMR reference design safety concept, defense in depth (DiD) is implemented as successive independent design provisions at five levels for managing the nuclear installation state following a postulated initiating event (PIE; the Czech abbreviation PIU is commonly used).

The individual SMR ETE states will be linked to the applicable levels of defense in depth (see below).

The approach to implementing defense in depth for design basis conditions (DBC) is supplemented by dividing initiating events into frequent initiating events and unusual, less frequent, initiating events:

- Frequent initiating events (PIEs) are events whose expected frequency is greater than once per 1,000 years and whose consequences, if the protective measures failed, would exceed the statutory radiological criteria. For such PIEs, the SMR design will include at least two mutually independent and diverse design provisions that ensure the performance of safety functions.
- Unusual initiating events (PIEs) are events whose expected frequency is between once per 1,000 years and once per 100,000 years and whose consequences, if the protective measures failed, would exceed the statutory radiological criteria. For such PIEs, the design will include at least one design provision ensuring the performance of safety functions.

For frequent initiating events, the safety demonstrations, or safety analyses, will assume the failure of one of the two implemented design provisions.

For design extension conditions (DEC), initiating events are defined as follows:

- DEC-A: PIEs and complex event sequences without nuclear fuel melting whose frequency is less than once per 100,000 years and whose consequences, if the protective measures failed, would exceed the statutory radiological criteria.
- DEC-B: Severe accident conditions arising from the inherent hazards of the nuclear installation and resulting from the failure of multiple protective measures.

A key element in implementing defense in depth is protecting the physical barriers against releases of radioactive substances into the environment, specifically the fuel cladding, primary circuit, and containment, which are described in detail in Chapter B.I.6.2.2. Basic requirements for nuclear power plants (page 86 of this Documentation).

B.I.6.3.1.8. Strategy for retaining core melt after a severe accident

A severe accident assumes severe damage to the reactor core, including its partial or complete destruction, and the formation of a molten mixture of nuclear fuel and certain reactor internals. This melt may form inside the reactor pressure vessel during a severe accident, and the objective of preventive and mitigating measures is to cool it by removing the residual heat still generated within the melt and to retain it within the barriers against radioactive releases. The fundamental strategy for SMR ETE will be to retain any melt within the reactor pressure vessel, known as the in-vessel retention (IVR) strategy, by maintaining vessel integrity through external cooling. If external reactor pressure vessel cooling fails and the vessel melts through, releasing the melt into the containment, some nuclear installation designs use an ex-vessel cooling (EVC) strategy. This strategy spreads the melt into a thin layer or divides it into many small volumes, which are cooled by removing heat from these small volumes to outside the containment.

The IVR strategy is preferred for SMR ETE, and the design will demonstrate that reactor pressure vessel melt-through is practically eliminated and that the adopted IVR strategy is effective. This strategy is consistent with the WENRA SRLs and SSR-2/1 requirements for maintaining containment function and mitigating accident consequences even in the event of vessel melt-through (see SSR-2/1 Requirements 54–56 and 58). If the functionality of the IVR strategy cannot be demonstrated with confidence, the SMR ETE design will be supplemented with additional means enabling ex-vessel cooling of the melt.

The following measures must be implemented for both strategies:

- Control of hydrogen concentration in the containment. As the core melts and reacts with water inside the reactor pressure vessel, the zirconium alloys in the nuclear fuel cladding oxidize and generate hydrogen. The containment will therefore be equipped with passive catalytic hydrogen recombiners arranged so as to maintain the concentration below the explosion limit. The hydrogen concentration control system for the RR SMR reference design is described in Chapter B.I.6.3.2.2.5.2. Design provision for a severe accident [JM02].
- Ensuring containment integrity. The containment structure will be designed to withstand pressure and temperature shocks during a severe accident. More detailed information on the containment structure in the RR SMR reference design is provided in Chapter B.I.6.3.2.3. Protection against external hazards. Specific calculations and demonstrations of containment resistance will form part of the design documentation and will be incorporated into the SMR ETE Operational Safety Analysis Report (PrBZ).

B.I.6.3.1.8.1. Principles for applying the IVR strategy

The SMR ETE design will include several additional features that maximize the likelihood of maintaining reactor vessel integrity during a severe accident:

- Limited core thermal power. Because the SMR ETE core has a relatively lower output per unit volume and is smaller, the heat flux density at the vessel wall is lower than in large reactors. The lower thermal load means that external vessel cooling can remove residual heat more readily. This reduces the risk that the reactor vessel wall will begin to melt as a result of overheating.

- Capability for external reactor pressure vessel cooling. The reactor cavity and containment structure will allow the area around the reactor vessel to be flooded with water in the event of an accident. The objective is to achieve a sufficient rate of heat removal from the outer surface of the vessel and prevent the temperature from exceeding the level at which the melt would melt through the lower part of the reactor pressure vessel.
- Passive external reactor pressure vessel cooling systems. The design will provide passive external cooling systems that remove heat from the volume of water flooding the reactor pressure vessel. SMR ETE will be equipped with systems using natural circulation that will remove heat even during a loss of power. This minimizes dependence on pumps or external power, allowing cooling to function even during a station blackout.
- Reactor depressurization. As part of accident management, the primary circuit will be depressurized before melting begins so that reactor pressure vessel pressure decreases to a low value. This eliminates a high-pressure melt scenario involving increased reactor pressure vessel loading. The released steam and gases will be discharged to the containment through the safety depressurization systems, and the containment will be designed for sufficient internal overpressure. This will protect the integrity of both the reactor pressure vessel and the containment.

The IVR strategy is used in the RR SMR reference design, and a detailed description of the relevant design provisions is provided in Chapter B.I.6.3.2.2.5.2. Design provision for a severe accident [JM02].

B.I.6.3.1.8.2. Principles for applying the EVC strategy

For completeness, the principles for applying the ex-vessel cooling (EVC) strategy are provided, although the reference design does not use this strategy. The strategy would be used only if practical elimination of reactor pressure vessel melt-through during a severe accident could not be demonstrated.

If this strategy were used, the following additional measures would have to be implemented:

- Melt retention and cooling equipment. An area known as the corium pit or core catcher is provided in the reactor cavity and lower part of the containment to receive any molten core debris and reactor internals that melt through the vessel. This area is made of high-temperature-resistant materials, such as special concrete and heat-resistant bricks, and is equipped with cooling channels. Cooling media, water or air, are supplied to these areas through independent and diverse paths, for example passively by gravity from tanks and, alternatively, by pumping from external sources.
- Passive water inventory and alternative coolant supply. The design must include large-volume passive tanks that can be drained into the reactor cavity or core catcher during a severe accident. These tanks must be designed to provide enough water to flood the area beneath the reactor and ensure cooling for at least several tens of hours, even during a station blackout involving loss of electrical power. Once the passive sources have been depleted, provision may be made for replenishing the water using active means or external mobile equipment.
- Heat removal and stabilization of the melt in the containment. If the vessel melts through, the resulting melt, consisting of molten nuclear fuel and reactor internals mixed with concrete and known as corium, spreads into the retention area. Circulation of cooling water or air through channels around the melt ensures that the corium gradually cools and solidifies. The core catcher design must include structures that spread the corium into a wider layer or smaller volumes that can be cooled more effectively. If water can come into contact with hot corium, it must be supplied gradually to reduce the risk of a steam explosion.

The supplier will perform detailed analyses of severe accident progression when applying in-vessel retention (IVR). Deterministic calculations will assess the temperatures reached by the inner surface of the vessel bottom for different quantities of melt, and structural analyses will assess stresses in the vessel material under heating and pressure. The PSA will quantify the probability of vessel failure and sensitivity to input assumptions. If it is not conclusively demonstrated that the reactor pressure vessel will remain intact, deterministic analyses must verify that the containment will remain intact under the implemented EVC strategy and that maximum pressures and temperatures remain within the design limits. Multiple failures will also be taken into account, such as situations in which the functionality of parts of the system is limited by an extreme external event, including a fire or earthquake.

A Level 2 probabilistic safety assessment (PSA L2) will calculate the frequency of scenarios in which the containment would be breached during a severe accident. These frequencies must be very low, on the order of $\leq 10^{-7}$/reactor-year, and must be consistent with the design objectives.

The SMR ETE design emphasizes the IVR scenario and the practical elimination of reactor pressure vessel damage scenarios. The EVC strategy will be considered only if the IVR strategy cannot be demonstrated and practical elimination of a large or early release is not possible.

All analyses will be performed in accordance with Decree No. 329/2017 Coll. and IAEA SSG-54 methodology. The results will be documented in the Preliminary Safety Analysis Report (PBZ) and subsequently in the Operational Safety Analysis Report (PrBZ).

B.I.6.3.1.9. Implementation of general nuclear installation design principles

During preparation of the SMR ETE design, the following important principles will be applied to design provisions at the DBC level and to the individual items of equipment used by these design provisions:

- Conservative safety system design ensuring performance of safety functions without dependence on other equipment.

- Safety systems will be resistant to common-cause failure.
- Sufficient safety system redundancy, including elimination of a single failure under the worst permitted initial equipment configuration.
- Separation, including physical and functional separation, of the individual redundant systems or divisions.
- Diversity in initiating individual safety measures at different DiD levels.
- Diversity of essential services, including media and power, at the site.
- Automatic safety system actuation or use of passive systems so that no main control room operator action is required during the first 30 minutes after event initiation.
- If operator action outside the main control room is necessary, it will not be required earlier than 1 hour after event initiation.
- Safety functions will be ensured for at least 72 hours without the need to use mobile equipment, for the RR SMR reference design.
- Safety functions will be ensured for at least 7 days without the need for external services if response personnel are not present at the site, for the RR SMR reference design.

The following best-estimate principles will be applied to DEC-A and DEC-B provisions:

- Ensuring safety functions if DBC design provisions fail as a result of an initiating event.
- Ensuring the supply of essential services, including power and media, from sources different from the service sources used for DBC where the same service is required at the DEC level; for example, the DEC electrical power source will differ from the DBC source.
- Ensuring performance of safety functions during and after an aircraft crash incident.
- Safety functions will be performed so that no main control room operator action is required during the first 30 minutes after initiation. No operator action outside the main control room will be required for 1 hour. For DEC-B, no action will be required during the first 12 hours, or potentially up to 24 hours.
- Safety functions will be ensured for at least 24 hours without the need to use mobile equipment, for the RR SMR reference design.
- Safety functions will be ensured for at least 7 days without the need for external services if response personnel are not present at the site, for the RR SMR reference design.
- DEC-B provisions will be resistant to all internal and external hazards.

All systems, structures, and components will be designed using principles and standards corresponding to their safety classification or safety class. Equipment used to ensure safety functions will be designed to withstand the environmental conditions present when its function is required. Equipment located inside SMR ETE will therefore withstand the harsh environment that may be present at its location during an event. Equipment located outside interior spaces will withstand the conditions that may occur in the relevant environment, including external climatic conditions for equipment, structures, and components located outside buildings. All equipment will be designed and constructed to permit testing, maintenance, inspection, and the necessary examinations.

The overall site design and arrangement of SMR ETE structures will separate areas where radioactive substances may be present from service areas where personnel are permitted, thereby establishing a controlled area. All structures and external systems, structures, and components will be isolated to the maximum extent from locations that may be sources of internal or external hazards, for example by distance or a barrier from operating-media storage facilities containing gases, diesel fuel, and similar materials. The design will provide escape routes in the event of a threat to personnel, as well as the necessary equipment and routes for the movement of response units and, where applicable, operators during emergency response.

The overall arrangement of structures and roads at the site will facilitate construction, installation of individual components, nuclear installation commissioning and operation, and final decommissioning and demolition.

B.I.6.3.1.10. Equipment examinations and testing, inspection, and maintenance

SMR ETE will be maintained throughout the service life of the nuclear installation. Depending on the required activities, maintenance will be performed either during reactor operation (online maintenance) or during outages (offline maintenance). Online maintenance will be permitted only where it does not adversely affect nuclear installation safety. In some cases, only offline maintenance will be possible, particularly where maintenance would reduce safety system availability. The required availability of safety systems and their permitted configurations will be described in the operating Limits and Conditions.

The design will identify examination, maintenance, inspection, and testing activities that must be performed throughout the nuclear installation life cycle. They will be derived from the requirements for ensuring safety and reliable operation and will be designed in accordance with proven nuclear industry practices.

To ensure a sufficiently long service life for SMR ETE, the nuclear installation design will consider all relevant aging effects, such as corrosion, erosion, and material fatigue caused by mechanical, thermal, or radiation loading, during all operational states. A life-cycle and aging management program for the individual systems, structures, and components will be established to ensure long-term safe operation. This program will maintain

the individual items of equipment in a condition enabling them to perform their safety and other design functions in accordance with the design requirements.

The life-cycle and aging management program will focus primarily on equipment important to safety and on irreplaceable or long-lived equipment. Particular attention will be paid to monitoring large structures and components so that aging effects are detected in good time and preventive and corrective measures can be implemented. Reactor pressure vessel aging management will take account of all relevant factors, including embrittlement, thermal aging, and fatigue. Its actual condition will therefore be determined continuously and compared with the predicted development of that condition through the end of its service life.

The systems, structures, and components life-cycle management program, including managed aging, obsolescence, and similar matters, will be incorporated into the configuration management program, which will be based on international best practices. The configuration management program will be introduced during SMR ETE design and maintained as a "living" system throughout the nuclear installation life cycle, including design, construction, commissioning, operation, and decommissioning.

Equipment testing, inspection, and maintenance will meet Czech legislative requirements, particularly Act No. 263/2016 Coll., the Atomic Act, as amended, and Decree No. 329/2017 Coll. They will form an integral part of the design documentation and subsequent SMR ETE operation and will support equipment reliability in terms of safety, environmental protection, compliance with legislative requirements, and electricity generation. This will ensure that the operability of all equipment required for safety remains consistent with the safe operation assumptions and the design documentation.

The basic SMR ETE design approach to equipment testing, inspection, and maintenance applies the following principles:

- Testing, inspection, and maintenance will be performed throughout the service life of SMR ETE equipment. Appropriate intervals will be selected for individual equipment tests and inspections to achieve the required component reliability. Nondestructive inspection methods will be preferred, and their scope and frequency will correspond to the safety significance, or safety class, of the equipment.
- The intervals and scope of tests and inspections will be determined using the results of a probabilistic safety assessment (PSA), thereby optimizing the SMR ETE configuration in terms of requirements for nuclear safety. Necessary outages of multitrain safety systems will therefore also be considered so that removing them from service for testing or maintenance does not disproportionately reduce the overall safety of SMR ETE.
- Human factors relating to maintenance and personnel participating in the required tests will be considered during SMR ETE design. The equipment will be designed for ease of maintenance, and the testing methods will limit or eliminate the potential for human error.

Testing, inspection, and maintenance methods will form part of the design documentation for all equipment, and their required scope will be reflected in the Limits and Conditions for safe SMR ETE operation.

B.I.6.3.1.11. Design verification and validation

To comply with nuclear installation design rules, the SMR ETE design will undergo verification and validation procedures demonstrating that it is consistent with the safety analysis results and the needs of all stakeholders, such as future operation and maintenance. Verification and validation of the SMR ETE design will be performed in accordance with standard industry practices and will comprise the following activities:

- Design verification will provide objective evidence that the proposed system and all its elements meet the required criteria and have the expected characteristics.
- Design validation will provide objective evidence that the systems, when used, perform the expected safety and operating functions and therefore meet the overall system functionality requirements.

Design verification and validation include equipment qualification. Equipment qualification is the generation and continuous maintenance of evidence ensuring that the applicable equipment will operate when required under specified operating conditions so as to meet the performance requirements for ensuring safety and, where applicable, operating functions. Operating conditions are the physical conditions, expressed in physical parameters, that prevail or are expected during the equipment service life, such as ambient conditions and conditions during external or internal hazards.

Design verification and validation will be applied according to the life-cycle stage of the equipment or system to which they apply at the relevant time. The first step in ensuring design verification and validation will be to define the design requirements by verifying the proposed equipment parameters and comparing them with safety requirements and the requirements of other stakeholders, such as operation and maintenance.

The next step will be to verify the definition of the design requirements in terms of equipment qualification requirements and its ability to perform its safety and operating functions across the expected range of operating conditions and abnormal and accident states. SMR ETE equipment qualification will be performed in three stages and will meet the requirements of Decree No. 329/2017 Coll. and Decree No. 358/2016 Coll., as amended. First, the design requirements for the scope of qualified equipment and the qualification conditions for each component will be collected. The actual design characteristics of the components proposed for individual positions will then be verified so that the equipment meets the design operating conditions. In the third stage, maintenance and inspection of qualified equipment will be established and performed so that the qualification requirements are met throughout the entire SMR ETE life cycle.

B.I.6.3.1.12. Safety analyses

The SMR ETE safety concept includes safety analyses that demonstrate the correctness of the individual design requirements and assess the overall safety of the nuclear installation. SMR ETE safety analyses will include deterministic and probabilistic analyses, as well as special severe accident analyses. The safety analyses will meet Czech legislative requirements, particularly Decree No. 162/2017 Coll., as amended.

B.I.6.3.1.12.1. Deterministic safety analyses

Potential SMR ETE operating risks will be identified using proven procedures standard in the use of nuclear technologies. Such procedures include studies of potential component failures, failure mode analyses, human factors analyses, and similar studies. These processes will produce a list of postulated initiating events (PIEs), whose attributes include occurrence frequency and radiological consequences without safety system or personnel intervention. This bottom-up procedure will be supplemented by a top-down procedure that examines and verifies generic postulated initiating events for pressurized water reactors, assessing whether such generic PIEs can occur at the SMR ETE nuclear installation.

The results of all studies will be compiled into a list of postulated initiating events, which will also determine the required scope of subsequent deterministic analyses and serve as the basis for the PSA model. When deciding whether individual PIEs fall within design-basis events, their possible occurrence frequency and radiological consequences without safety system or operator intervention will be considered. The consequences of these PIEs will be determined using conservative methods and the best realistic input data. For analyses whose input data consist of natural hazard intensities, conservative input data will be used. If possible PIE frequencies are at the boundary between design-basis events and design extension conditions and the input data are subject to substantial uncertainty, such PIEs will be conservatively included among the design-basis events.

The PIE list will be a key input to the deterministic safety analyses, i.e., analyses of potential threats to safety functions and safety measures. For each PIE, a timeline of the event progression across all levels of defense in depth will be prepared, and the necessary protective and mitigating measures included in the SMR ETE design will be characterized. Safety measures ensuring a high level of operational safety and protection against radiological consequences will comprise the use of adequate technical means, or safety systems, and a combination of optimal procedures for main control room operators or nuclear installation operating personnel.

The deterministic analyses will then assess the overall procedure for managing PIEs, including both safety system functions and operator actions, and their results must confirm the performance of all safety functions. Failure sequences will be modeled using validated computer codes in combination with conservative assumptions, such as application of the single-failure criterion or failure of unqualified components, and will be assessed against criteria ensuring sufficient safety margins. These include potential target doses of released radiation, the departure from nucleate boiling ratio (DNBR), pressure in the main process circuits, containment pressure, and the maximum nuclear fuel cladding temperature reached.

Values for the individual criteria corresponding to the applicable levels of defense in depth will be used to define successful safety system and operator intervention. More stringent acceptance criteria will be established for higher-frequency failures, namely PIEs for DBA and DEC-A, than for very-low-frequency failures under DEC-B. The deterministic safety analyses will cover all plant states up to severe accident conditions and will include assessment or elimination of potential cliff-edge effects. For PIEs that could cause an early or large release, the analyses will demonstrate their practical elimination. The analyses will cover the period from time zero, the occurrence of the initiating event, until SMR ETE reaches a stable safe state.

The deterministic safety analysis results will also be used to justify the operating Limits and Conditions and to define and verify strategies for managing emergency events and accident conditions.

B.I.6.3.1.12.2. Probabilistic safety analyses

The probabilistic safety analysis (PSA) will combine information from the PIE list with the probability of safety measure failure, including both safety system and operator action failures, to determine the resulting SMR ETE design objective and compare it with the required value for new reactors. The individual PSA studies will include the following comparisons:

- comparison with the core damage frequency (CDF) objective for Level 1 PSA,
- comparison with the large or early release frequency (LERF) objective for Level 2 PSA.

PSA studies will be performed and updated throughout the design process, with updates intended to examine and verify potential design changes during SMR ETE manufacture and construction. The updated PSA studies will continuously verify the level of radiological risk, which must remain below the design objectives and meet ALARP requirements. The updated PSA studies are also intended to achieve a balanced SMR ETE design so that no element contributes disproportionately to the overall risk.

B.I.6.3.1.12.3. Specific aspects of deterministic severe accident analyses

Severe nuclear installation accidents are states that pose a risk of an early or large release of radioactive substances into the nuclear installation surroundings and represent a high risk to the public and the environment. The purpose of severe accident analyses is to assess the range of postulated nuclear installation behavior during a severe accident involving nuclear fuel melting. The objective of these analyses is to design safety measures that prevent an early release of radioactive substances into the nuclear installation surroundings to the greatest reasonably practicable extent and maintain the fundamental safety function of radioactive substance confinement over the long term.

Severe accident analyses will be performed using the best-estimate method with realistic input data and assumptions. These analyses will include analyses of transient phenomena during the event and source term estimates for individual scenarios. Severe accident progression will be modeled using validated computer codes. These deterministic analyses are intended to verify containment conditions and compliance with the acceptance criteria for containment leaktightness and strength at the DEC-B level.

The severe accident safety analyses will also demonstrate the "practical elimination" of early or large releases of radioactive substances into the SMR ETE surroundings. Practical elimination of early or large releases will be achieved through the SMR ETE design itself and through adequate safety measures during less severe nuclear installation states preceding a severe accident. These analyses are also intended to demonstrate that cliff-edge effects are eliminated and to confirm the qualification assumptions for equipment intended to mitigate the consequences of a severe accident.

The severe accident analysis will build on the PSA because equipment states leading to reactor core damage provide the starting point for developing scenarios in which the SMR ETE state progresses to a severe accident. The deterministic severe accident analysis will serve as an input to the Level 2 PSA for modeling subsequent postulated scenarios involving radiation releases.

B.I.6.3.1.13. Internal hazards

In accordance with Act No. 263/2016 Coll., the Atomic Act, as amended, and Decree No. 329/2017 Coll., the SMR ETE design will also take into account potential internal hazards and highly probable combinations of such hazards arising from the plant's internal environment that could jeopardize the performance of functions important to nuclear safety. The SMR ETE design will include inherent measures against internal hazards and, where this is not possible, resistance to such hazards will be demonstrated so as to ensure safety and reduce risk to the ALARP level.

Internal hazard analyses will take account of national legislative requirements and international WENRA and IAEA requirements and recommendations. The SMR ETE design concept will be based to a large extent on separating the individual safety systems and other important components so that all redundant divisions cannot be lost simultaneously. Separation will be achieved by physical distance between the individual divisions or by sufficiently resistant barriers so that the remaining redundant systems are preserved when affected by an internal hazard. The SMR ETE design will also take account of personnel movement, including the ability to enter and exit and the communication routes inside, which could be restricted by the effects of internal hazards.

Internal hazard identification will consider the initial conditions, extent, and probability of potential hazards; the location of potential hazard sources; and the potential effect on equipment critical to safety, including safety systems and systems affecting nuclear safety. Internal hazards will be assessed using deterministic methods, engineering judgment, and, to the extent reasonably practicable, probabilistic methods. The assessment will consider all internal hazard sources and the corresponding direct and credible indirect effects; for example, a technical gas explosion may breach a tank and cause subsequent internal flooding. The internal hazard assessment process will also consider highly probable combinations of internal hazards, including a state in which a primary hazard causes a secondary hazard or multiple hazards have the same cause. Meaningful combinations of internal and external hazards will also be considered.

Internal hazard sources that cannot be eliminated by technical or organizational measures will be taken into account in the SMR ETE design so that their effects are limited to an acceptable level, and deterministic analyses will be used to assess design resistance to these effects. The safety classification of internal barriers will be performed in the same manner as for other systems, structures, and components, and the corresponding safety class will therefore be assigned to them.

B.I.6.3.1.14. External hazards

In accordance with Act No. 263/2016 Coll., the Atomic Act, as amended, and Decrees Nos. 378/2016 Coll. and 329/2017 Coll., the SMR ETE design will take account of external hazards arising from site characteristics that could jeopardize safety function performance, and the structures will be designed for the loads arising from these characteristics of the Temelín site.

B.I.6.3.1.14.1. Seismic resistance

Seismic resistance of structures, systems, and components will be designed in accordance with Czech legislation and IAEA standards to reflect the specific conditions at the Temelín site. Pursuant to the requirements of SÚJB Decree No. 329/2017 Coll., on Nuclear Installation Design Requirements, seismic resistance will be determined on the basis of a postulated peak horizontal ground acceleration beneath the building structure supporting the relevant system, structure, or component, with a minimum value of PGA = 0.1 g. The RR SMR design declares basic seismic resistance corresponding to a horizontal PGA = 0.3 g.

Two design earthquake levels, SL-1 and SL-2, will be established in accordance with SÚJB regulations and IAEA recommendations. The SL-1 level represents a lower seismic load, known as the "operating" level, whose occurrence must be considered during the plant design life in view of the local geological and seismic conditions. After such a seismic event has ended, the nuclear installation must be capable of being returned to operation following the appropriate inspections. The SL-2 level represents the design value for the maximum seismic load at which the capability to shut down the reactor and perform the fundamental safety functions must be ensured. It is used primarily to assess the resistance of nuclear installation structures, systems, and components significant to safety.

A return period of 100 years is considered for SL-1, and a return period of 10,000 years is considered for SL-2. The design must provide sufficient margins for structures, systems, and components required to prevent early or large radioactive releases so that they do not fail even during an earthquake exceeding SL-2.

Information on the seismic characteristics of the Temelín site is provided in Chapter C.II.11.1. Geological environment and seismicity of the area (page 305 of this Documentation).

B.I.6.3.1.14.2. Geological structure, tectonic conditions, and hydrogeological and geotechnical conditions

The SMR ETE design will take account of the identified geological structure, groundwater flow, and physicochemical properties of groundwater at the SMR siting area.

The layout of the individual SMR ETE structures will be based on the local geotechnical conditions of the SMR siting area.

Information on the geological, geotechnical, tectonic, hydrogeological, and engineering-geological characteristics of the Temelín site is provided in Chapter C.II.11.1. Geological environment and seismicity of the area (page 305 of this Documentation).

B.I.6.3.1.14.3. Extreme climatic hazards and floods

The SMR ETE design will take account of loads caused by climatic extremes.

Extreme climatic hazards include maximum and minimum temperatures, wind speed, torrential rain, and snow cover loads. They also include design values for exceptionally occurring meteorological phenomena such as lightning and tornadoes. For flooding, both extreme torrential precipitation at the site and the extreme water level/flow rate in nearby watercourses are determined and assessed, including the maximum level resulting from a dam failure or ice blockage of a watercourse and the resulting flooding.

Loads due to climatic hazards are specified for two design levels in accordance with the IAEA standards and usual international practice. These are known as design loads and extreme loads. A frequency of once per 100 years is considered for design climatic loads, and a frequency of once per 10,000 years is considered for extreme climatic loads. For extreme loads, the capability to shut down the reactor and perform the fundamental safety functions must be ensured. As with seismicity, an adequate margin will also be assessed for systems, structures, and components preventing early or large radioactive releases under other extreme climatic hazards so that they do not fail even under loads greater than those with a potential frequency of once per 10,000 years.

A detailed assessment of meteorological and hydrological conditions, including the derivation of design values for climatic extremes, is available for the Temelín site. Data from the monitoring networks of Czech Hydrometeorological Institute (ČHMÚ) stations are available for statistical processing of the individual meteorological characteristics. The statistical processing methods are based on the applicable IAEA standards (SSG-18, Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations, 2011). Climatic parameters are assessed periodically on the basis of measurement results. They will continue to be monitored and updated as necessary throughout the SMR ETE service life and will provide a basis for periodic SMR ETE safety reviews.

B.I.6.3.1.14.3.1. Temperature

Extreme outdoor temperature values for the Temelín site were determined from outdoor air temperature measurements at the Temelín, Kocelovice, České Budějovice, and Tábor meteorological stations. Design values for 100-year and 10,000-year maxima are determined by fitting a series of annual maxima using extreme value distributions, specifically the two-parameter Gumbel distribution and the three-parameter generalized extreme value distribution (GEV), in accordance with the recommendations of IAEA Safety Guide SSG-18.

Information on design values for temperature extremes at the Temelín site is provided in Chapter C.II.2.2. Climatic factors (page 227 of this Documentation).

B.I.6.3.1.14.3.2. Wind velocity

Extreme wind speed values for the Temelín site were determined from measured maximum instantaneous wind speeds (1 s). The Temelín, Kocelovice, Churáňov, and Praha-Ruzyně stations were selected to determine extreme wind loads. The locations of all stations are representative in terms of the measured parameter and geographical conditions and comply with World Meteorological Organization requirements.

Information on design wind speed values at the Temelín site is provided in Chapter C.II.2.2. Climatic factors (page 227 of this Documentation).

B.I.6.3.1.14.3.3. Rainfall

The design values for 24-hour precipitation totals at the site were determined from measurements of precipitation intensity and totals at the Temelín, Kocelovice, České Budějovice, and Třeboň stations. The recommended estimates of 100-year precipitation values for all durations are based on the results of the PERUN project, Prediction, Assessment and Research into the Sensitivity of Selected Systems and the Effects of Drought and Climate Change in Czechia, published as an official project output. The design values were recalculated using the ROI method and therefore reflect both the measured data at the site and regional measurements.

Information on design rainfall values at the Temelín site is provided in Chapter C.II.2.2. Climatic factors (page 227 of this Documentation).

B.I.6.3.1.14.3.4. Snowfall and snow loads

The snow load is expressed as the snow water equivalent, i.e., the height in millimeters of the water column produced by melting the snow. This value includes not only water in the form of snow, but also liquid precipitation retained by the snow.

Daily data for the "calculated snow cover water equivalent" were used as the initial values. ČHMÚ calculates these data from snow measurement data, including daily precipitation totals, fresh snow, total snow cover, and measured snow water equivalent, using a special methodology developed by ČHMÚ. This methodology also incorporates liquid precipitation infiltrating the snow. It uses direct weekly snow cover water equivalent measurements and calculates the effects of other parameters such as fresh snow, air temperature and humidity, and precipitation totals. Given the different observation periods at the individual stations, changes in the monitoring network, interruptions in observation, and similar factors, daily area maxima were calculated from the initial data for four variants of distance zones around the Temelín site: 1, 9, 25, and 35 km. Nine suitable stations in this area at elevations from 238 to 485 m a.s.l. were included in the calculation. A series of seasonal maxima of snow cover water equivalent was produced for these station zones.

Fresh snow depth data were processed to determine the design values for maximum snowfall. Fresh snow means a layer of snow or ice formed directly or indirectly from solid precipitation, including snow, hail, snow pellets, snow grains, ice pellets, small hail, and glaze ice, that fell between 7:00 a.m. on the preceding day and 7:00 a.m. on the measurement day.

Data measured at meteorological and climatological stations within 35 km of the Temelín site were used to determine the design values for fresh snow depth. The stations were selected so that their elevations were approximately 400 to 600 m a.s.l.

Information on design snowfall values at the Temelín site is provided in Chapter C.II.2.2. Climatic factors (page 227 of this Documentation).

B.I.6.3.1.14.3.5. Specification of exceptionally occurring meteorological phenomena

Snowstorm: A snowstorm involves strong winds that lift and carry snow and is often accompanied by snowfall or potentially thunderstorms and hail. It is a hazardous phenomenon occurring primarily in North America. It is almost nonexistent at Czech latitudes, and the ČHMÚ network in the Czech Republic monitors the phenomenon indirectly through the combination of snowfall and wind speed. The phenomenon will be assessed as part of external hazard combinations in terms of its parameters for the SMR ETE design, but it is not significant for the purposes of this Documentation.

Dust and sandstorm: A dust or sandstorm involves strong winds carrying fine-grained sand, dusty soil, clay, or peat over long distances from the source of wind erosion. Such storms occur most frequently in arid or semiarid regions. The ČHMÚ network does not observe this phenomenon in the Czech Republic. Dust storm parameters and design values for dust deposits and loads on horizontal structures were determined for the Temelín site by a conservative expert estimate based on similarity to power plants in the United States.

Information on design parameters for dust and sandstorms at the Temelín site is provided in Chapter C.II.2.2. Climatic factors (page 227 of this Documentation).

Cyclones, typhoons, and hurricanes: Tropical cyclones, typhoons, and hurricanes are meteorological phenomena that do not occur in Central Europe.

Drought: Drought is defined as the duration of a continuous interval of days with daily precipitation totals of up to and including 2 mm, i.e., a period with a severe moisture deficit. Based on an assessment of the results of various methods for estimating extreme drought durations and taking the length of the data series into account, ČHMÚ determined the final estimates for drought return periods of 100 and 10,000 years.

Information on design drought parameters at the Temelín site is provided in Chapter C.II.2.2. Climatic factors (page 227 of this Documentation).

B.I.6.3.1.14.3.6. Icing

The number of days with icing and freezing precipitation was assessed at the surrounding meteorological stations. On average, the Temelín site experiences 21 days with icing and 4 days with freezing precipitation each year. A maximum of 35 days with icing and 22 days with freezing precipitation was recorded at the Kocelovice station. Differences between the individual stations are small. ČHMÚ recommended an ice thickness of 80 mm combined with a wind speed of 3 m/s as the design value for icing loads at the Temelín site.

B.I.6.3.1.14.3.7. Hail

Hailstorms occur at the Temelín site an average of 1–2 times per year. The highest recorded number of days with hailstorms in a single year was 5. Differences between the individual stations are small. Hail loads were determined by expert estimate based on the largest hailstones recorded at the Temelín site.

Information on design values for hail loads at the Temelín site is provided in Chapter C.II.2.2. Climatic factors (page 227 of this Documentation).

B.I.6.3.1.14.3.8. Lightning

Under the ČHMÚ methodology, a day with a thunderstorm accompanied by lightning is a day on which 2 or more lightning strikes occur within 10 km of the measurement location. Under this definition, the Temelín site experiences an average of 33 days and a maximum of 51 days with thunderstorms accompanied by lightning each year. Both the number of thunderstorm days and the maximum at the Temelín station are approximately 30 % lower than at the Kocelovice and České Budějovice stations, i.e., an average of 24 thunderstorm days and a maximum of 37 per year. When lightning occurs in Central Europe, 10 to 15 cloud-to-ground discharges per square kilometer per year can be expected. Only 1 % of these cloud-to-ground discharges reach a discharge current of 200 kA.

B.I.6.3.1.14.3.9. Tornado

Data on tornado occurrence in the Czech Republic are available in an online database operated by ČHMÚ and the Amateur Meteorological Society. Data on tornado occurrence in Austria are stored in the European Severe Weather Database. Approximately 3–5 tornadoes per year have been documented in the Czech Republic during the past 15 years. The frequency of recorded cases in earlier years is substantially lower. However, settlement patterns differed significantly from today, a meteorological station observation network providing reliable data has existed for only 100 years, and observation methods and intensity, as well as documentation capabilities, have changed significantly. It is therefore not yet possible to conclusively assess whether the current tornado occurrence rate is higher solely because of more intensive observation or also because of climate change. The nearest tornado to occur close to the Project siting area was an F1 tornado approximately 12 km from the SMR ETE site near the municipality of Vodňany. The nearest F2 tornado was recorded approximately 40–50 km from the SMR ETE site. In terms of tornado dimensions, the Fujita-Pearson tornado intensity scale indicates an expected path length of 1.6–5.0 km and path width of 16–50 m for an F1 tornado, while an F2 tornado has a path length of 5.1–16 km and a path width of 51–160 m. Tornado occurrence was assessed within a circular area with a radius of 130 km, excluding the relevant portion of the circle in Bavaria and the adjacent part of Upper Austria because the high Šumava Mountains separate that area from the Temelín region, making it climatologically significantly nonhomogeneous relative to the area of interest.

Information on the probability of tornado occurrence at the Temelín site is provided in Chapter C.II.2.2. Climatic factors (page 227 of this Documentation).

The design tornado parameters that must be taken into account in the SMR ETE design to protect SMR equipment against these effects correspond to the design tornado parameters for Region III under U.S. NRC RG 1.76. These parameters were selected on the basis of expert assessment and comparison of tornado occurrence frequencies and intensities in the area assessed with U.S. Regions II and III under U.S. NRC RG 1.76.

The design tornado parameters for the Temelín site are provided in Chapter C.II.2.2. Climatic factors (page 227 of this Documentation).

B.I.6.3.1.14.3.10. Floods

The SMR ETE siting area is located near the Vltava River, on which the Hněvkovice hydraulic structure is located. Even during a 1,000-year flood on the Vltava River, the water level would be at an elevation of approximately 371.56 m a.s.l.; smaller surrounding watercourses rise at an elevation of approximately 490 m a.s.l. The SMR ETE site itself is at an elevation of 495 m a.s.l. Flooding of the SMR ETE siting area from surrounding watercourses as a result of extreme rainfall near the SMR or sudden snowmelt is therefore physically impossible. The only flooding that can occur at the SMR ETE siting area is flooding corresponding to the precipitation total, whether rain or snow followed by rapid melting, on the SMR site, or flooding caused by stormwater inflow from the higher-elevation existing ETE1,2 site. The SMR will be designed for such flooding. A hypothetical dam-break wave caused by failure of the Lipno I hydraulic structure does not endanger the SMR ETE siting area because it is located at an elevation of 495 m a.s.l., almost 120 m above the maximum water level of the Hněvkovice hydraulic structure, which would reach an elevation of 376.6 m a.s.l. in this case. Appropriate countermeasures will also be adopted to prevent the SMR ETE site from flooding as a result of a rise in the groundwater level.

B.I.6.3.1.14.3.11. Combinations of extreme meteorological conditions

Design values for combinations of extreme meteorological conditions for the SMR ETE design will be established in the Siting Safety Analysis Report, which will be prepared as a basis for the nuclear installation siting permit process under the Atomic Act.

The SMR ETE Project does not affect the intensity or frequency of extreme meteorological conditions at the site.

B.I.6.3.1.14.4. External biological hazards

In addition to the extreme meteorological conditions described above, SMR ETE will be required to withstand all biological hazards relevant to the site. These include algae and aquatic plants, fish, mollusks, and crustaceans in the raw water source; animals and plants capable of forming airborne swarms or accumulations, such as insects, birds, straw, fallen leaves, and hay; and animals capable of entering the plant and damaging the technology, such as rodents. Where the presence of microorganisms and algae in the external SMR ETE cooling circuits must be limited, appropriately certified biocidal and algicidal agents that do not pose a threat to the environment or public health will be used.

B.I.6.3.1.14.5. Wildfires

Agricultural and forest areas where fires may occur are located in the vicinity of the SMR ETE site. Analyses show that the thermal effects of natural fires near the SMR ETE site will themselves be negligible for the SMR, but adverse effects from the spread of toxic combustion products cannot be ruled out. Appropriate countermeasures will be implemented at SMR ETE to ensure control room habitability and limit effects on personnel.

B.I.6.3.1.14.6. External hazards caused by human activities

The SMR ETE design takes account of loads caused by human-induced hazards.

These hazards originate in the vicinity of the SMR ETE siting area. They arise primarily from industrial or agricultural activities in the region, the transport of hazardous substances along transport routes near the plant, including roads and railways, and air traffic hazards, including an aircraft crash. Other potential external sources of human-induced hazards that must be considered during SMR ETE preparation include accidents involving the storage and transport of hazardous substances at the ETE1,2 site, the future New NPP ETE site, and in the vicinity of the SMR ETE siting area. Potential hazard sources within the ETE1,2 site include, in particular, the storage and internal transport of toxic, explosive, flammable, oxidizing, asphyxiating, and radioactive substances, typically including hydrogen, ammonia, diesel fuel, hydrazine, oxygen, nitrogen, other chemicals used at the plant, and the transport of radioactive waste and spent nuclear fuel. Similar hazard sources can also be expected at the New NPP ETE site.

A specific external human-induced hazard is the potential occurrence of a radiation extraordinary event at other nuclear installations located at the ETE1,2 site, involving releases of radioactive substances into the surroundings, or a radiation extraordinary event at one of the New NPP ETE units if the two-unit alternative is implemented. This would primarily involve a severe accident at a nuclear installation at the ETE1,2 or New NPP ETE site. The approach to managing risks arising from the presence of multiple nuclear installations at the site if accident conditions occur at one of them is described in Chapter D.II.1.4.1. Main principles of protection against common-cause failure and of ensuring protection during a radiation extraordinary event at another nuclear installation at the site (page 465 of this Documentation).

As part of the assessment of other potential human-induced external hazard sources near the SMR ETE siting area, potential sources were screened in accordance with the requirements of SÚJB Decree No. 378/2016 Coll., on Nuclear Installation Siting; IAEA Standard NS-R-3 (Rev. 1); IAEA Recommendations SSR-1, SSG-35, and SSG-79; and SÚJB Safety Guide No. BN-JB-4.2. The screening identified potential human-induced hazard sources near SMR ETE.

The sources are divided into external (stationary and mobile) and internal (stationary and mobile) sources. External sources represent human activities outside the SMR siting area, while internal sources represent activities within the ETE1,2 site that could pose a hazard to SMR ETE. The stationary sources identified included stationary industrial and military facilities and forest stands that could represent potential hazard sources for the SMR. The mobile sources identified similarly included road and rail routes used to transport hazardous substances and aviation, pipeline, and water routes near the SMR. Potential hazard sources within 10 km of the SMR ETE siting area were analyzed. Where multiple sources of the same type were identified, such as filling stations, the source nearest to the SMR was selected as the reference source. For the purposes of assessing the hazard to SMR ETE from an accidental aircraft crash, the criteria established by SÚJB Guide BN-JB-4.2 were applied to airports within approximately 20 km of SMR ETE. For EMI, the assessed area of interference sources covers the frequency range of approximately 50 Hz to 6 GHz. The source and interference object cannot be delineated by distance; electromagnetic field measurements were therefore performed to obtain information on the electromagnetic environment at the SMR ETE site.

Two basic terms are used in English-speaking countries and in WENRA and IAEA documents: "hazard" and "risk". For the purposes of this Documentation, these terms are understood as follows:

Hazard: A property of a substance or a physical or biological phenomenon, process, factor, or system state that has an adverse effect. It is an "inherent" property that cannot be removed from the entity concerned, but it manifests only if the facility assessed is exposed to its effect. A hazard is a source of risk.

Risk: Here it is understood as the relationship between the expected consequence, meaning the consequence of a hazard manifesting, and uncertainty regarding that consequence, generally expressed as the probability of occurrence.

Hazards, or sources of risk, outside a facility are referred to as external or outside event sources, while hazards inside a facility are referred to as internal or inside event sources. Event sources are further distinguished as stationary, associated with a fixed object; mobile, associated with a moving object; pipeline, associated with product pipeline routes; and waterborne. Based on the above classification of event sources, the following text assigns them identification numbers with prefixes according to this key:

External event sources: ES - external stationary, EM - external mobile, EP - external pipeline, EV - external waterborne.

Internal event sources: IS - internal stationary, IM - internal mobile.

Sources of events take the form of facilities and routes where activities involving hazardous substances or forms of energy take place.

The identified human-induced event sources near SMR ETE and the results of the analysis of their potential effects on the SMR are as follows:

B.I.6.3.1.14.6.1. External stationary sources

Table B.3: External stationary event sources near the SMR ETE siting area

Designation	Location	Hazardous substances
ES1	Kočín high-voltage substation	transformer oil
ES2	Týn nad Vltavou filling stations (Shell and GW Jihotrans) and the Š+H filling station in the municipality of Temelín	fuel in underground tanks; liquefied petroleum gas (LPG) in small containers
ES5	Slavětice quarry	industrial explosives
ES7	forest stand near SMR ETE	combustible vegetation

Note: The event sources are numbered consistently with the analyses already performed for the existing ETE1,2 units.

B.I.6.3.1.14.6.2. External mobile sources

Rail transport: Only Railway Line No. 193 passes within 10 km of the SMR ETE siting area; at Temelín station, a siding branches from this line into the ETE1,2 site.

Table B.4: Railway lines near the SMR ETE siting area assessed as external mobile event sources

Designation	Route	Hazardous substances
EM1	public Railway Line No. 193, Číčenice - Týn nad Vltavou, Temelín - Bohunice section	ammonia, ammonium nitrate
EM2	Temelín - ETE railway siding (up to the entrance to the ETE1,2 STP)	aqueous ammonia, nitric acid, sulfuric acid, diesel fuel

Road transport: No Class I or higher-class road lies within 10 km of the SMR ETE siting area, so long-distance road transport of dangerous goods does not need to be assumed. Several Class II roads are located within 10 km of the SMR ETE site. Three roads, II/105, II/138, and II/141, pass closest to the planned SMR ETE site, with Roads II/138 and II/105 passing in the immediate vicinity of the SMR ETE site. Accidents and events on the sections of these roads adjacent to SMR ETE have the greatest potential to affect items important to nuclear safety.

Table B.5: External mobile event sources near the SMR ETE siting area

Designation	Route	Hazardous substances
EM3	Road II/105	Industrial explosives, motor fuels, LPG, acetylene, ammonium nitrate, hydrogen, hydrazine hydrate
EM4	Road II/138	Industrial explosives, motor fuels, LPG, acetylene, ammonium nitrate
EM5	Road II/141	Industrial explosives, motor fuels, LPG, acetylene, ammonium nitrate

Waterways: The Vltava River is not used to transport hazardous and toxic materials, so no waterway event sources potentially affecting SMR ETE need to be considered near SMR ETE.

B.I.6.3.1.14.6.3. Internal stationary sources

Table B.6: Internal stationary event sources at the existing ETE1,2 site

Designation	Location	Hazardous substances
IS1	chemical storage facility (Structure 592/01), presence and replenishment	aqueous ammonia, hydrazine hydrate, nitric acid, sulfuric acid
IS2	cylinder gas storage facility (Structure 642/01), presence	acetylene, hydrogen, oxygen, propane-butane, methane, argon-methane mixture
IS3	hydrogen storage system (Structure 643/01), presence and replenishment	hydrogen
IS4	diesel fuel system (Structure 703/04), presence and replenishment	diesel fuel, oils, used oils
IS5	gas boiler room (Structure 410), pipeline transport to boilers	natural gas
IS8	nitrogen storage system (Structure 643/01), presence and replenishment	nitrogen
IS10	storage facility for bitumen and bituminized radioactive waste near BAPP (Structure 801), presence and replenishment	bitumen, conditioned radioactive waste

Note: The event sources are numbered consistently with the analyses already performed for the existing ETE1,2 units.

B.I.6.3.1.14.6.4. Internal mobile sources

Table B.7: Internal event sources on transport routes within the existing ETE1,2 site

Designation	Route	Hazardous substances
IM1	rail route to the chemical storage facility (from the railway gatehouse along Structure 801 to Structure 703/01, then northwest through the turnout and past the south side of Structure 641/01 to Structure 592/01), transport	aqueous ammonia, nitric acid, sulfuric acid
IM2	road route to the chemical storage facility (from the road gatehouse to Structure 592/01), transport	hydrazine hydrate
IM3	road route to the cylinder gas storage facility (from the road gatehouse	acetylene, hydrogen, oxygen, propane-butane, methane, argon-methane

	between Structures 592/01 and 655/02 and, before Structure 590/01, turning left southeast to Structure 642/01), transport	mixture
IM4	road route to the hydrogen storage system (turning left after the road gatehouse between the administration building and Structure 701/01, then southeast to Structure 643/01), transport	hydrogen
IM5	rail route to the diesel fuel unloading track at the diesel fuel system (from the railway gatehouse along Structure 801 to Structure 703/04), transport	diesel fuel
IM6	road route to the unloading point at the diesel fuel system (from the road gatehouse between Structures 592/01 and 655/02 and, before Structure 641/01, turning left southeast to Structure 703/04), transport	diesel fuel
IM7	road route to the nitrogen storage system (turning left after the road gatehouse between the administration building and Structure 701/01, then southeast to Structure 643/01), transport	nitrogen
IM8	Road route to the bitumen storage facility (from the road gatehouse, turning right before Structure SO592/01, then past SO801 to the bitumen storage facility), transport	bitumen

B.I.6.3.1.14.6.5. Air operations and transport

The SMR ETE site lies within prohibited airspace LKP2, which is established around ETE1,2. LKP2 is cylindrical, has a radius of 1.1 NM (approximately 2 km), and extends from the ground to 5,000 ft AMSL (approximately 1,500 m above sea level). All air operations are prohibited in this airspace, except for flights authorized by the Civil Aviation Authority of the Czech Republic and essential life-saving, aerial firefighting, police, and military flights.

In 2021, standard routes through fixed points in Czech airspace above flight level FL95 were replaced by the free route airspace (FRA) system. Flight routes can therefore be planned to optimize operating economics, provided the flight plans comply with FRA rules. Published routes remain below FL95, but their use is generally not mandatory for flights under instrument flight rules (IFR). The planned route must always comply with the current rules and restrictions for the relevant airspace. Z30 is the published route nearest to the SMR ETE site, with a minimum distance of approximately 20 km from the site. It may be used for IFR flights under the specified conditions, but its use is not mandatory. The SMR ETE site itself is not located within the protection zone of any civil or military airport.

To assess accidental air traffic risks, the analysis covered movements at all airports within 20 km of SMR ETE, all relevant civil aviation accidents in the Czech Republic during 2015–2024, and military aircraft accidents since 1993. For an intentional aircraft crash, the approach used to account for the event in the SMR ETE design is described in Chapter D.II.1.5.1. Risk of a terrorist attack (page 468 of this Documentation).

B.I.6.3.1.14.6.6. External pipeline routes

The assessment of risks arising from pipeline routes near the SMR ETE site identified gas pipelines within 10 km of the site. Four branches of a transit gas pipeline pass in the immediate vicinity of the existing ETE1,2 site. Separate studies of accidents on these gas pipeline branches assess in detail potential gas release scenarios and their effects on ETE1,2 and New NPP ETE. These results can also be applied to SMR ETE, which will be in a more favorable position because it will be farther from the transit gas pipeline routes than ETE1,2 or the planned New NPP ETE. The SMR ETE design will provide protection against potential horizontally diffusing gas releases, and it can be assumed that the existing diffusion barrier protecting ETE1,2 will be used to the maximum possible extent.

B.I.6.3.1.14.6.7. Electromagnetic interference and stray electric currents

Electromagnetic field strength and stray current density were measured within the SMR ETE site.

For stray electric currents, measurements at the future SMR ETE site showed a higher density of direct-current stray currents near the hot-water pipeline to České Budějovice, and alternating-current stray currents were also measured near the 110 kV VVN line and the 400 kV ZVN line. These facts will be taken into account in the SMR ETE design.

No external electromagnetic interference sources that would restrict SMR ETE operation were identified.

B.I.6.3.1.14.6.8. Strong vibrations

Sources of strong vibration represent sources of induced seismicity. These primarily involve risks associated with ground movements, which were assessed as part of the area's seismological conditions, and these vibration sources were assessed as negligible. Vibration caused by explosions near the SMR ETE site was also assessed and found to be negligible.

B.I.6.3.1.14.6.9. Environmental pollution

Sources of air, surface water, groundwater, and geological environment pollution within 5 km of the SMR ETE site were identified and assessed. Several sources of pollution affecting individual environmental components were identified, but the assessment showed a negligible effect on SMR ETE.

B.I.6.3.1.14.7. Conclusion of the preliminary analyses

The results of the analyses of the above human-induced hazard sources showed that events at certain sources near the SMR ETE site involving the release and dispersion of clouds of toxic, flammable, and explosive gases may have a potentially adverse effect on the SMR. The SMR ETE design will take these events into account, and appropriate countermeasures will be adopted to eliminate adverse effects on SMR technology or operators or limit them to an acceptable level. The conclusions of these analyses are described in greater detail in Chapter D.II.1.4, Risks associated with human activities at and around the site (page 465 of this Documentation).

B.I.6.3.1.14.8. Design extension conditions and cliff-edge effects

The SMR ETE design will also take account of external hazards more severe than external design basis events, i.e., events with an occurrence frequency lower than once per 10,000 years. For these events, deterministic analyses will determine, among other matters, the severity levels of an external event at which safety function performance cannot be ensured; demonstrate the existence of margins in systems, structures, and components affecting nuclear safety that can be used to manage accident conditions; and demonstrate the existence of a margin before a cliff-edge effect occurs. A cliff-edge effect means undesirable nuclear installation behavior consisting of a significant change in the nuclear installation state caused by a small deviation in operating conditions or a nuclear installation parameter.

B.I.6.3.1.15. Safety categorization and classification

Defense in depth for the SMR ETE design will be achieved through practical and independent design provisions that ensure the performance of fundamental safety functions and the associated high-level safety functions and prevent an event from progressing to an accident state. The safety functions to be performed by the nuclear installation will be assigned to Categories I, II, and III according to their significance to nuclear safety, in accordance with Annex No. 1 to Decree No. 329/2017 Coll., on Nuclear Installation Design Requirements. To ensure performance of the safety functions, systems, structures, and components in the SMR ETE design will be divided into:

- systems, structures, and components not affecting nuclear safety,
- systems, structures, and components affecting nuclear safety that are not selected equipment, and
- selected equipment, specifically
  - selected equipment that is not a safety system, and
  - safety systems.

Selected equipment will be further classified in Safety Class 1, 2, or 3 based on the category of the safety function it performs.

Specific classification of selected SMR ETE equipment will be performed during the next design preparation phase in accordance with the principles described above under Decree No. 329/2017 Coll., on Nuclear Installation Design Requirements, SÚJB guides, and WENRA and IAEA requirements.

Further information on safety categorization and classification in the RR SMR reference design is provided in Chapter B.I.6.3.2. Technical and technological design (page 116 of this Documentation), specifically Subsection B.I.6.3.2.5. Safety categorization and classification in the RR SMR design.

B.I.6.3.1.16. Categorization and classification of security equipment

Security functions correspond to the individual stages of a potential attack on the nuclear installation. A graded approach will be applied to the design of equipment used to secure SMR ETE, with the applicable security category assigned to each security function. These categories will be assigned on the basis of the potential consequences of a potential attack. To identify these consequences, the relevant security analyses will be performed for the individual delineated areas, including specific categorization of the individual internal areas and their division into guarded, protected, inner, and vital areas pursuant to Decree No. 361/2016 Coll., on the Security of Nuclear Installations and Nuclear Materials, as amended. Analyses of potential theft within these areas, particularly potential theft of nuclear materials, will be performed in connection with the division of the internal areas, as will a security analysis of cybersecurity risks.

Further information on the categorization and classification of security equipment in the RR SMR reference design is provided in Chapter B.I.6.3.2. Technical and technological design (page 116 of this Documentation), specifically Subsection B.I.6.3.2.6. Categorization and classification of security equipment in the RR SMR design.

B.I.6.3.1.17. Seismic classification

Seismic resistance classification defines the quality requirements imposed on systems, structures, and components and the resistance required of each element in response to seismic events. Specific seismic classification of SMR ETE systems, structures, and components will be performed during subsequent design preparation phases in accordance with Decree No. 329/2017 Coll., on Nuclear Installation Design Requirements, SÚJB guides, and WENRA and IAEA requirements.

Further information on seismic classification in the RR SMR reference design is provided in Chapter B.I.6.3.2. Technical and technological design (page 116 of this Documentation), specifically Subsection B.I.6.3.2.7. Seismic classification in the RR SMR design.

B.I.6.3.1.18. Radiation extraordinary event management

The future operator is responsible for preparing organizational measures and emergency procedures for managing radiation and non-radiation extraordinary events. The following text therefore summarizes only the design requirements for systems that will support emergency organization and management. Legislative requirements for radiation extraordinary event management are established primarily by Act No. 263/2016 Coll., the Atomic Act, as amended, Decree No. 359/2016 Coll., as amended, and Decree No. 329/2017 Coll. Under the SMR ETE design, all equipment described below will withstand design extension conditions and enable accident management up to a severe accident (DiD 4). The interventions and organizational measures to be further developed by the future operator serve to ensure defense in depth at DiD 5.

B.I.6.3.1.18.1. Main control room

The SMR ETE design includes a centralized main control room for controlling all nuclear installation states, located inside the reactor island structure. From the main control room, operators will monitor the situation and take action to correct identified problems and deviations, including responding to potential accident states. Given the predominance of passive SMR ETE safety systems, no main control room operator action will be required during the first 30 minutes after a failure occurs. The main control room will be designed to maintain a habitable environment for the specified period from the occurrence of a fault state until the unit is stabilized and brought to a safe state. It will have sufficient resistance to both design basis conditions (DBC) and design extension conditions (DEC).

The main control room will be equipped with a backup (secondary) ventilation system that backs up the normal ventilation system if normal electrical power is lost. During a radiation accident or in the presence of other substances hazardous to life or health, ventilation system isolation is initiated automatically; the standard system is shut down and the backup closed-cycle ventilation system is placed in operation.

The main control room will be designed using scientific and research findings concerning human-machine interaction so as to minimize the potential for human error.

B.I.6.3.1.18.2. Backup (emergency) control room

The SMR ETE design will also include a backup (emergency) control room for use if the main control room is uninhabitable, for example because of a fire. The backup control room will be located so that a single event cannot simultaneously jeopardize both control rooms, but sufficiently close to allow operators to move rapidly from one control room to the other. The backup control room will be used to monitor and control safety systems so that a safe SMR ETE state can be achieved and maintained. The design will ensure that control is possible from only one of the control rooms at any time, preventing uncoordinated or malicious control of equipment.

B.I.6.3.1.18.3. Emergency response center

The emergency response center will comprise the crisis center (emergency response team), technical support center, and operational support center. These facilities will enable an appropriate response to emergencies such as a radiation release or another hazard, including a fire or the effects of external hazards of natural origin. The crisis center will coordinate external response units and other external support entities, including external communications. It will also coordinate the technical support center, which provides technical advice, and the operational support center, which manages the response of operating personnel and field response units.

B.I.6.3.1.18.4. Physical protection control center

The center will cooperate with the crisis center to ensure site protection during an emergency.

B.I.6.3.1.18.5. External (backup) emergency response center

If an accident progresses to the point where broader protective measures, such as evacuation, are required, the backup crisis center facility will be activated. This facility will be maintained as a permanent standby workplace and staffed only when necessary, specifically if the main emergency response center fails or is unavailable, so as to perform all its essential communication and coordination functions. The future license holder will determine the location of the backup emergency response center.

B.I.6.3.1.18.6. Site entrances and exits

The SMR ETE protective barrier will contain two vehicle and pedestrian entrance/exit points on opposite sides of the barrier to reduce the risk that any single event would prevent passage through an entrance/exit point. The specific passage locations have not yet been identified and will be added later. Similarly, the locations and numbers of passages into and out of the reactor island building will be specified on the basis of the specific location of the structure at the site.

B.I.6.3.2. Technical and technological design

B.I.6.3.2.1. Basic information

Small modular reactors (SMRs) are new Generation III+ or potentially Generation IV nuclear reactor designs whose electrical output ranges from single-digit values to hundreds of MW_e. SMRs use a broad range of reactor technologies and a modular approach to designing key components and systems that can be manufactured and assembled into the relevant modules directly at manufacturing plants and subsequently transported and installed in the relevant generating unit at the construction site.

Compared with existing reactors, proposed SMR designs are generally simpler, and the SMR safety concept often relies more heavily on passive systems and inherent reactor safety characteristics such as low output and operating pressure. In such cases, this means that no human action, external energy supply, or other force is required to shut down the reactor because passive systems rely on physical phenomena such as natural circulation, convection, and gravity. In some cases, these increased safety margins eliminate or significantly reduce the potential for hazardous radioactive releases into the environment during an accident.

The basic SMR ETE technical information is summarized below:

- the power-generating unit will be equipped with a Generation III+ light water reactor (LWR) incorporating a high degree of passive safety features,
- net electrical output of up to 500 MW_e,
- service life of at least 60 years,
- the design will comply with Czech legislation and apply the experience and recommendations of international institutions,
- the power plant will operate in the base-load portion of the daily load curve and will be capable of providing the transmission system operator with ancillary services corresponding to primary, secondary, and tertiary control,
- the average generating unit availability will exceed 90 %.

The Rolls-Royce design (RR SMR) is considered and presented as the reference design for the SMR ETE Project.

Safety objectives have been established for the RR SMR design, with the fundamental safety objective being to protect workers, the public, and the environment from the harmful effects of nuclear and conventional hazards:

- nuclear hazards take into account the risks expected from exposure to ionizing radiation,
- conventional hazards include all other anticipated sources of harmful effects.

The RR SMR reference design is designed so that it can be constructed, commissioned, operated, maintained, and decommissioned in a manner that controls and minimizes risks from both nuclear and conventional sources of potential harm, demonstrates the application of best available and proven techniques, and ensures that safety, security, and safeguards principles are implemented in the design. This means:

- Implementation of the safety principle: compliance with the framework of defined operating conditions, prevention of progression to accident conditions, or mitigation of the consequences of accidents. Implementation of this principle protects workers, the public, and the environment from undue radiation risks.
- Implementation of the security principle: prevention and detection of, and timely response to, theft, sabotage, unauthorized access, unlawful transfer, or other intentional harmful acts involving the unauthorized handling of nuclear material, radioactive substances, or associated equipment.
- Implementation of the safeguards principle: timely detection of the misuse of nuclear materials or technologies and prevention of nuclear weapons proliferation; provision of assurance that states using nuclear material and nuclear installations do so solely for peaceful purposes. These matters are addressed within the framework of international treaties, agreements, and conventions.

In the RR SMR design, the prevention of accident conditions and mitigation of their consequences are based on the implementation of defense in depth (DiD). Requirements are also established for a conservative design and the performance of the necessary analyses; experience from good operating practices is applied, adequate maintenance and testing requirements are established, and appropriate quality standards are implemented. All these measures are intended to minimize the probability of failures.

The RR SMR is designed so that postulated initiating events are managed within design basis conditions and do not directly result in design extension conditions (DEC), where reasonably practicable.

Performance of the fundamental safety function requiring the prevention of the spread of radioactive substances into the environment is essential to the practical elimination of an early or large radiological accident. The RR SMR therefore gives priority to ensuring the required reliability and effectiveness of measures at the individual DiD levels so that the lower DiD levels prevent the need to use the higher DiD levels. This is achieved through the use of passive safety features, robust technological equipment, and adequate procedures. The practical elimination of an early or large release of radioactive substances is ensured by preventing events that could lead to an early or large radiological accident, while also ensuring an adequate level of protection and maintaining the functionality of all levels of defense in depth.

The basic characteristics of the RR SMR reference design are as follows:

- The RR SMR is a single-reactor generating unit with a light-water-moderated pressurized water reactor (PWR). The primary circuit has a three-loop configuration, and the electrical output is up to 500 MW_e. The reactor uses standard fuel assemblies containing UO_2 fuel pellets enriched to a maximum of 4.95 % U-235 as nuclear fuel. Core reactivity is controlled by control rods, and the core configuration is designed so that the temperature coefficient of reactivity is always negative. Coolant containing dissolved boron is not used to control core reactivity. Potassium hydroxide (KOH) is used to increase the pH of the primary coolant.
- The primary circuit has a three-loop configuration, with one vertical steam generator in each loop. Each circulation loop includes one centrifugal seal-less reactor coolant pump connected directly to the steam generator outlet nozzle. The steam generators are located above the reactor pressure vessel to permit gravity-driven natural circulation if the reactor coolant pumps fail.
- A pressurizer is connected to the hot leg of one primary circuit loop to control coolant pressure. Coolant pressure is controlled by electrical heaters in the lower part of the pressurizer to increase pressure and by cooler spray into the steam space to reduce pressure. Water (coolant) in the pressurizer is maintained at saturation conditions to provide sufficient pressure in the primary circuit. The pressurizer is a cylindrical low-alloy steel vessel whose properties permit rapid cooling and heating without damage, thereby enabling pressure control in the primary circuit.
- The RR SMR design uses proven PWR technologies with the objective of maximizing design simplification and introducing inherent nuclear safety and environmental protection principles. Defense in depth is ensured through redundant and diverse safety systems. The generating unit design emphasizes the use of passive safety systems, appropriately complemented by diverse active safety systems. Passive safety measures are designed to perform their safety functions without requiring external intervention for 72 hours.
- Both passive and active safety systems are used to remove residual heat after reactor shutdown under fault and accident conditions. Residual heat removal systems may use the same equipment employed during normal operation, such as steam generators, if that equipment is available. However, specialized systems are also available for heat removal under accident conditions, both passive systems, such as a gravity-fed water supply for replenishing the steam generators followed by heat removal through natural circulation, and active systems. The basic safety systems are passive systems; active systems are considered diverse systems.
- Core reactivity under fault and accident conditions is controlled primarily by a passive reactor shutdown system using control rods, which is actuated automatically and can also be actuated manually. An active system for the rapid injection of boron concentrate into the reactor is provided as an alternative reactor shutdown system. Each system is independently capable of bringing the reactor to a subcritical state and maintaining subcriticality until complete cooldown.
- To prevent the release of radioactive substances under fault and accident conditions, the entire primary circuit and other important systems are located inside a steel pressure vessel (the inner containment), whose penetrations are fitted with isolation valves so that the penetrations can be hermetically sealed and radioactive substances isolated within the containment.
- Diverse mechanical, electrical, and control systems are available for design extension conditions without significant nuclear fuel damage (DEC-A). Design extension conditions involving significant nuclear fuel damage (DEC-B) are addressed by retaining the core inside the reactor pressure vessel (the in-vessel retention strategy) and removing heat from the containment using independent passive or active systems.
- Independent, diverse instrumentation and control (I&C) systems initiate reactor shutdown, residual heat removal from the core, and containment isolation. Two types of I&C system are provided: nonprogrammable hard-wired equipment serving as the primary system for initiating reactor shutdown and actuating safety systems, and diverse equipment implemented as a nuclear-qualified programmable electronic system that permits the use of complex computational functions for reactor trip signals and serves as the secondary system. Electronic accident management systems enable the display of predicted nuclear installation states over the days and months following a postulated accident.
- The Category II emergency AC power supply is provided by two diesel generators that, following a loss of off-site power, can provide the safety systems with uninterrupted power for 168 hours (7 days). The RR SMR is also equipped with a Category I DC uninterruptible battery power supply, which supplies the I&C systems that actuate the safety systems, the containment isolation valves, and the systems used to start and operate the Category II emergency AC diesel generators. The Category I DC battery power supply also supplies the monitoring systems necessary to control the generating unit under accident conditions for 72 hours. If the emergency AC power supply (Category II emergency power supply diesel generator) fails, the RR SMR is equipped with a diverse alternate AC power system (AAC DG), which supplies diverse safety equipment and charges the Category I DC batteries.
- The reactivity of both fresh and irradiated nuclear fuel is controlled by the fuel storage rack configuration without the use of a liquid absorber (borated solution). Heat removal from the irradiated fuel storage pool is provided by two independent redundant systems, each sized to remove 100 % of the residual heat. If these systems fail, the irradiated fuel is cooled by evaporation of water from the pool, providing heat removal for at least 72 hours without external intervention. Two mechanical handling devices, one outside and one inside the steel containment, and a polar crane inside the containment are provided for handling during refueling. All handling equipment is fitted with trip and interlock devices to prevent loads from falling and consequently damaging the nuclear fuel.
- Structures are designed to provide protection against external hazards, including seismic isolation bearings that attenuate horizontal seismic ground motion and limit the maximum acceleration transmitted to the other reactor island structures. A reinforced-concrete protective structure (Hazard Shield) surrounds the inner hermetically sealed steel containment and provides protection against a design basis aircraft crash and other external hazards of natural origin and hazards caused by human activity.
- Waste treatment technologies are based on the best available and proven technologies so as to minimize the generation of both radioactive and non-radioactive waste and discharges. Technological modules are used for waste treatment to ensure a high degree of design flexibility.

Operating the reactor without boron in the primary coolant significantly reduces the environmental impacts of discharges and simplifies the entire waste management system.

- Protection against internal hazards is ensured by using separate redundant divisions of safety systems and other systems, structures, and components that serve to ensure safety. Radiation doses to personnel are minimized by separating active components from areas in which personnel move, suitably shielding equipment, using appropriate construction materials, and optimizing coolant chemistry.

A more detailed description of these systems is provided in the following chapter.

B.I.6.3.2.2. Data on the RR SMR reference design

The reference design data are based on Rolls-Royce SMR documentation, specifically the document set *"Environment, Safety, Security and Safeguards Case Version 3, Tier 1"*, available at https://gda.rolls-royce-smr.com/documents. The set of supporting documents is referred to below as "E3S" (Environment, Safety, Security and Safeguards). The E3S documentation describes the RR SMR generating unit design principles, which are based on recognized international principles, including IAEA, WENRA, and EUR requirements.

To facilitate orientation, the technological designation of individual systems or design provisions is shown in square brackets in this chapter, for example, [JAA] denotes the reactor pressure vessel. Where appropriate, the description of individual systems and design provisions is supplemented by the original English descriptive abbreviation in parentheses, for example, (HPIS) = "High Pressure Injection System", because these abbreviations are generally in common use in the field of nuclear technology. Where no commonly established Czech equivalent exists for an element or system, or English is used in a figure, the original English terms are provided in parentheses to facilitate understanding of the function of the system or design provision described. The accompanying figures in the text originate from the above-mentioned Rolls-Royce SMR documentation and are retained in their original form.

Table B.8: Basic RR SMR design parameters

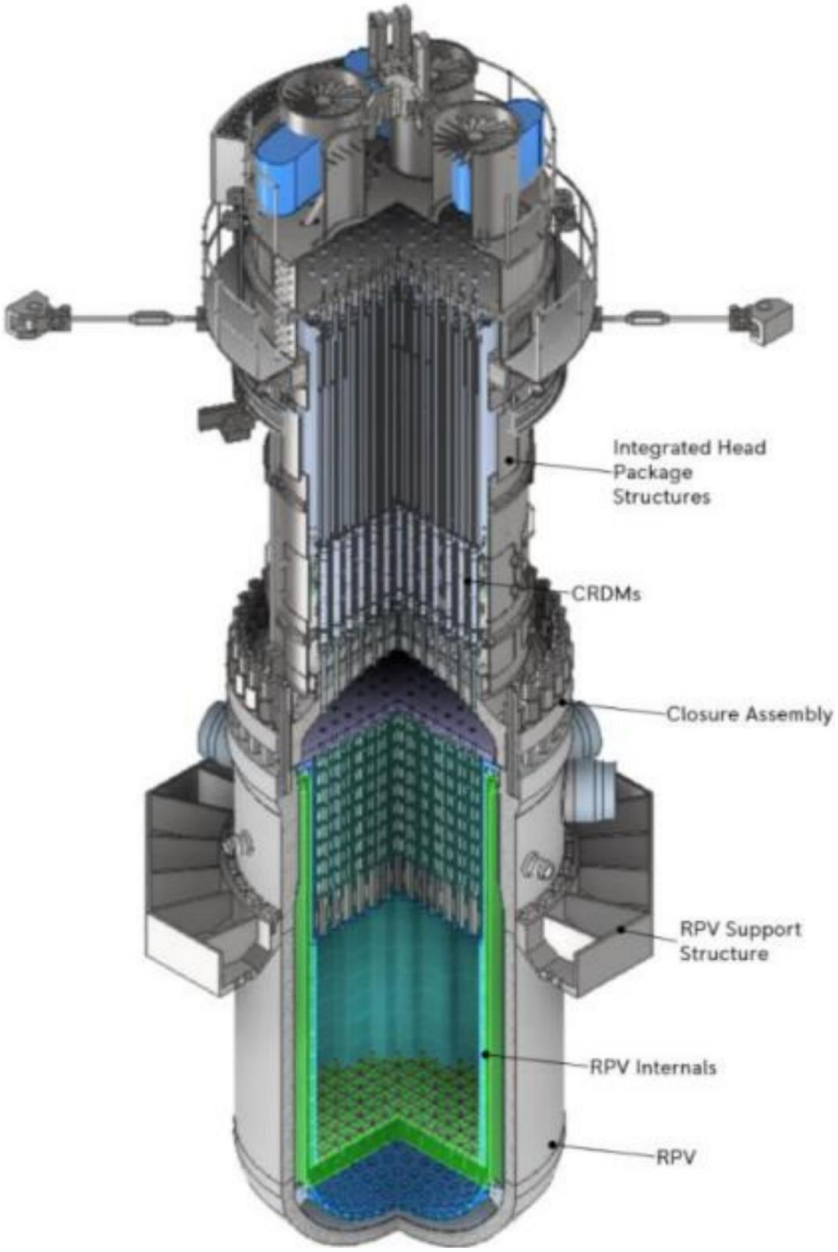
Parameter	Value
Reactor thermal output	up to 1,400 MW_t
Design life	60 years
Net electrical output (depending on power plant configuration)	up to 500 MW_e
Expected capacity factor	>90 %
Coolant/moderator	light water
Primary circulation	forced circulation during normal operation, natural circulation for residual heat removal
Primary circuit operating pressure	15.5 MPa
Maximum primary circuit design pressure	17.6 MPa
Fuel cycle	18 months
Nuclear fuel	Industry-standard UO_2 in a 17 × 17 lattice
Active nuclear fuel length	2.8 m
Number of fuel assemblies	121
Nuclear fuel enrichment	<4.95 % U-235
Reactivity control	89 control rods for primary reactivity control, alternative boron concentrate injection system
Outage length	18 days (target value)
Containment	full-pressure steel vessel
Number of loops	3

B.I.6.3.2.2.1. Nuclear reactor [JA]

The nuclear reactor system [JA] comprises many components, the most important of which are as follows:

- Reactor pressure vessel (Reactor Pressure Vessel [PT108]).
- Reactor pressure vessel head (Closure Head [PT158]).
- Reactor upper assembly (Integrated Head Package [PT159]).
- Reactor internals (RPV Internals [PT110]).
- Fuel assemblies (Fuel Assemblies [PT164]).
- Neutron sources (Neutron Sources [PT165]): used only for the first fuel loading and inserted at the positions of normal fuel assemblies.
- Control rod assemblies (Control Rod Assemblies [PT190]).
- Control rod drive mechanism assembly (Control Rod Drive Mechanism [PT101]).

Fig. B.12: Simplified diagram of the nuclear reactor [JA]



The nuclear reactor is connected to the primary circuit [JE] by three primary loops connected through nozzles distributed evenly around the circumference at 120° intervals. The reactor internals maintain the fixed positions of the fuel assemblies located in the core barrel.

B.I.6.3.2.2.1.1. Reactor core [JAC]

The function of the reactor core [JAC] is to generate heat through a fission chain reaction and remove this heat by means of the primary coolant during normal operation. The reactor core [JAC] comprises 121 fuel assemblies. Each fuel assembly contains nuclear fuel (UO_2) with a maximum U-235 enrichment of 4.95 %. Because a liquid absorber (boric acid solution) is not used for reactivity control, the fuel also contains a burnable absorber (Gd_2O_3), which reduces core reactivity at the beginning of the fuel cycle. The reactor core is designed for 18 months of normal operation at rated power. Individual fuel loads will be specified in separate fuel-loading designs for each fuel cycle.

The reactor core systems also control reactivity by means of the controlled movement of 89 control rods, both insertion and withdrawal. Their movement is controlled by drives [PT101] connected to the control rods by extension rods. When the reactor is shut down, all 89 control rods are fully inserted into the reactor core. A total of 32 fuel assemblies are not fitted with control rods and are used to accommodate sensors or, where applicable, the neutron source for the first fuel loading. The fuel assemblies rest on the lower core support plate, below which a mixing plenum ensures an even distribution of coolant flow through the individual assemblies. Springs hold the fuel assemblies against the upper core plate, above which an extension tube assembly secures the control rods and their extension rods, which connect them to the drive mechanisms.

The core system performs all fundamental safety functions, namely reactivity control, heat removal from the nuclear fuel, and confinement of radioactive substances, during normal and abnormal operation and under accident conditions up to DEC-B.

B.I.6.3.2.2.1.2. Control rods [PT190]

The control rods [PT190] are the primary means of controlling reactor core reactivity, and there are 89 in total. The RR SMR design uses three unique control rod designs, each made of a different absorber material and performing a different function:

- Reactor shutdown absorber rods (Type 1): fully withdrawn during normal operation and containing the largest reserve of negative reactivity. When reactor shutdown is required, they are inserted into the core by gravity and are capable of ensuring sufficient subcriticality.
- Control rods (Type 2): arranged in three groups, with some continuously partially inserted into the core to control reactivity during reactor power changes and transients.
- Gray rods (Type 3): ensure the correct core power distribution by balancing reactivity and provide reactivity compensation during the operating cycle. They replace the dissolved boron solution of variable concentration commonly used for long-term reactivity compensation in PWR (VVER) reactors.

All three types of control rod consist of stainless steel tubes containing pellets made of different absorber materials with different absorption capacities. The pellets are held in a stable position inside the tubes by spring force. The spring mounting also accommodates the thermal expansion of the pellets. At the bottom, they terminate in a welded projectile-shaped plug to reduce hydraulic resistance during insertion.

Each rod (tube) has a chromium coating to increase wear resistance. Type 1 absorber rods used for reactor shutdown have cladding tubes with increased wall thickness. The increased wall thickness is required because the absorber material, boron carbide, swells and releases helium during irradiation.

When the reactor is shut down and all 89 control rods are fully inserted, the lower ends of the absorber sections are level with the lower ends of the fuel assemblies; when the control rods are fully withdrawn, the lower absorber sections are level with the upper part of the fuel assemblies. Above the upper control rod position are nine additional "parking" positions into which a control rod can be withdrawn further without changing core reactivity. Regular repositioning prevents excessive rod wear.

During full-power operation, only the control rods (Type 2) are used; gray rods (Type 3) may be used to compensate for transients and during reduced-power operation. All 89 control rods contribute to reactor shutdown, including emergency shutdown.

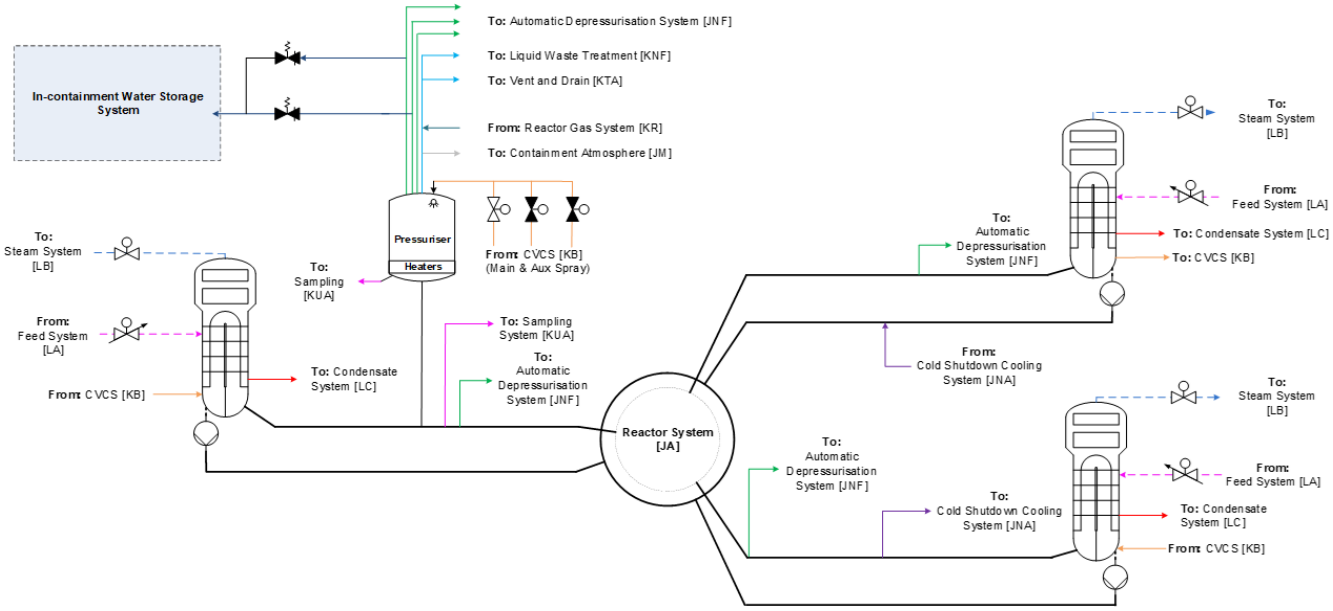
B.I.6.3.2.2.2. Primary circuit [JE]

The primary coolant circuit [JE] transfers heat from the reactor system [JA] to the steam generator system [JEA], in which steam is produced to drive the steam turbines and subsequently generate electricity during normal operation. The primary circuit pressure boundary forms the third barrier against the release of radioactive substances into the environment and comprises the following subsystems:

- The nuclear reactor pressure vessel [JAA], which contains the reactor core with the nuclear fuel, with the reactor internals ensuring uniform primary coolant flow through the fuel assemblies.
- The steam generator system [JEA], which transfers heat from the primary coolant to the secondary coolant and produces steam that is conveyed through the steam line systems [LBA] to the steam turbine [T01].
- The reactor coolant pump system [JEB], which provides forced circulation of primary coolant through both the reactor and the steam generators, thereby transferring heat.
- The reactor coolant piping system [JEC], each loop of which comprises a hot leg that transfers heat from the reactor to the steam generator and a cold leg that returns coolant from the steam generator to the reactor pressure vessel through the reactor coolant pumps [JEB].
- The primary circuit pressurizer system [JEF], which controls primary circuit pressure and limits primary circuit pressure during transients.
- The pressurizer safety valves [JEG], which provide primary circuit overpressure protection.

The primary circuit system supports fundamental safety functions, including support for the reactivity control system [JD] and systems for removing residual heat from the reactor under fault and accident conditions, up to DEC-B.

Fig. B.13: Simplified diagram of the primary circuit



Primary coolant chemistry is controlled by the letdown and makeup system [KBA], which maintains chemistry within the prescribed limits by dosing chemical reagents.

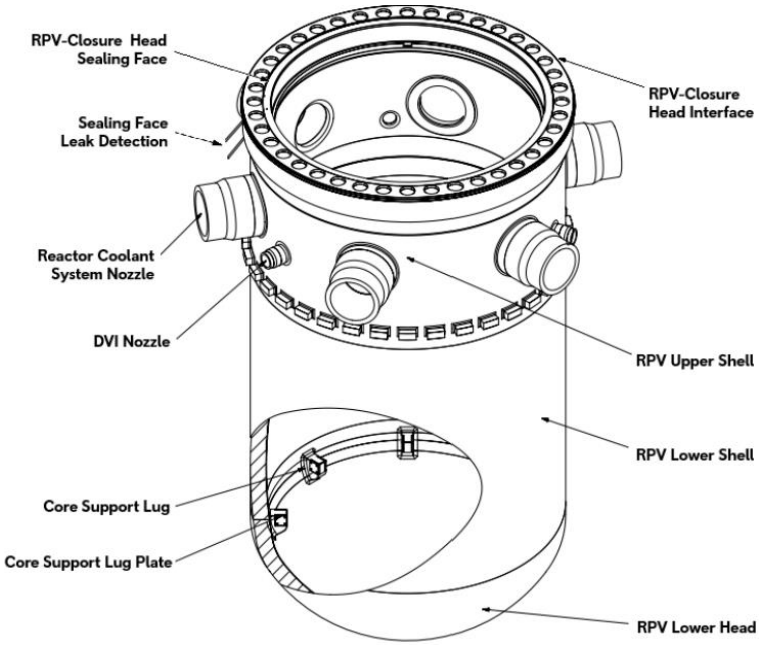
B.I.6.3.2.2.2.1. Reactor pressure vessel [JAA]

The reactor pressure vessel [JAA] comprises three main forgings:

- The upper shell (RPV Upper Shell), with six nozzles for connecting the circulation loops and three nozzles for emergency coolant injection as part of the emergency core cooling design provision [JN01].
- The lower shell (RPV Lower Shell) is a one-piece forging without longitudinal welds or nozzles and with a uniform wall thickness.
- The reactor pressure vessel lower head (RPV Lower Head) is a one-piece formed forging that reverses the flow of primary coolant from the cold legs into the lower part of the reactor core and supports the reactor internals by means of support feet.

The reactor internals, including the reactor core [JAC], are located inside the reactor pressure vessel. Primary coolant returning from the cold legs flows through the cold nozzles into the vessel and downward along the inner wall of the reactor pressure vessel to its lower head. The flow then reverses direction, and the coolant enters the reactor core, where it is heated, after which the primary coolant exits the reactor pressure vessel through the hot nozzles. The coolant flow paths inside the pressure vessel are separated by the reactor internals.

Fig. B.14: Diagram of the reactor pressure vessel [JAA]



All reactor pressure vessel forgings are made of a chemically resistant material with excellent mechanical properties, good weldability, and high resistance to degradation mechanisms such as irradiation embrittlement of steel. The pressure vessel nozzles are made of material compatible with the material of the connected piping, namely the circulation loops, to ensure good weldability. All wetted parts have an internal austenitic stainless steel weld overlay to protect the inner surface of the reactor pressure vessel against corrosion.

B.I.6.3.2.2.2.2. Reactor coolant pumps [JEB]

The reactor coolant pump system [JEB] comprises three vertical, single-stage, seal-less centrifugal pumps, shown in gray in the following figure. Each pump is located in one primary circuit loop and is connected to the body of the corresponding steam generator, shown in green in the following figure. Each reactor coolant pump is connected by a nozzle to the reactor coolant piping, shown in blue in the following figure, and comprises a hydraulic casing, impeller, electric motor, electrical equipment, and heat exchanger. Each reactor coolant pump is equipped with a flywheel that prolongs pump coastdown during loss-of-primary-coolant-flow events.

Fig. B.15: Connection of reactor coolant pumps to the steam generator [JEB]



The reactor coolant pump electric motor is powered through a frequency converter, which provides smooth pump startup and reduces pump output during normal reactor shutdown. Each reactor coolant pump has its own electrical switchgear and transformer and is equipped with the necessary instrumentation and control systems.

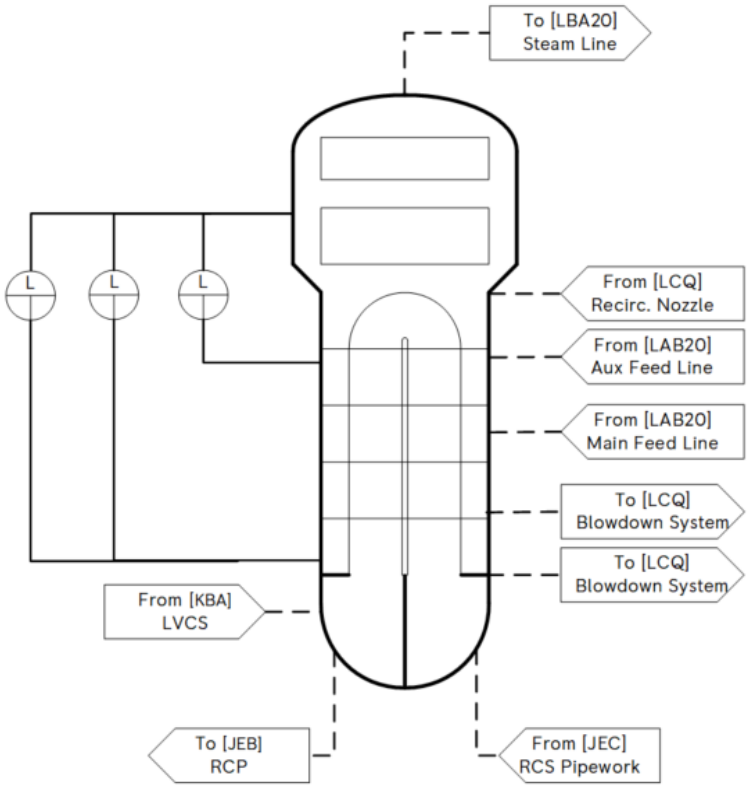
B.I.6.3.2.2.2.3. Steam generator system [JEA]

The steam generator system comprises three vertical shell-and-tube steam generators that serve as heat exchangers and transfer heat from the primary coolant to the secondary medium to produce steam. All three steam generators are located inside the steel containment above the reactor pressure vessel so that gravity-driven natural coolant circulation can be used if forced flow is lost because the reactor coolant pumps fail.

The steam generators use centrifugal water droplet separators to dry the steam produced, which is conveyed through the steam lines [LBA] outside the containment and used to drive the steam turbine [T01] and generate electricity. The steam generator design provides cross-flow feedwater preheating by directing the incoming cooler feedwater [LAB] to the colder side of the tube bundle, namely toward the primary coolant outlet to the reactor coolant pump and the cold leg of the primary piping. This increases the efficiency of converting feedwater into steam.

The steam generator system also includes narrow-range and wide-range level measurement, which is necessary to effectively control the quantity of feedwater supplied and maintain a stable steam generator water level. Signals for actuating protective systems are also derived from the steam generator water level.

Fig. B.16: Schematic diagram of the steam generator [JEA]

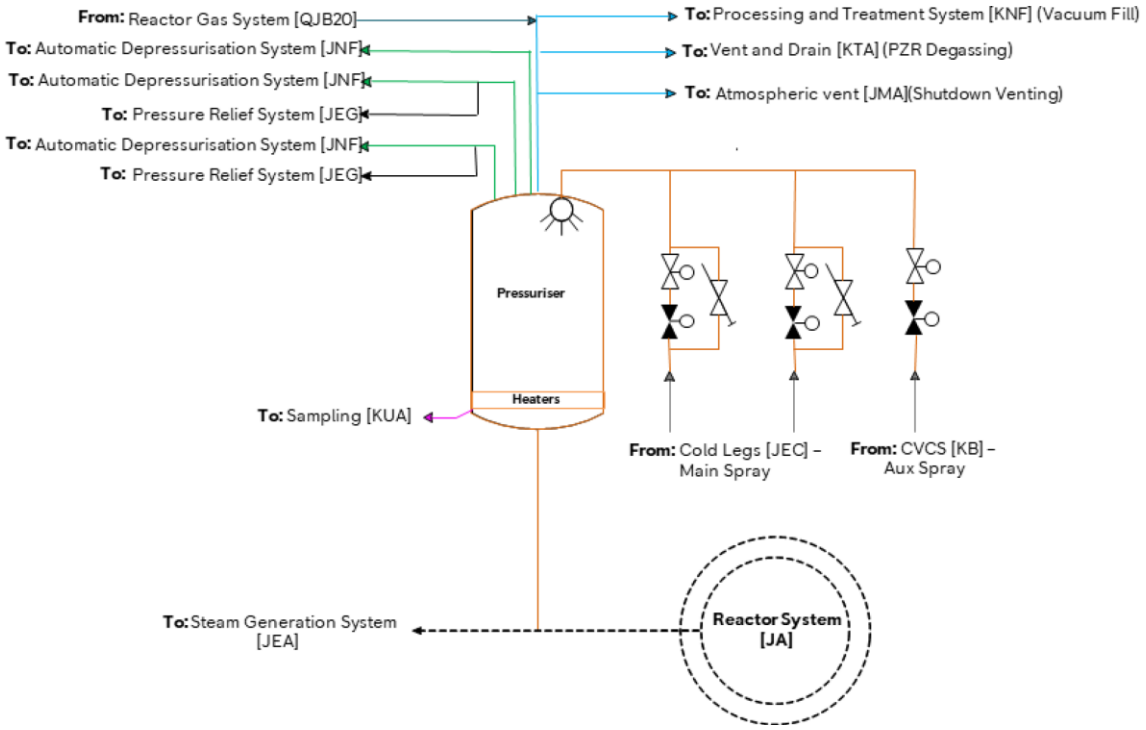


Steam generator chemistry is controlled by continuous feedwater blowdown to system [LCQ]. During both reactor startup and controlled shutdown, for example for refueling, the secondary side will be passivated using hydrazine to minimize the concentration of oxygen dissolved in the feedwater.

B.I.6.3.2.2.2.4. Primary circuit pressurizer [JEF] and overpressure protection [JEG]

A key component of the primary circuit pressure control system [JEF] is the pressurizer, which is connected to the hot leg of one primary circuit loop. Pressurizer pressure control is based on the equilibrium between water and steam at saturation conditions, which maintains the required primary circuit pressure and prevents coolant boiling in the core and other parts of the primary circuit. System pressure is increased by electrical heaters in the lower part of the pressurizer water volume. System pressure is reduced by condensing the pressurizer steam volume using sprays of cooler water from the cold leg of a primary circuit loop. The pressure differential required for correct spray operation is provided by connecting them to the reactor coolant pump discharge. During low-pressure operation, at pressures below 2 MPa, the steam volume is sprayed by the makeup pumps [KB].

Fig. B.17: Simplified diagram of pressurizer operation (primary circuit pressure control) [JEF]



The primary circuit pressure control system [JEF] is connected through three nozzles on the pressurizer body to lines that subsequently branch into the high-pressure safety valve system [JEG] and the automatic depressurization system [JNF], as described below. Other auxiliary systems are also connected, including sampling, pressurizer degassing, the vacuum filling system, atmospheric venting, and similar systems.

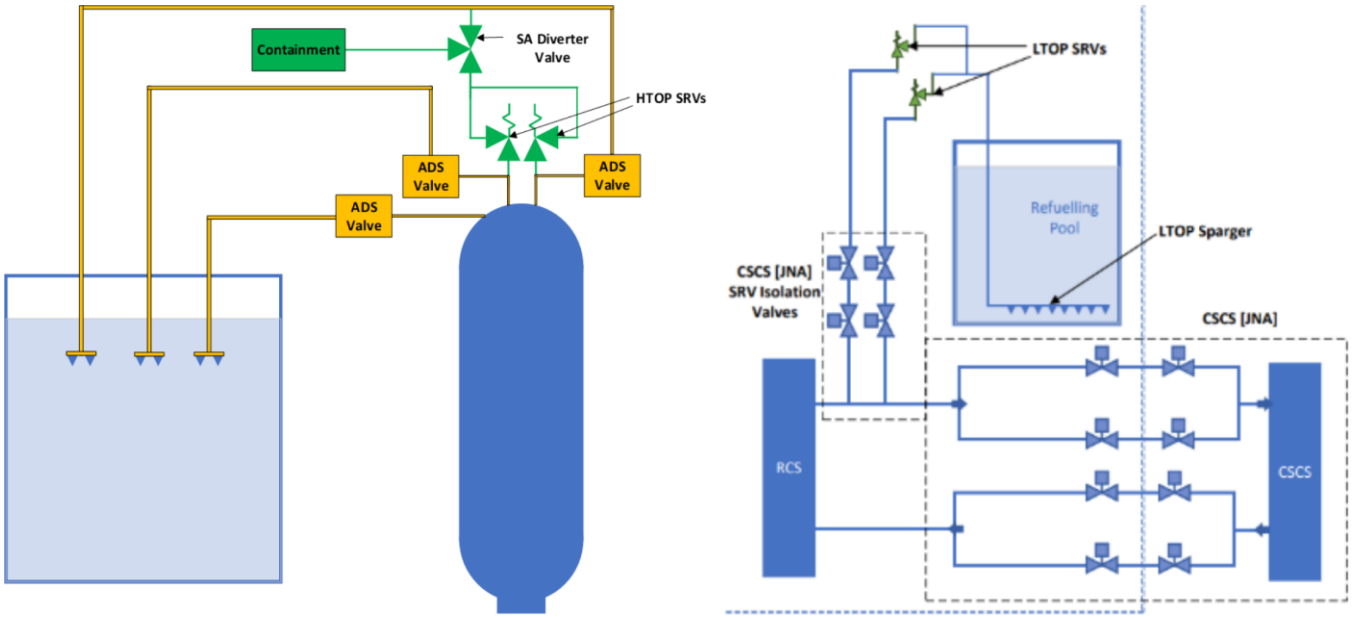
During normal operation, system [JEF] maintains the primary circuit operating pressure at 15.5 MPa (+/- 0.1 MPa). The pressurizer steam volume is degassed periodically by discharging non-condensable gases to the drain system [KTA]. A stable pressurizer level is maintained by the primary circuit makeup and letdown system.

The primary circuit overpressure protection system [JEG] comprises two subsystems:

- High-temperature primary circuit overpressure protection (HTOP), which performs its function using two redundant controlled safety valves located at the top of the pressurizer. Each redundant train is capable of performing the required safety function over the entire range.
- Low-temperature primary circuit overpressure protection (LTOP), which performs its function using two redundant controlled safety valves located on the primary circuit piping, specifically on the shutdown cooling system [JNA] line. Each redundant train is capable of performing the required safety function over the entire range.

The high-pressure safety valves discharge the medium into the in-containment water storage system [JNH], while the low-pressure safety valves discharge it into the refueling pool [FAF]. If necessary, the high-pressure safety valve outlet can be routed by a three-way valve directly into the atmosphere inside the containment, which would be used to inert the containment atmosphere if hydrogen were present. However, this flow path must be placed in service by the operator through the severe accident management system.

Fig. B.18: Simplified diagram of primary circuit overpressure protection (high-pressure/low-pressure system)

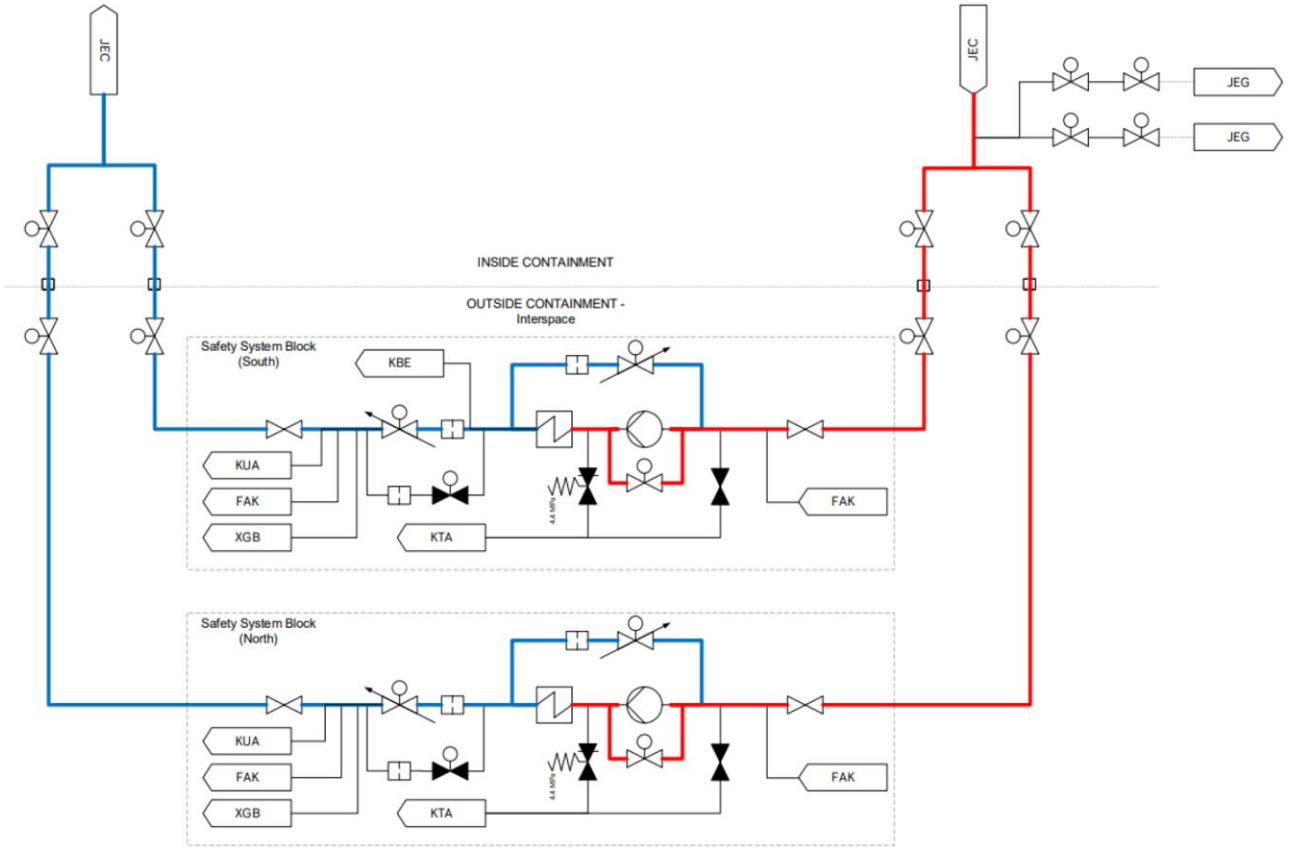


B.I.6.3.2.2.2.5. Low-temperature shutdown cooling system [JNA]

At primary circuit temperatures above 120 °C, the steam generators and steam discharge to the secondary circuit are used to remove residual heat from the primary circuit. This method becomes ineffective at primary circuit temperatures below 120 °C, and the low-temperature shutdown cooling system [JNA] is used for further cooldown, for example before refueling. During cooldown below 120 °C, two redundant trains of this system are used until a temperature of 55 °C or lower, as required for refueling, is reached. During refueling, residual heat is then removed by the irradiated fuel storage pool cooling system [FAK].

Reactor coolant is withdrawn from one hot leg of a primary circuit loop and divided between two parallel cooling circuits. Each cooling circuit contains a low-pressure pump and a heat exchanger cooled by the primary component heat removal system [KAA]. The cooled primary coolant is returned to the primary circuit cold leg. Other auxiliary systems are also connected to the circuit, including primary coolant purification, makeup and letdown, sampling systems, and similar systems. The entire system [JNA] is located outside the containment and is connected to the primary circuit through isolation valves arranged in series for safe separation.

Fig. B.19: Simplified diagram of low-temperature shutdown cooling [JNA]



System [JNA] can also be used as a backup cooling system for the irradiated nuclear fuel storage pools. Branches for the primary circuit low-pressure overpressure protection system [JEG] are located on the common suction line of the two trains. Startup of the entire system [JNA] is interlocked until primary circuit parameters, specifically pressure and temperature, that are safe for its operation and are specified in the Limits and Conditions have been reached.

B.I.6.3.2.2.3. Design provisions for core cooling and residual heat removal

The RR SMR design includes four design provisions supporting the fundamental safety function of residual heat removal from the core under fault conditions:

- Emergency core cooling (ECC) [JN01].
- Passive decay heat removal (PDHR) [JN02].
- High-temperature heat removal (HTHR) [JN03].
- Low-temperature decay heat removal (LTDHR) [JN04].

For initiating events during normal or abnormal operation, the HTHR [JN03] or LTDHR [JN04] design provision is used to remove residual heat. If the HTHR [JN03] design provision fails, the PDHR [JN02] design provision provides the required cooling. If design provisions [JN02], [JN03], and [JN04] are unavailable, the ECC [JN01] design provision is used for heat removal at the design basis conditions (DBC) level.

B.I.6.3.2.2.3.1. Emergency core cooling (ECC) design provision [JN01]

The emergency core cooling design provision [JN01] removes residual heat from the reactor core and transfers it to the atmosphere. The primary function of design provision [JN01] is to provide sufficient coolant to remove residual heat from the reactor core and transfer it to the atmosphere. Design provision [JN01] performs the fundamental safety function of "Heat removal from the reactor core" for initiating events corresponding to design basis conditions (DBC), and thus corresponds to defense-in-depth level DiD 3a.

The fundamental principles of the design provision are as follows:

- Primary circuit depressurization and coolant injection from accumulators [JNG]. Once the initiation conditions are met, the system automatically depressurizes the primary circuit into the in-containment water storage system (IWSS) tank [JNH] and directly into the containment. After the pressure in the primary circuit decreases, coolant is injected passively from the accumulators by means of the pressure differential.

- Gravity flooding of the reactor core with coolant from the in-containment water storage system (IWSS) [JNH] through the low-pressure injection system (LPIS) [JNG]. The in-containment water storage system (IWSS) is connected so that water from the tank floods the reactor core by gravity through nozzles located directly on the pressure vessel. The quantity of water in the internal tank is sufficient to flood the entire core above the top of the fuel assemblies. Water escaping from the flooded reactor collects in the steel containment sump [UJA].
- Recirculation and heat removal from the containment. Coolant from the containment sump flows back into the reactor through recirculation lines under the gravity head between the containment sump water level and the reactor. Steam produced by boiling coolant condenses on internal containment heat exchangers, which passively transfer heat to three external system [JNK] tanks, designated LUHS (Local Ultimate Heat Sink) in the following figure. Heat from these tanks outside the containment is subsequently removed to the atmosphere by boiling.

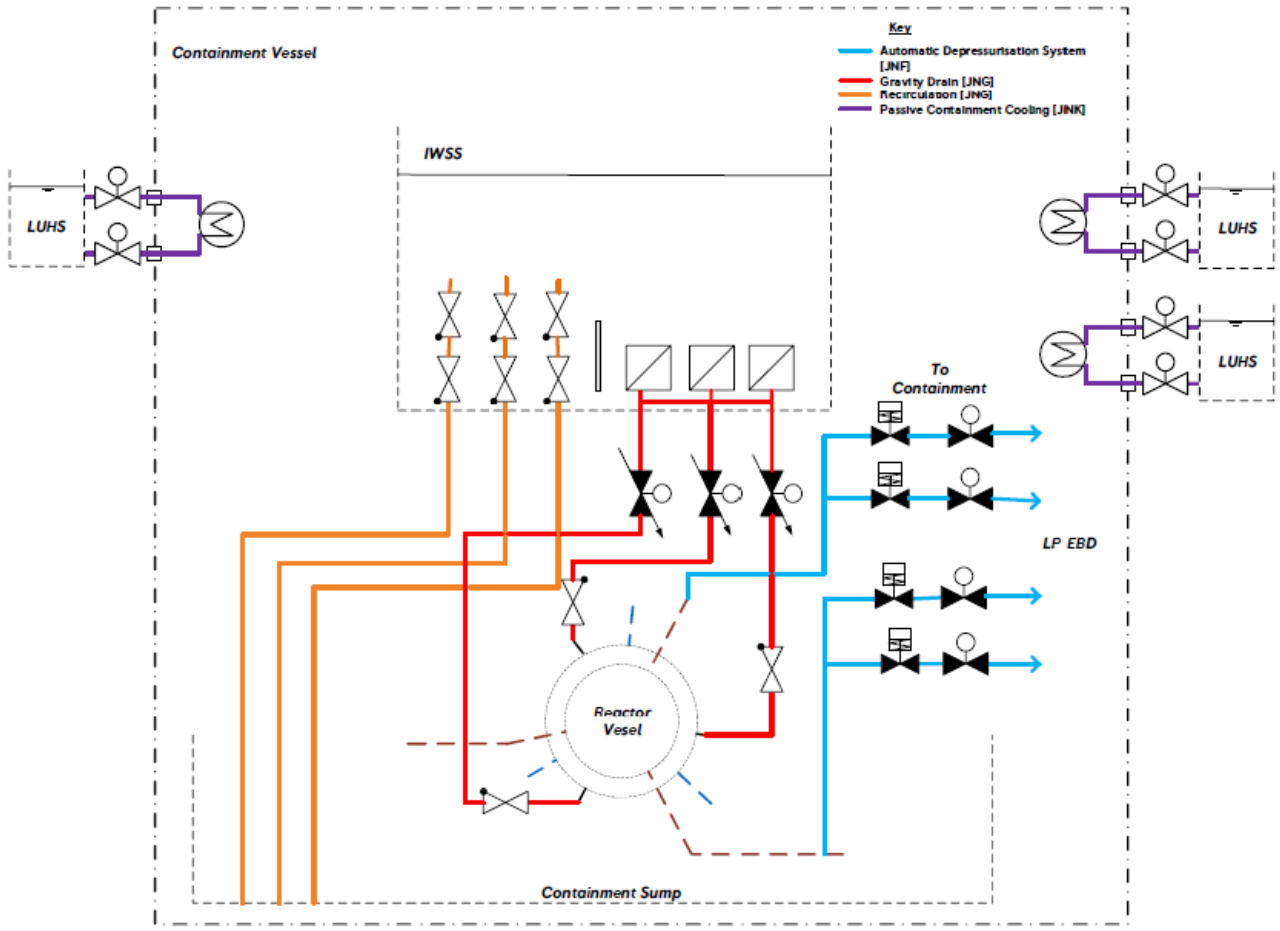
The emergency core cooling design provision [JN01] operates in conjunction with the reactor trip system [JD01], which ensures core subcriticality and thus performs the fundamental safety function of "Reactivity control". It also interacts with the containment system [JMA] and containment isolation system [JM01], thereby performing the fundamental safety function of "Confinement of radioactive substances".

Design provision [JN01] meets the following fundamental safety requirements:

- Performance of safety functions during design basis accidents and exposure to design basis external hazards.
- High reliability, with the probability of failure of an individual redundant train between 1E-03 and 1E-05.
- Optimized controls meeting human-machine interface (HMI) requirements to minimize human error.
- Equipment qualification for environmental and seismic conditions.
- Application of codes and standards for safety systems.
- The system design and construction permit testing, maintenance, inspection, and examinations that ensure reliability and performance throughout the life cycle.
- A modular design permitting straightforward assembly, commissioning, and decommissioning in accordance with the applicable strategies.
- A design that reduces activation of the materials used to facilitate decommissioning.
- The design specifies adequate resistance to component aging and degradation throughout the life cycle.
- Sufficient redundancy of system divisions to ensure single-failure resistance in the event of an individual failure, failure caused by an initiating event, or unavailability due to maintenance, examinations, testing, or inspections.
- Separation and segregation of the individual redundant system divisions.
- Functional diversity and automatic system initiation without requiring main control room operator action for the first 30 minutes after an initiating event or action by personnel outside the main control room for the first hour after an initiating event.
- Performance of the safety function during a complete loss of off-site power and a station blackout without support from essential on-site services, such as alternate power supplies, for 72 hours and without off-site services for 7 days.

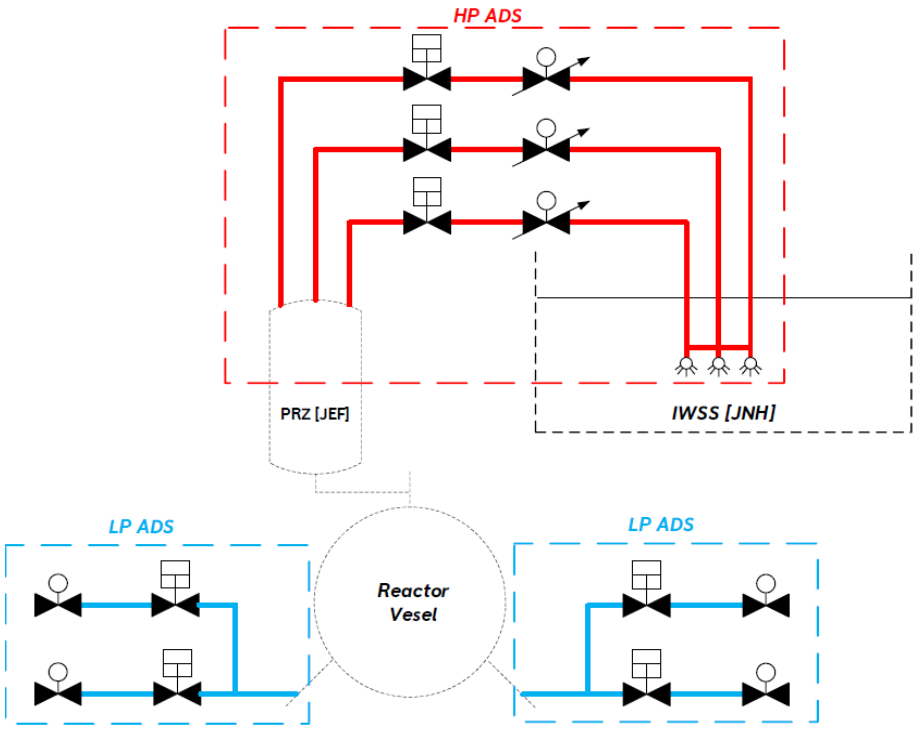
The basic architecture of design provision [JN01] comprises three independent redundant cooling systems, each independently capable of performing the safety function of the entire design provision.

Fig. B.20: Simplified diagram of the principle of design provision [JN01]



All these functions are initiated automatically without operator action. A high-pressure automatic reactor depressurization subsystem [JNF] is used to provide timely primary circuit depressurization and core flooding by accumulators.

Fig. B.21: Simplified diagram of the high-pressure (HP ADS) and low-pressure (LP ADS) primary circuit depressurization system [JNF]



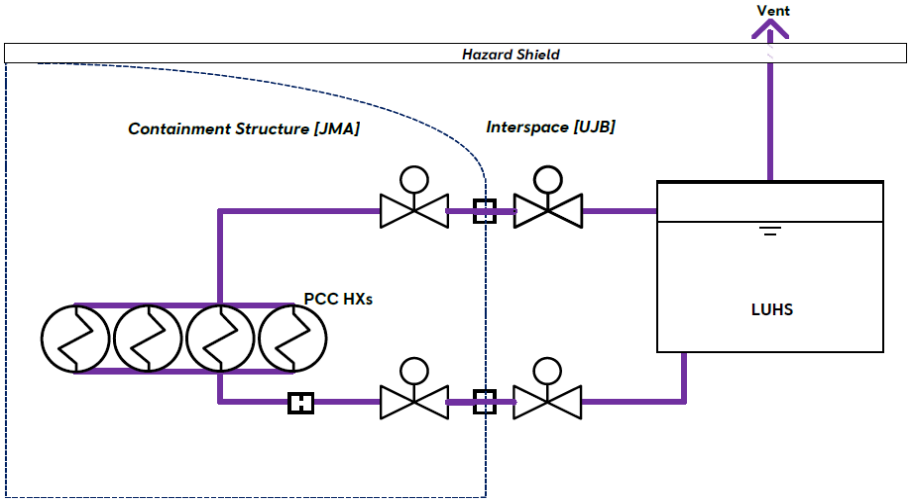
The primary function of the high-pressure portion (HP ADS) of subsystem [JNF] is to reduce primary circuit pressure sufficiently to permit coolant delivery from the passive accumulators [JNG]. Pressure is reduced through three trains connecting the pressurizer to the in-containment water storage system (IWSS) tank [JNH]. Steam from the pressurizer is routed below the tank water level and condenses there, thereby depressurizing the primary circuit. The system comprises three redundant trains, each capable of performing the full pressure-reduction function. Each train is connected independently to the pressurizer steam space and contains, in series, a passive opening valve (Emergency Blowdown, EBD), a control valve, and a sparger located below the IWSS tank water level.

To provide gravity flooding of the reactor from the IWSS tank, the pressure differential between the reactor pressure vessel and the atmosphere inside the steel containment must be minimized. This function is performed by the LP ADS subsystem for low-pressure primary circuit depressurization within subsystem [JNF]. The setpoints and primary circuit depressurization sequence are configured so that the system performs its safety functions for all loss-of-coolant accident (LOCA) sizes.

Low-pressure injection system [JNG]: The low-pressure injection system [JNG] comprises the accumulators and gravity flooding of the reactor core from the in-containment water storage system (IWSS). The accumulators are used during LOCA events in power operation, as described above. In shutdown states involving primary coolant leakage, only gravity flooding from the IWSS tank is used, with depressurization provided by the LP ADS low-pressure depressurization system. The design uses three accumulators, each of which alone is sufficient to flood the entire reactor core. The connecting piping between the accumulators and the reactor is fitted with two check valves in series, which prevent the accumulators from being overpressurized during normal operation.

Local ultimate heat sink system [JNK]: The primary function of the local ultimate heat sink system is to remove residual heat from the interior of the containment to the environment. The system comprises three identical redundant trains, each containing a water tank connected to four heat exchangers inside the steel containment. The individual tanks are interconnected so that any heat exchanger can be connected to any tank.

Fig. B.22: Simplified diagram of the local ultimate heat sink system [JNK]



Each system [JNK] division is sized to remove residual heat from the containment for 24 hours. Because residual heat generation decreases over time and the initial accumulated heat is removed immediately after reactor shutdown, two system divisions are capable of removing residual heat for 72 hours. Operator action to interconnect the individual LUHS tanks is required to provide longer-term cooling for 72 hours.

The primary function of the internal heat exchangers (PCC HX) is to condense steam inside the steel containment and return the condensate to the containment sump by drainage. Coolant circulation between the LUHS tanks and the PCC HX heat exchangers is provided by gravity-driven natural circulation. Each system division line is fitted with two isolation valves that are open during normal operation. After 72 hours, once the coolant has evaporated from the system into the atmosphere, water can be replenished from the safety coolant makeup system [KAX].

B.I.6.3.2.2.3.2. Passive heat removal design provision (PHDR) [JN02]

The principle of the passive heat removal design provision PHDR [JN02] is to transfer heat from the reactor core to the atmosphere during specific event sequences classified as design basis accidents, such as a small LOCA or SGTR. The design provision performs the fundamental safety function of "Heat removal" according to the following principles:

- Removal of residual heat in steam from the steam generators [JEA] through downstream independent passive heat exchangers located below the water level in the LUHS tank, and subsequently to the atmosphere through boiling of the coolant in this system [JNK] tank.
- Control of primary coolant inventory and pressure by continuous injection using the high-pressure injection system (HPIS) pumps [JND] or the low-pressure injection system (LPIS) accumulators [JNG].
- Control of secondary coolant, namely feedwater, inventory and pressure through the steam generator isolation system and the atmospheric heat removal system (ASD) [LBK50].

The passive heat removal design provision PHDR [JN02] operates in conjunction with the reactor shutdown system [JD01] or the diverse reactor shutdown system (ASF) [JD02], which ensures core subcriticality and thus performs the fundamental safety function of "Reactivity control". It also interacts with the containment system [JMA] and containment isolation system [JM01], thereby performing the fundamental safety function of "Confinement of radioactive substances".

If a steam generator tube ruptures (SGTR), design provision [JN02] isolates the affected steam generator and coordinates primary circuit depressurization to equalize the pressure between the affected steam generator and the primary circuit, thereby stopping leakage from the primary to the secondary side.

Design provision [JN02] meets the following fundamental safety requirements:

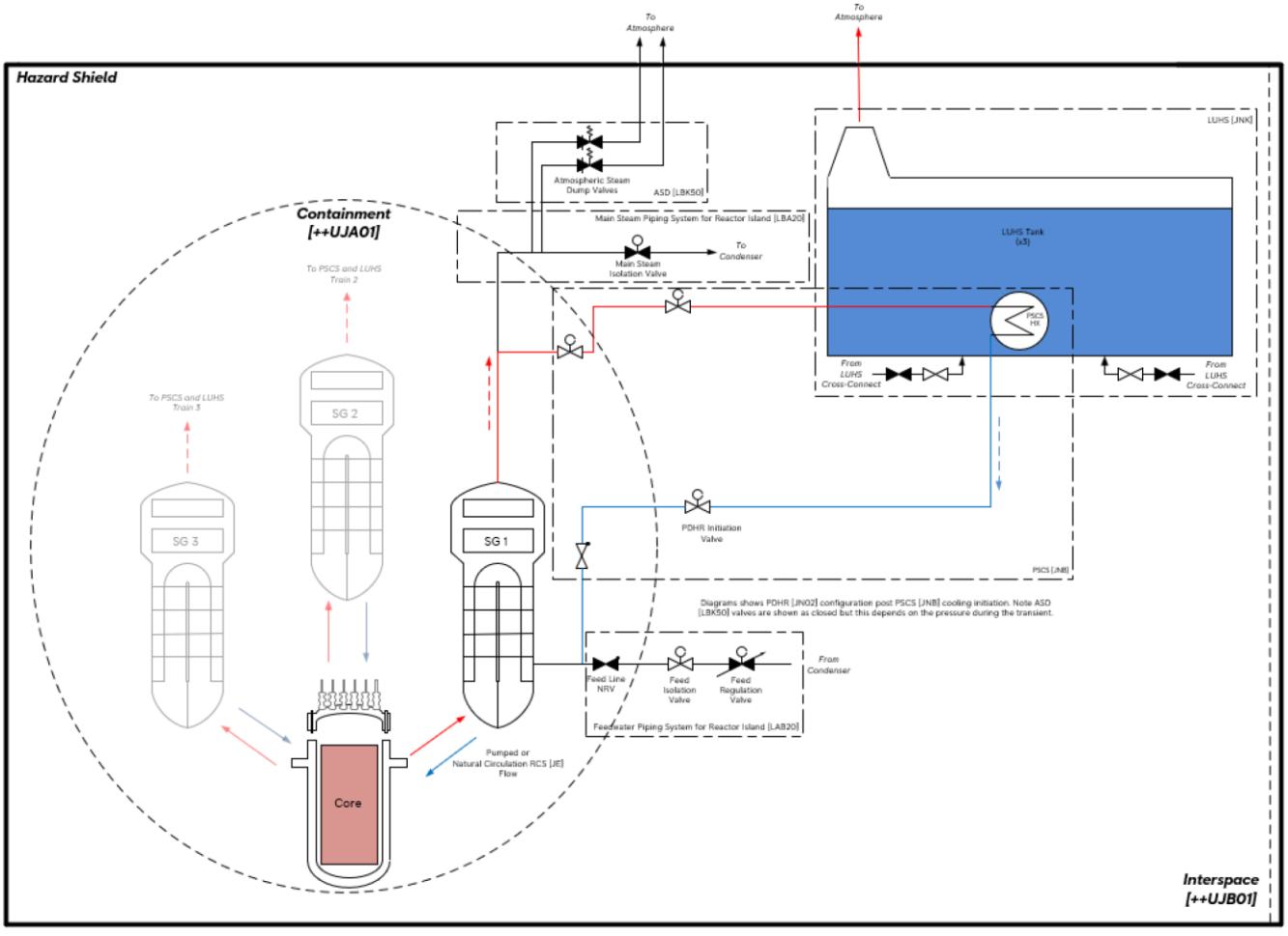
- Performance of safety functions during design basis accidents, up to DiD 3a, and exposure to design basis external hazards.
- High system reliability corresponding to its safety classification.
- Optimized controls meeting human-machine interface (HMI) requirements to minimize human error.
- Equipment qualification for environmental and seismic conditions.
- Application of codes and standards for safety systems.
- The system design and construction permit testing, maintenance, inspection, and examinations that ensure reliability and performance throughout the life cycle.
- A modular design permitting straightforward assembly, commissioning, and decommissioning in accordance with the applicable strategies.

- Sufficient redundancy of system divisions to ensure single-failure resistance in the event of an individual failure, failure caused by an initiating event, or unavailability due to maintenance, examinations, testing, or inspections.
- Functional diversity and automatic system initiation without requiring main control room operator action for the first 30 minutes after an initiating event or action by personnel outside the main control room for the first hour after an initiating event.
- Performance of the safety function during a complete loss of off-site power and a station blackout without support from essential on-site services, such as alternate power supplies, for 72 hours and without off-site services for 7 days.
- The system design includes the capability to connect an additional external source of coolant, electrical power, and other operating media required to perform the safety function.

Design provision [JN02] uses three independent cooling circuits (divisions), one for each primary loop. Each individual division is capable of removing all residual heat from the core through the primary circuit after the reactor has been shut down by the reactor trip system [JD01]. If the reactor is shut down by the diverse system [JD02], involving high-pressure injection of boron solution, two divisions are required to remove residual heat.

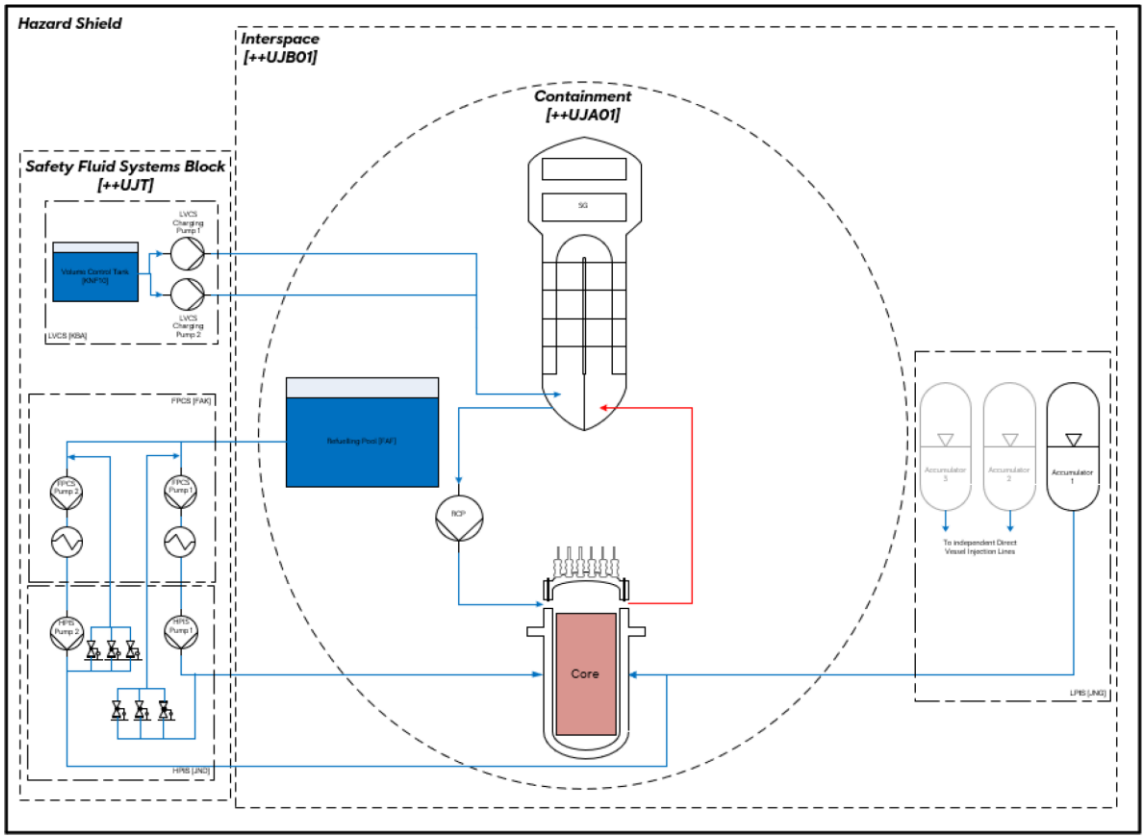
If the reactor is tripped by system [JD01], one circulation loop with natural coolant circulation is required to transfer residual heat between the reactor core and the steam generator. Adequate heat removal is ensured by the primary circuit geometry, in which the steam generators are located substantially above the reactor core, thereby providing sufficient driving head for natural circulation of the primary coolant. Heat is removed from the steam generator by boiling the lower-pressure secondary coolant.

Fig. B.23: Simplified diagram of the principle of passive heat removal to the atmosphere, PHDR [JN02] (heat removal)



The steam generators are isolated from the remainder of the steam system by the main steam isolation valves (MSIV) and are also isolated from the feedwater system. The steam produced flows through system [JNB] piping to heat exchangers located below the water level in the LUHS evaporation tanks [JNK], where the steam condenses. The condensate returns by gravity through system [JNB] piping to the steam generators. In the evaporation tanks, heat from the heat exchanger is transferred to the water inventory, which is connected to the atmosphere, and is removed by boiling.

Fig. B.24: Simplified diagram of the principle of passive heat removal to the atmosphere, PHDR [JN02] (coolant inventory control)

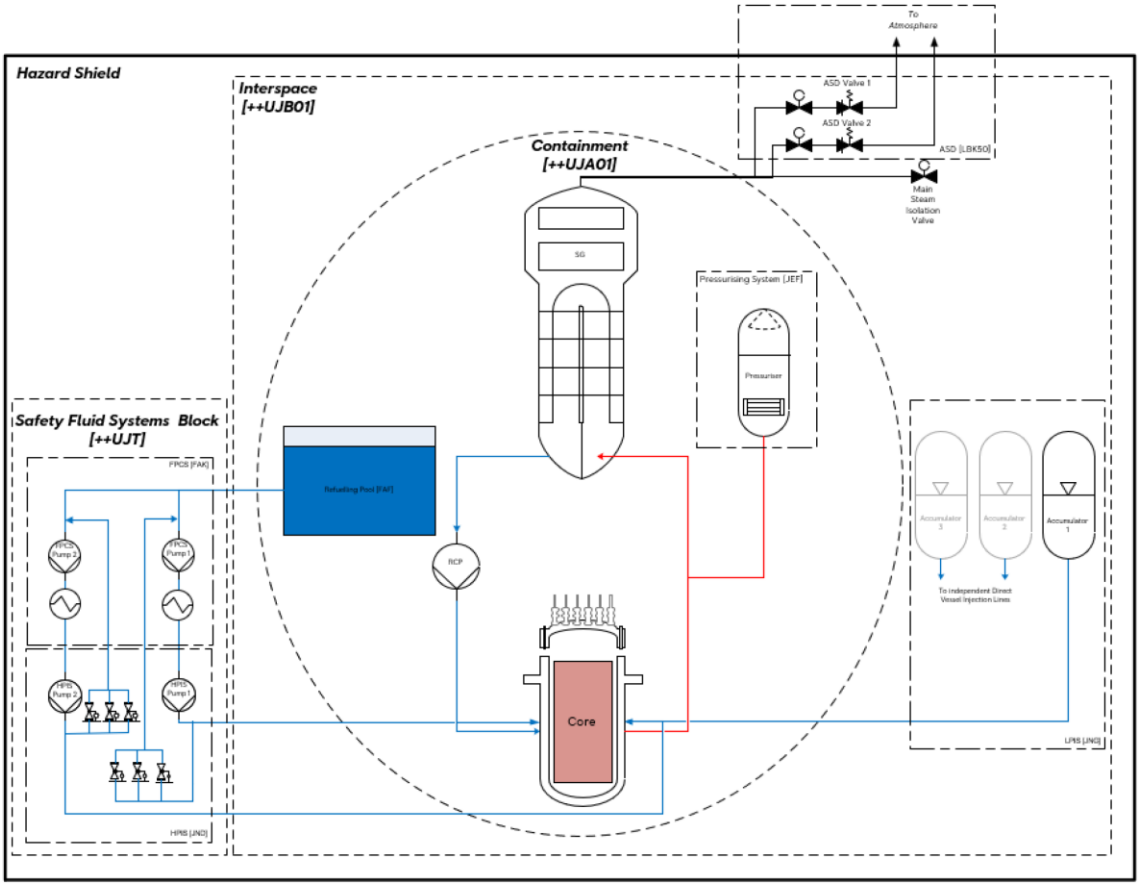


When design provision [JN02] is used, primary coolant inventory decreases because of possible leakage, such as a small LOCA, and contraction of the coolant as it is gradually cooled. It is replenished by:

- The normal makeup system (LVCS) [KBA].
- If system [KBA] is unavailable or has insufficient capacity, by the high-pressure injection system (HPIS) [JND].
- If both systems [KBA] and [JND] are unavailable, for example during a station blackout, the low-pressure injection system (LPIS) [JNG], namely the accumulators, is used for coolant makeup.

Control of the secondary-system water inventory is not required when design provision [JN02] is used because the cooling circuit between the steam generators and heat exchangers [JNB] is closed. The LUHS [JNK] coolant inventory used for evaporation is sized for 72 hours of operation without replenishment, but operator action is required to transfer water between the individual divisions after 24 hours. For system operation exceeding 72 hours, the LUHS tanks [JNK] can be replenished using the safety coolant supply system [KAX].

Fig. B.25: Simplified diagram of the principle of passive heat removal to the atmosphere, PHDR [JN02] (pressure control)



When design provision [JN02] is used, primary circuit pressure is controlled by the pressurizer heaters. If the heaters are unavailable, the high-pressure injection system (HPIS) [JND] is started to increase pressure.

All functions of design provision [JN02] are initiated automatically without operator action.

B.I.6.3.2.2.3.3. High-temperature heat removal design provision (HTHR) [JN03]

The primary principle of the high-temperature heat removal design provision HTHR [JN03] is to remove residual heat from the reactor core during normal operation, such as an unplanned power reduction, or abnormal operation, such as house-load operation. Heat removal is provided by operating systems, structures, and components. Design provision [JN03] performs the fundamental safety function of "Heat removal" through the following functions:

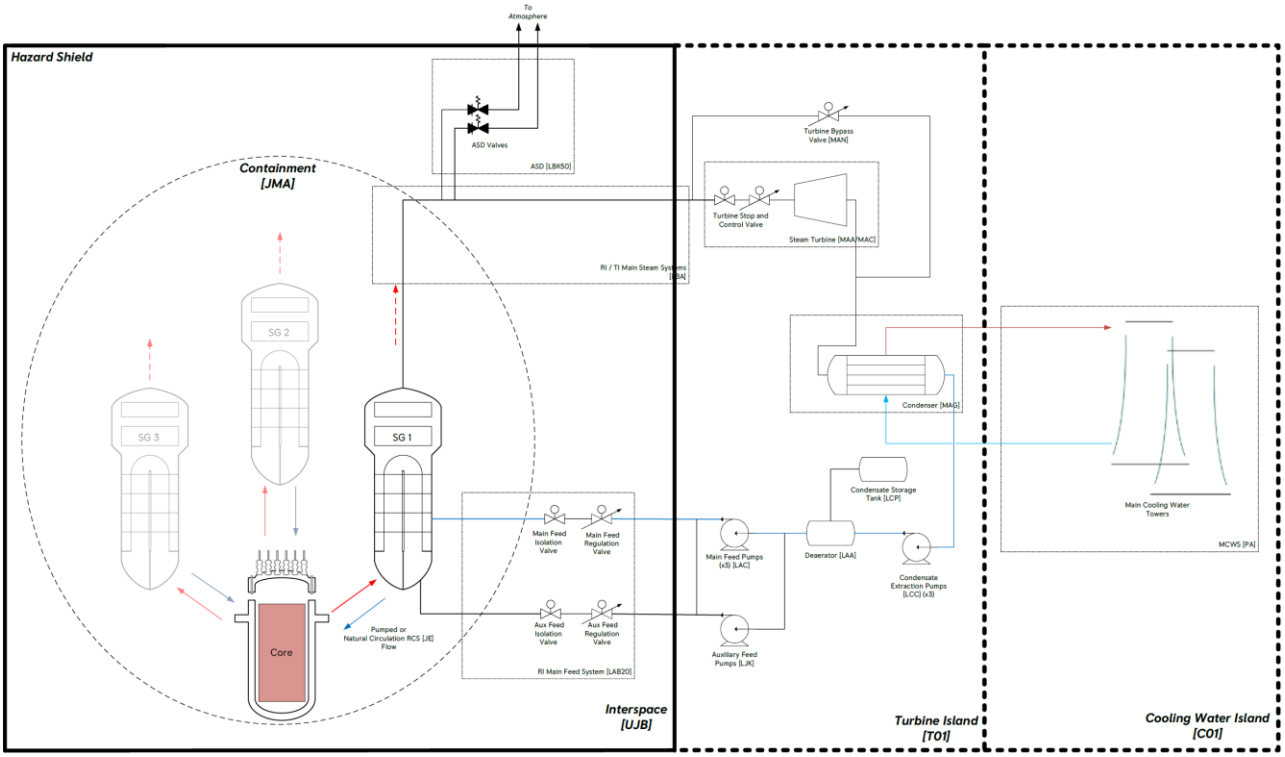
- Residual heat is removed to the atmosphere through the main condenser [MAG] and, if it is unavailable, by means of atmospheric steam dump stations (ADS) [LBK50].
- Primary coolant inventory and pressure are controlled by the normal makeup and letdown system [KB] and the pressurizer system [JEF].
- Secondary coolant inventory and pressure are controlled by the feedwater system [LAB] or the auxiliary feedwater system [LJ].

Design provision [JN03] meets the following fundamental safety requirements:

- High system reliability corresponding to its safety classification.
- Optimized controls meeting human-machine interface (HMI) requirements to minimize human error.
- Equipment qualification for environmental and seismic conditions.
- Application of codes and standards corresponding to its safety classification.
- The system design and construction permit testing, maintenance, inspection, and examinations that ensure reliability and performance throughout the life cycle.
- A modular design permitting straightforward assembly, commissioning, and decommissioning in accordance with the applicable strategies.
- The design provision is connected to external systems such as water makeup, electrical power supply, and the supply of other operating media.

The basic architecture of design provision [JN03] uses operating systems.

Fig. B.26: Simplified diagram of the principle of the high-temperature heat removal design provision HTHR [JN03]



The principle of design provision HTHR [JN03] uses operating systems. Heat is transferred from the reactor core through the primary circuit to the steam generators, where steam is produced. The steam is routed to the turbine condenser [MAG], either through the high-pressure [MAA] and low-pressure [MAC] turbine sections, only during house-load operation, or through the steam dump station to the condenser [MAN].

If steam cannot be routed to the main condenser system [MAG], the atmospheric steam dump system (ADS) [LBK50] is used. Feedwater is supplied to the steam generator through the normal feedwater lines, and when steam is discharged to the main condenser system, the circuit operates as a closed loop.

Primary coolant inventory and pressure are controlled by the normal makeup and letdown operating systems and the pressurizer system.

Atmospheric steam dump station (ADS) [LBK50]: The atmospheric steam dump station (ADS) [LBK50] provides an alternative means of removing heat from the steam generators when the turbine-generator condensing system [MAG] cannot be used. The atmospheric steam dump stations are connected to the main steam lines at the steam generator outlet by two lines (i.e., a total of 6 steam dump stations). Each line has an isolation valve, which is open during normal operation, a control valve, and an outlet to the atmosphere through a silencer. The ADS piping is connected to the main steam lines outside the inner steel containment, but upstream of the MSIV isolation valves, which are the main steam isolation valves on the steam lines.

Main steam distribution systems [LBA20] and [LBA00]: In the RR SMR design, the main steam distribution system is divided into two parts: the primary-section main steam lines [LBA20] and the secondary-section main steam lines [LBA00]. The two sections are separated by the main steam isolation valves (MSIV), which are located outside the inner steel containment. The steam distribution system also includes a lower-parameter auxiliary steam header that supports the feedwater storage and deaeration system, namely the feedwater tank.

Steam turbine system [MA]: The primary function of the steam turbine system [MA] is to convert steam energy into mechanical rotational energy used to drive the electrical generator and generate electricity. The main functions of the steam turbine system are therefore:

- Conversion of steam energy into rotational mechanical energy.
- Condensation of the steam whose energy has been used and return of the water inventory to the secondary circuit.
- Operation of auxiliary systems supporting the primary function of the steam turbine and the condensing system.
- Provision of a steam bypass around the main part of the steam turbine directly to the condenser, when required.

The steam turbine system comprises the high-pressure [MAA] and low-pressure [MAC] sections, the main condenser system [MAG], and the steam dump stations to the condenser [MAN]. When the steam dump stations

to the condenser are used, the inlet steam enthalpy is reduced by condensate spray [LCE]. If the operating conditions for the steam dump stations to the condenser [MAN] are not met, steam is routed to the atmospheric steam dump stations (ADS) [LBK50] to prevent damage to the main condenser.

Feedwater system [LA]: The primary function of the feedwater system [LA] is to supply the steam generators [JEA] so that heat can be removed from the primary circuit. The feedwater flow rate always corresponds to the required rate of heat removal from the primary circuit.

The feedwater system comprises the primary piping system [LAB20], which supplies the appropriate quantity of feedwater according to the current heat-removal demand in the primary section of the RR SMR; the feedwater storage and deaeration system [LAA], which deaerates feedwater by heating it to saturation temperature; the secondary piping system [LAB00], which conveys feedwater in the secondary part of the circuit; and the feedwater pumping station system [LAC], which includes the main feedwater pumps that control feedwater flow from 0 to 2,592 t/h. The auxiliary feedwater system [LJA] is connected to the feedwater system to maintain the steam generator water level. The auxiliary feedwater system [LJA] is used in primary-circuit residual heat removal modes, specifically during low-power transients when the HTHR heat removal system is used.

Condensate system [LC]: The condensate system [LC] forms part of the system that returns water from the turbine main condenser to the steam generator feedwater system [LA]. The system comprises the main condensate piping system [LCB], which conveys condensate from the main condenser to the feedwater deaeration and storage system [LAA], and the condensate pumps [LCC]. The condensate pump system operates automatically in a 3 × 50 % configuration, with two pumps in continuous operation and one standby pump. A spray supply [LCE] branches from the condensing system to the steam dump stations to the condenser [MAN] to reduce steam enthalpy when these steam dump stations are used during transients. The condensate system includes a cold condensate storage and transfer subsystem [LCP], which provides a backup water source for feedwater makeup. If the condensate circuit from the main condensers through the deaeration system to the feedwater pumping station and steam generators is unavailable, the water inventory in system [LCP] is sufficient for 24 hours of high-temperature heat removal [JN03] operation.

Main circulating water circuit [PA]: The primary function of the circulating water system [PA] is to remove heat from the steam turbine condenser during normal operation and when the high-temperature heat removal system HTHR is used, with heat removed through the steam dump stations to the condenser. Heat is removed to the MCWS cooling towers.

B.I.6.3.2.2.3.4. Low-temperature decay heat removal design provision (LTDHR) [JN04]

The low-temperature decay heat removal design provision LTDHR [JN04] removes residual heat from the core following a reactor trip caused by a fault and during refueling. The fundamental principles of the design provision are as follows:

- Residual heat removal to the atmosphere through the shutdown cooling system [JNA], the primary component cooling system [KAA], and the essential service water system (ESWS) [PBD].
- Primary circuit pressure is controlled by two controlled pressurizer safety valves in LTOP mode, which provides low-temperature reactor overpressure protection.

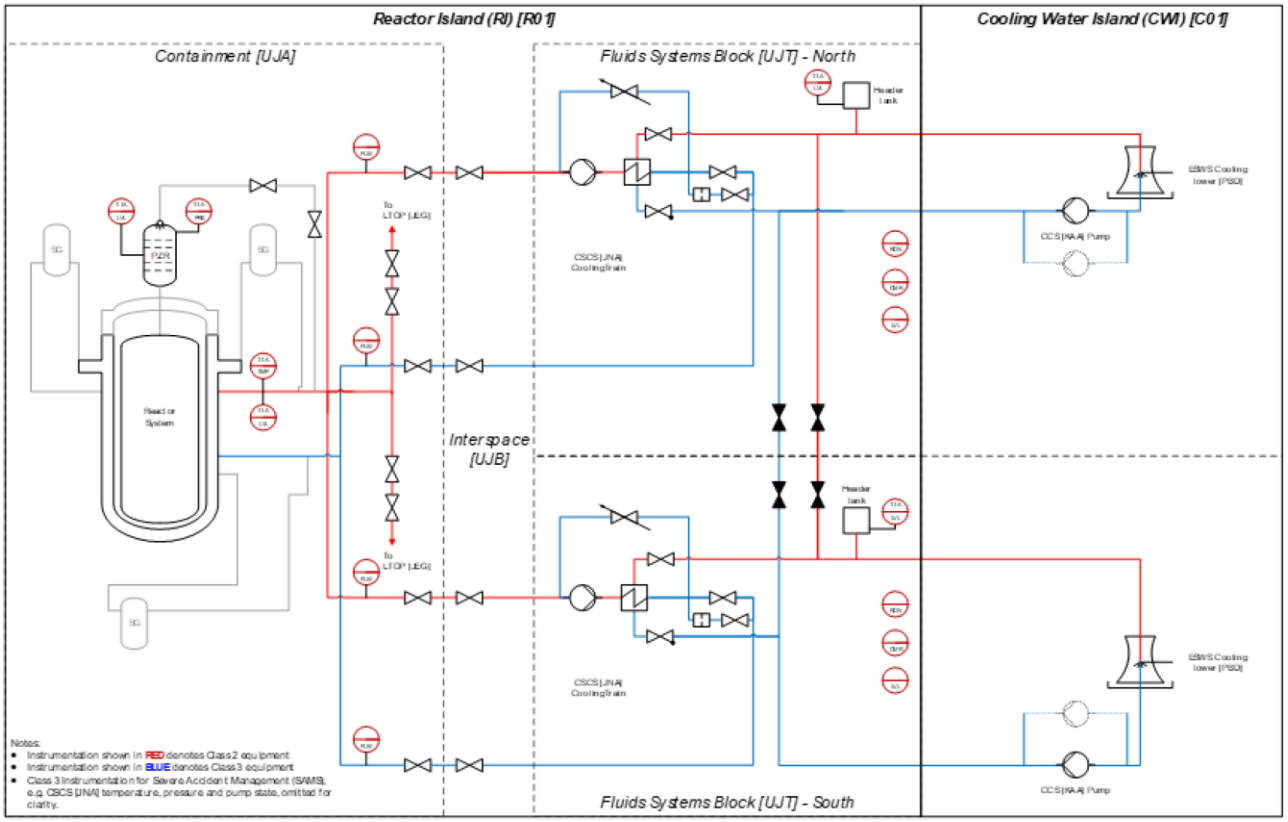
Design provision [JN04] meets the following fundamental safety requirements:

- Performance of safety functions during internal hazards.
- Protection against design basis external hazards.
- Equipment qualification for environmental and seismic conditions.
- Application of codes and standards at a level corresponding to the safety significance.
- The system design and construction permit testing, maintenance, inspection, and examinations that ensure reliability and performance throughout the life cycle.
- A modular design permitting straightforward assembly, commissioning, and decommissioning in accordance with the applicable strategies.
- A design that reduces activation of the materials used to facilitate decommissioning.
- The design specifies adequate resistance to component aging and degradation throughout the life cycle.
- Sufficient redundancy of system divisions to ensure single-failure resistance in the event of an individual failure, failure caused by an initiating event, or unavailability due to maintenance, examinations, testing, or inspections.
- Separation and segregation of the individual redundant system divisions.
- Functional diversity and automatic system initiation without requiring main control room operator action for the first 30 minutes after an initiating event or action by personnel outside the main control room for the first hour after an initiating event.

- Performance of the safety function during a loss of off-site power and a station blackout without support from essential on-site services, such as diverse and alternate power supplies, for 72 hours and without off-site services for 7 days.

The basic architecture of design provision [JN04] comprises two independent redundant CSCS systems [JNA] connected to the cold and hot legs of the primary circuit [JE]. Residual heat is transferred from the fuel assemblies to the primary coolant, which flows through the circulation loops to the connected CSCS cooling circuits [JNA]. These cooling circuits are equipped with system [KAA] shell-and-tube heat exchangers cooled by essential service water, which is routed to the fan cooling tower [PBD]. In the fan cooling towers, heat is transferred to the atmosphere by evaporation.

Fig. B.27: Simplified diagram of the principle of the low-temperature heat removal design provision LTDHR [JN04]



Design provision [JN04] is supported by the primary circuit [JE] and pressurizer [JEG] systems described above. The shutdown cooling [JNA], high-pressure injection [JND], and irradiated fuel pool cooling [FAK] systems are also used to perform the function of the design provision.

Reactor shutdown cooling system [JNA]: When design provision [JN04] is used, coolant circulation is provided by the CSCS shutdown cooling system pumps [JNA], and heat is transferred through heat exchangers from the primary coolant to the essential service water system. The shutdown cooling system comprises two independent divisions. The system is single-failure resistant, and only one system division is required to remove heat. In this mode, primary circuit pressure is limited by the pressurizer safety valves, which are switched to reactor pressure vessel overpressure protection mode.

High-pressure injection system [JND]: When design provision [JN04] is used, primary coolant makeup to compensate for the loss of coolant inventory due to cooldown is provided by the high-pressure coolant injection system [JND]. This system comprises two independent coolant injection circuits connected directly to the reactor pressure vessel through nozzles leading to the reactor inlet plenum. Each independent circuit is capable of providing sufficient coolant, making the system single-failure resistant. Both circuits are started automatically by a low-pressure signal from the pressurizer, indicating a loss of reactor subcooling and an inability of the normal makeup system [KBA] to maintain sufficient primary coolant inventory.

Irradiated fuel pool cooling system [FAK]: The irradiated fuel cooling system FPCS [FAK] removes residual heat from the wet irradiated fuel storage pool and supplements system [JND] by helping maintain sufficient coolant inventory in the circuit through the following mechanisms:

- It permits the transfer of coolant inventory from the refueling pool [FAF] to the suction of the HPIS injection pumps [JND].

- The irradiated fuel pool cooling pumps [FAK] can be used to supply motive fluid to an ejector that draws coolant from the containment sump, thereby preventing cavitation of the HPIS pumps [JND].

The principles of primary circuit pressure control and primary coolant inventory control when design provision [JN04] is used are shown in the following figures.

Fig. B.28: Simplified diagram of the pressure-control principle of design provision LTDHR [JN04]

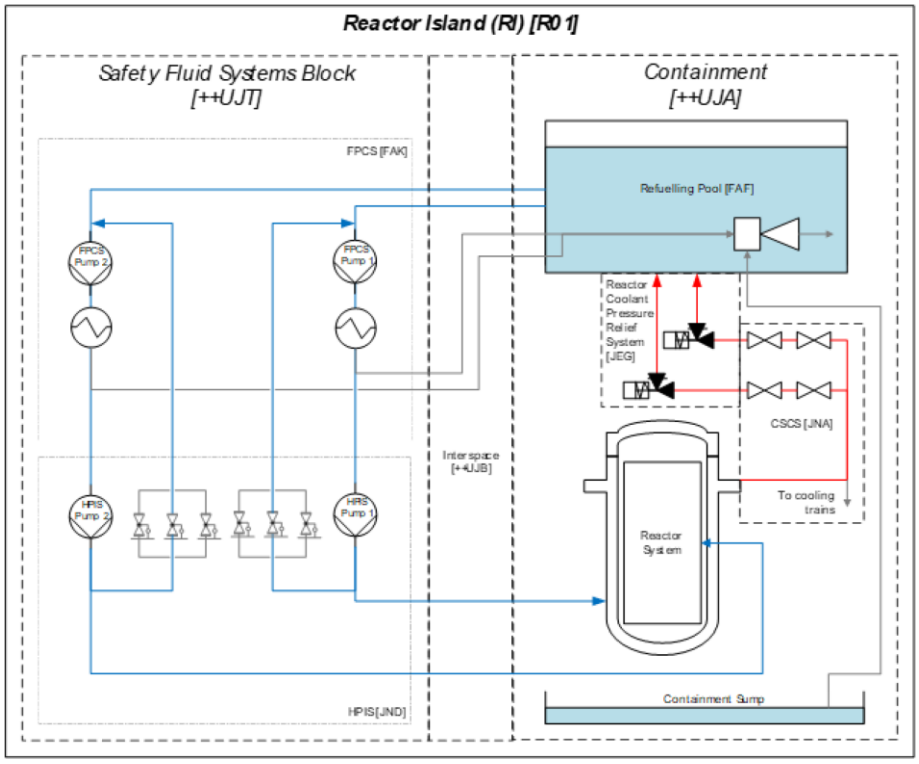
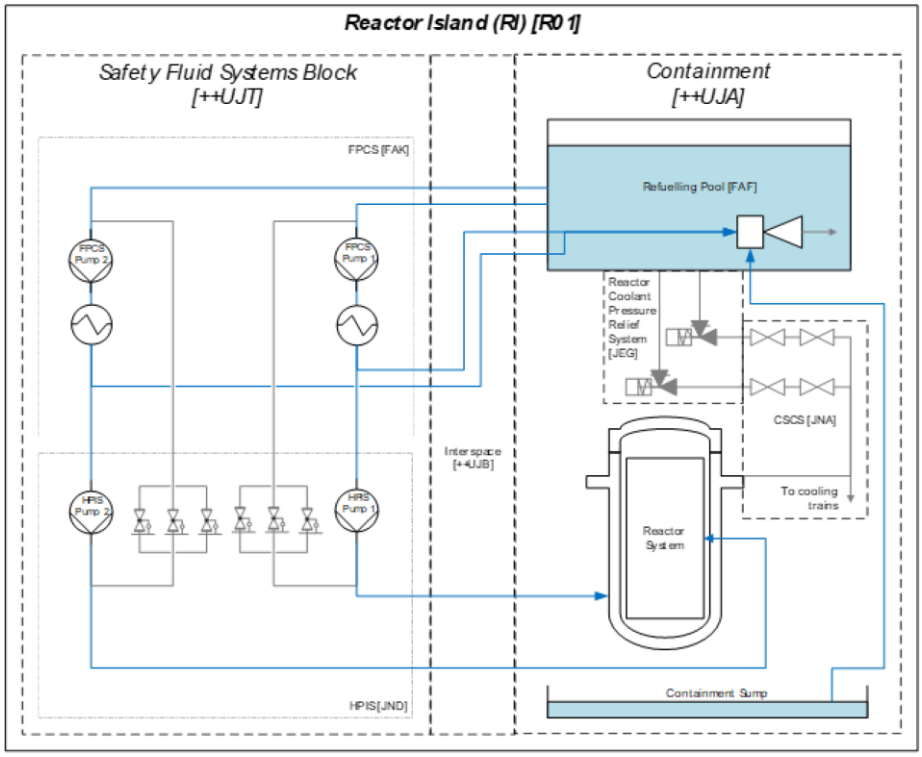


Fig. B.29: Simplified diagram of the coolant-inventory-control principle of design provision LTDHR [JN04]



B.I.6.3.2.2.4. Design provisions for reactivity control under fault and accident conditions

The objective of reactor reactivity control safety provisions is to perform the fundamental safety function of "Reactivity control" in all RR SMR operating modes. The design includes three independent design provisions:

- Reactor trip (SCRAM) [JD01].
- Alternative reactor shutdown (ASF) [JD02].
- Limiting system (RPR) [JD03].

The primary means is the reactor trip system [JD01], which is actuated automatically in the event of defined faults. If this system is unavailable, design provision [JD02] is actuated as a diverse means of performing the fundamental safety function of reactivity control. Design provisions [JD01] and [JD02] are supplemented by design provision [JD03], which serves as a limiting system and reduces reactor power below 50 %. At the same time, it maintains the reactor core in a critical state.

B.I.6.3.2.2.4.1. Reactor trip (SCRAM) [JD01]

The reactor trip design provision is the primary means of shutting down the reactor under fault and accident conditions. The reactor is shut down by inserting negative reactivity into the reactor core in the form of solid neutron absorbers. This shuts down the reactor and ensures sufficient core subcriticality even in the cold zero-power state. The design provision is actuated automatically, and the reactor can also be shut down manually by the operator.

The reactor trip design provision [JD01] performs the fundamental safety function of "Reactivity control" and meets the following fundamental safety requirements:

- Performance of the fundamental safety function during design basis internal hazards.
- Provision of protection during design basis external hazards.
- High reliability to achieve a low probability of failure in accordance with the safety classification.
- Optimized controls meeting human-machine interface (HMI) requirements to minimize human error.
- Equipment qualification for environmental and seismic conditions.
- Application of codes and standards for safety systems.
- The system design and construction permit testing, maintenance, inspection, and examinations that ensure reliability and performance throughout the life cycle.
- A modular design permitting straightforward assembly, commissioning, and decommissioning in accordance with the applicable strategies.

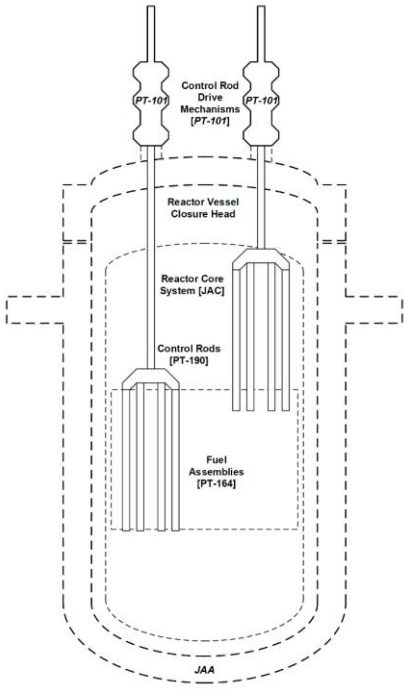
- Sufficient redundancy of actuation system divisions to ensure single-failure resistance in the event of an individual failure, failure caused by an initiating event, or unavailability due to maintenance, examinations, testing, or inspections.
- Separation and segregation of the individual redundant and diverse system portions, RPS1 and DPS.
- Functional diversity and automatic system initiation without requiring main control room operator action for the first 30 minutes after an initiating event or action by personnel outside the main control room for the first hour after an initiating event.

The basic architecture of the reactor trip design provision [JD01] comprises 89 control rods inserted into 121 fuel assemblies, together with their associated control rod drive mechanisms (CRDM). The number of absorber rods reflects the neutron flux density in the core and the fact that no liquid absorber, namely boric acid solution, is used for reactivity control. A liquid absorber is used in the diverse method of reactor shutdown provided by design provision [JD02], which is described below.

Reactor trip is initiated by the automatic reactor control system [JY], which is briefly described below. The reactor trip conditions and subsequent automatic initiation or manual reactor trip by the operator interrupt power to the control (absorber) rod drive mechanisms. The rods then fall into the core under gravity and shut down the reactor. The rods are guided during their insertion into the fuel assemblies by internal reactor structural components.

All components performing design provision [JD01] are located inside the concrete protective shield and on seismic isolation bearings so that they are protected against external hazards. The electronic actuation portion comprises two diverse systems, RPS1 and DPS, which use different equipment and are separated from one another to provide adequate protection against internal and external hazards.

Fig. B.30: Simplified diagram of the reactivity-control principle of design provision [JD01]



The function of design provision [JD01] is linked to that of design provisions HTHR [JN03] and the safety design provisions PDHR [JN02] and ECC [JN01]. The functional logic linking the systems is designed so that the reactor trip function [JD01] is actuated first, followed as necessary by initiation of other protective provisions according to the current situation. Design provision [JD01], involving insertion of the absorbers into the core, is designed so that successful actuation and reactor shutdown do not initiate the diverse design provision [JD02], involving boric acid injection.

If power to the reactor trip actuation systems is lost, a signal is sent to disconnect power from the control rod drives. As in the event of a loss of power to the control rod drive mechanisms (CRDM) themselves, the rods then fall into the core and shut down the reactor. However, if the RR SMR loses power from the external grid, resulting in a complete loss of the unit auxiliary power supply, the reactor is not shut down; the power plant transitions to house-load operation at lower reactor power.

During normal operation with the reactor critical, namely during power operation, all functions of design provision [JD01] are maintained in standby. The control rod drive power switches are energized, and the drives themselves are powered to maintain the control rods in the required positions in the core. The required reactor power is maintained by changing their positions. Reactor trip [JD01] is initiated when the setpoints of the relevant parameters from which the reactor trip signal is derived are reached, including physical parameters such as pressure and temperature, or is initiated manually by the operator using a pushbutton. The reactor protection system RPS1 [JRA10] or the diverse protection system DPS [JQA] issues a command to open the switches supplying the control rod drives, causing them to lose power so that the control rods are no longer held

in their defined positions in the core. The rods fall under gravity into the core, guided during insertion by the reactor internals and the structures of the fuel assemblies themselves. This shuts down the reactor.

B.I.6.3.2.2.4.2. Alternative reactor shutdown (ASF) [JD02]

The alternative reactor shutdown design provision [JD02] serves as a backup means of shutting down the reactor by injecting a boron solution of potassium tetraborate into the reactor, where it acts as a dissolved neutron absorber and ensures sufficient reactor subcriticality. Design provision [JD02] is actuated second, after design provision [JD01], and only if the latter fails; it meets the following fundamental requirements:

- Performance of the fundamental safety function during design basis internal hazards.
- Provision of protection during design basis external hazards.
- High reliability to achieve a low probability of failure in accordance with the safety classification.
- Optimized controls meeting human-machine interface (HMI) requirements to minimize human error.
- Equipment qualification for environmental and seismic conditions.
- Application of codes and standards corresponding to the safety classification.
- The system design and construction permit testing, maintenance, inspection, and examinations that ensure reliability and performance throughout the life cycle.
- A modular design permitting straightforward assembly, commissioning, and decommissioning in accordance with the applicable strategies.
- Sufficient redundancy of actuation system divisions to ensure single-failure resistance in the event of an individual failure, failure caused by an initiating event, or unavailability due to maintenance, examinations, testing, or inspections.
- Functional diversity and automatic system initiation without requiring main control room operator action for the first 30 minutes after an initiating event or action by personnel outside the main control room for the first hour after an initiating event.

The basic architecture of the alternative reactor shutdown design provision (ASF) [JD02] is based on:

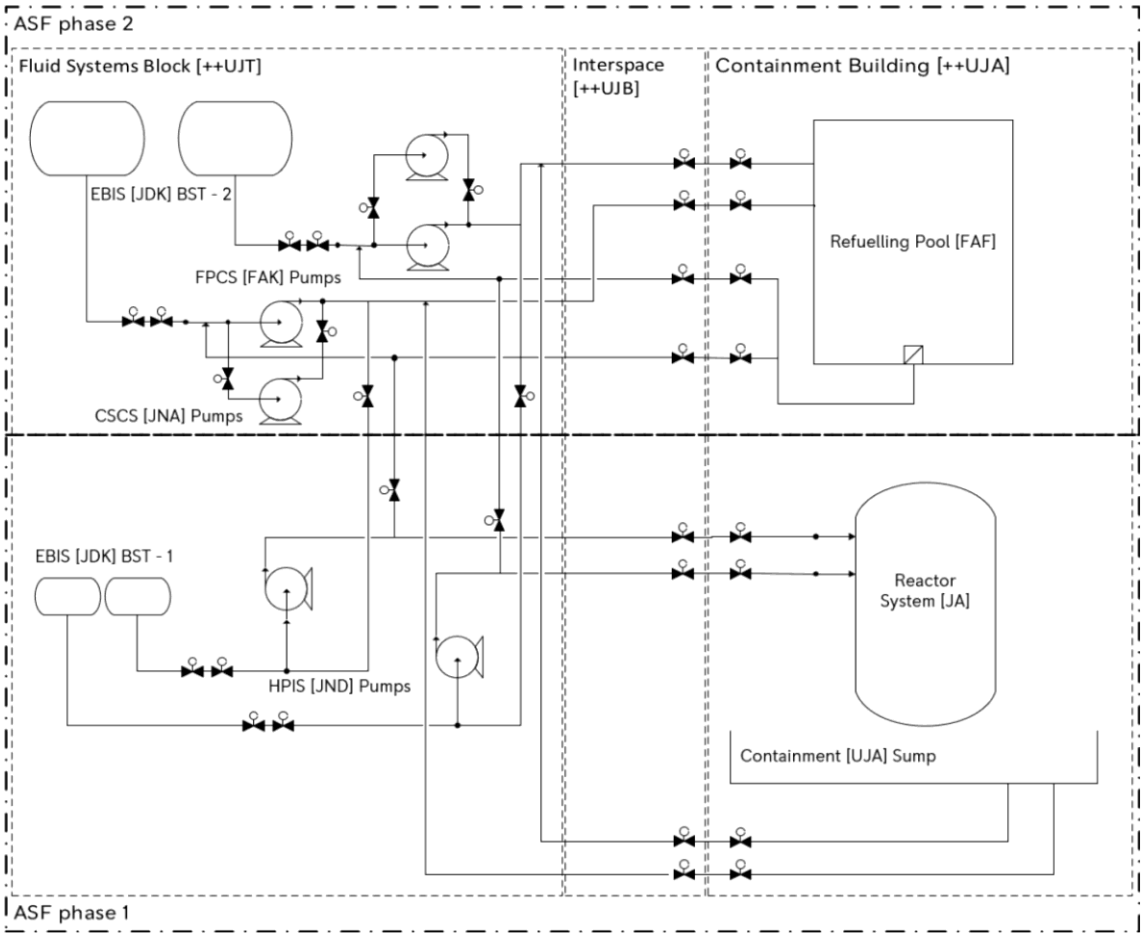
- The emergency boron injection system (EBIS) [JDK], with four potassium tetraborate solution tanks.
- High-pressure boron solution injection pumps (HPIS) [JND] for injection into the reactor.
- Support pumps (FPCS) [FAK] and (CSCS) [JNA] for borating the refueling pool [FAF] from tanks [JDK].

Design provision [JD02] uses the reactor protection system (RPS) [JY] for its initiation. If reactor shutdown by [JD01] is unsuccessful, the following two operations occur simultaneously:

- Potassium tetraborate solution enriched in the B-10 isotope is supplied from its solution tank to the reactor vessel nozzles in a quantity sufficient to borate the entire primary circuit volume.
- Potassium tetraborate solution enriched in the B-10 isotope is also supplied to and mixed in the refueling pool [FAF] to support subsequent operation of the PDHR design provision [JN02].

All functions are initiated automatically without operator action.

Fig. B.31: Simplified diagram of the reactivity-control principle of design provision [JD02]



Emergency boron injection system [JDK]: The primary purpose of the EBIS [JDK] is to store a supply of potassium tetraborate solution that is isolated from the other power plant systems during normal operation and used only in certain accident scenarios in which alternative reactor shutdown [JD02] is initiated. The potassium tetraborate solution is enriched in the B-10 isotope, which has a greater neutron absorption capacity. This permits the volume of the solution tanks and the time between system initiation and reactor shutdown to be reduced. System [JDK] comprises two pairs of redundant tanks. One pair of tanks is used to borate the reactor, and the other pair is used to borate the refueling pool.

Each reactor-boration tank [JDK] has a volume of 4 m^3 and is connected to the reactor by high-pressure pumps (HPIS) [JND]. Each refueling-pool-boration tank [JDK] has a volume of 14 m^3 and is connected to one division of the FPCS pumps [FAK] and one division of the CSCS pumps [JNA] for pumping and mixing the boron solution in the refueling pool [FAF].

High-pressure injection system (HPIS) [JND]: The high-pressure injection system supports the PDHR [JN02] and alternative reactor shutdown [JD02] design provisions. The HPIS [JND] comprises two high-pressure injection circuits capable of overcoming primary circuit pressure and connected directly to the reactor pressure vessel together with the low-pressure injection [JNG] lines, namely the accumulators. The injected solution is potassium tetraborate concentrate from the system [JDK] tanks.

Irradiated fuel pool cooling system (FPCS) [FAK] and reactor shutdown cooling system (CSCS) [JNA]: The irradiated fuel pool cooling system [FAK] performs its functions during normal operation and also supports a number of design provisions, including ASF [JD02]. It comprises two redundant trains, each containing a centrifugal pump, heat exchanger, piping system, and valves. The primary function of system [FAK] is to remove residual heat from irradiated nuclear fuel stored in the storage pool.

The reactor shutdown cooling system [JNA] comprises two redundant trains, each containing a heat exchanger, centrifugal pump, piping system, and valves. When system [JNA] is configured to perform the alternative reactor shutdown function [JD02], the heat exchanger is not used.

Together, these two systems provide the means of supplying boron concentrate to the refueling pool [FAF]. When alternative reactor shutdown [JD02] is demanded, boron concentrate is routed from the tanks [JDK] to the system

[FAK] piping, then to the suction of the pumps [JNA], back to the system [FAK] piping, and onward to the refueling pool [FAF]. During operation, a certain water level is maintained continuously in the refueling pool [FAF], with its elevation depending on the reactor operational state. Mixing this water with the boron concentrate produces a lower-concentration potassium tetraborate solution that is subsequently used to support ASF [JD02].

Refueling pool [FAF]: The primary functions of the refueling pool [FAF] are to provide shielding, facilitate fuel assembly handling during refueling, and temporarily store certain reactor internals for inspection. When the ASF design provision [JD02] is used, a homogeneous potassium tetraborate solution is produced in the refueling pool [FAF] and, if necessary, is used as coolant for primary circuit makeup.

B.I.6.3.2.2.4.3. Limiting system (RPR) [JD03]

The limiting system [JD03] rapidly reduces reactor power to a level between 50 % and 10 % of rated power. However, the reactor remains critical. Power is reduced by inserting the control rods.

B.I.6.3.2.2.5. Containment and associated systems

The RR SMR design includes three design provisions that perform the fundamental safety function of "Confinement of radioactive substances". These are as follows:

- Design provision for a design basis accident [JM01].
- Design provision for a severe accident [JM02].
- Containment operational state [JM03].

During normal and abnormal operation, the fundamental safety function of confining radioactive substances is performed by design provision [JM03] by maintaining the containment's operational leaktightness and monitoring the integrity of physical barriers. Design provision [JM01] is applied under accident conditions at the DBC level. In the event of a severe accident, design provision [JM02] is applied; in addition to the containment's own systems, this requires the interaction of certain other systems.

B.I.6.3.2.2.5.1. Design provision for a design basis accident [JM01]

The primary function of design provision [JM01] is to retain potential releases of radioactive substances during design basis accidents (DBC), thereby performing the fundamental safety function of confining radioactive substances. The principal system for this design provision is the containment [JMA], which comprises the systems, structures, and components forming its leaktight boundary. A partial function of design provision [JM01] is containment isolation, which defines the protection architecture for each penetration through the leaktight boundary using isolation valves so that containment leaktightness is ensured in the event of an accident and the functions of other design provisions are not jeopardized.

The objective of design provision [JM01] is to provide sufficient means to retain radioactive materials and isolate them from the environment during design basis accidents (DBA) classified as accident conditions in one of the DBC categories listed above. For the RR SMR, the individual barriers against the release of radioactive substances are defined as follows:

- Nuclear fuel cladding.
- Primary circuit system pressure boundary.
- The leaktight containment system, including systems connected to the primary circuit pressure boundary and systems ensuring containment leaktightness.

Design provision [JM01] includes two possible options covering the entire spectrum of DBC-level accidents:

- Option 1: All three barriers against the release of radioactive substances are available.
- Option 2: The primary circuit pressure boundary is breached (LOCA), but the nuclear fuel cladding and containment leaktightness remain intact. In certain fault scenarios, failure of up to 10 % of the nuclear fuel cladding is permitted.

Design provision [JM01] meets the following fundamental safety requirements:

- Performance of safety functions during design basis accidents and exposure to design basis external hazards.
- High reliability, with the probability of failure of an individual redundant train between 1E-03 and 1E-05.
- Optimized controls meeting human-machine interface (HMI) requirements to minimize human error.
- Equipment qualification for environmental and seismic conditions.
- Application of codes and standards for safety systems.
- The system design and construction permit testing, maintenance, inspection, and examinations that ensure reliability and performance throughout the life cycle.
- A modular design permitting straightforward assembly, commissioning, and decommissioning in accordance with the applicable strategies.

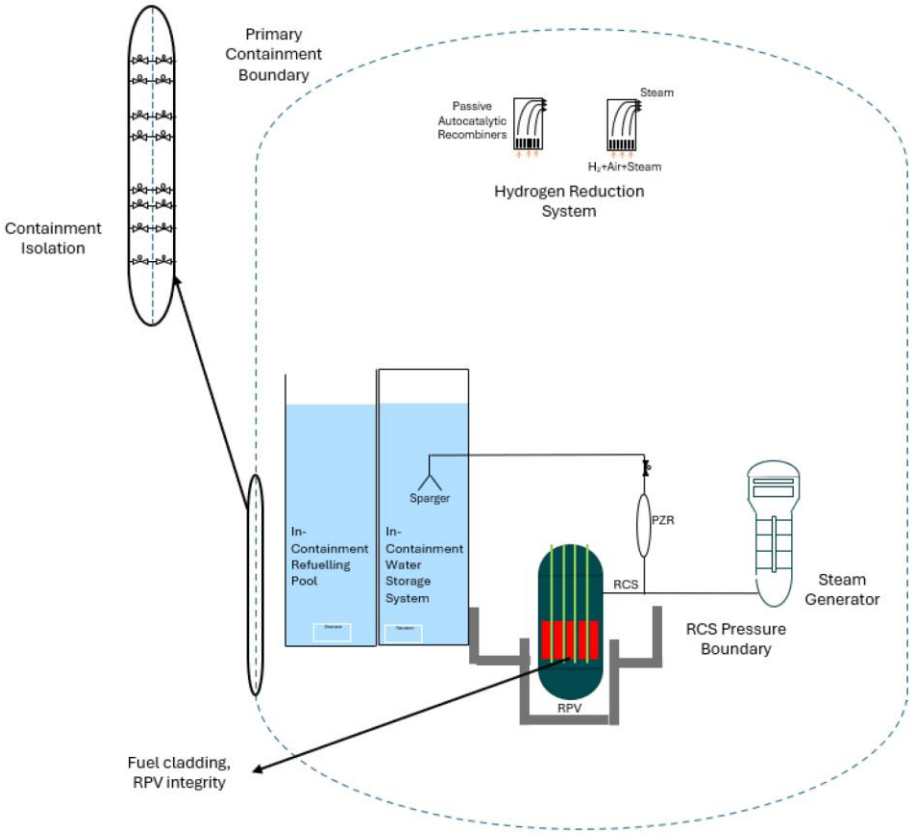
- A design that reduces activation of the materials used to facilitate decommissioning.
- The design specifies adequate resistance to component aging and degradation throughout the life cycle.
- Sufficient redundancy of system divisions to ensure single-failure resistance in the event of an individual failure, failure caused by an initiating event, or unavailability due to maintenance, examinations, testing, or inspections.
- Separation and segregation of the individual redundant system divisions.
- Functional diversity and automatic system initiation without requiring main control room operator action for the first 30 minutes after an initiating event or action by personnel outside the main control room for the first hour after an initiating event.
- Performance of the safety function during a complete loss of off-site power and a station blackout without support from essential on-site services, such as alternate power supplies, for 72 hours and without off-site services for 7 days.

The steel containment system [JMA] forms a leaktight boundary around the primary circuit system [JE] and is the final barrier against the release of radioactive substances into the environment. The steel containment penetrations are designed to withstand internal and external hazards and permit isolation, thereby ensuring that the boundary remains leaktight.

Option 1 of design provision [JM01] isolates all less significant containment penetrations, corresponding to a small or medium LOCA, and uses the Passive Decay Heat Removal (PDHR) [JN02] and Low-Temperature Decay Heat Removal (LTDHR) [JN04] design provisions to remove residual heat. Option 2 of design provision [JM01] isolates all containment penetrations and uses design provision [JN01] to remove residual heat.

Only very limited hydrogen generation is anticipated while design provision [JM01] is performing its function, which precludes combustion; the hydrogen is diluted by the large volume of air in the containment so that a flammable or explosive mixture does not form. The internal containment structure is designed to prevent the formation of dead spaces or pockets in which hydrogen could accumulate. However, the containment is equipped with hydrogen monitoring, passive recombiners, and igniters, so sufficient means are available to eliminate hydrogen if it is present in the containment atmosphere, as described below.

Fig. B.32: Schematic overview of systems, structures, and components used for design provision [JM01]



Systems performing design provision [JM01] are in standby during normal power operation and during reactor shutdown and cooldown. Design provision [JM01] is not active during refueling, but the containment boundary can be restored if a fault occurs in this state. The function controlling hydrogen concentration in the containment atmosphere is based on a passive principle and does not depend on the reactor operating mode. Under accident conditions, the functions of design provision [JM01], such as containment isolation, are initiated automatically without operator action. Depending on the extent of the initiating event, the containment is isolated partially under Option 1 or completely under Option 2. The automatic functions of design provision [JM01] are initiated by the reactor protection system [JY] in all operating modes.

Containment system [JMA]: The leaktight containment boundary is defined as follows:

- Steel leaktight containment structure [PT250]: forms the principal leaktight containment boundary. It is a cylindrical welded vessel with upper and lower semielliptical domes.
- Main equipment access penetration [PT251]: permits access to the containment during outages through a single hinged door. A double elastomeric seal is used to ensure leaktightness during normal operation and fault conditions.
- Personnel airlock [PT252]: permits personnel entry and equipment transfer during outages through a cylindrical transfer chamber with a hinged door at each end. The doors are designed to withstand the highest design pressures and are interlocked so that they cannot be opened simultaneously, permitting entry into the containment when the reactor is shut down but has not yet cooled.
- Fuel transfer canal [PT253]: provides a connection between the external irradiated nuclear fuel pool [FAK] and the internal refueling pool [FAF]. It is sealed during normal operation and is used during outages to transfer nuclear fuel into and out of the containment.
- Piping penetration assembly [PT260]: fitted with isolation valves that permit media to pass through the containment boundary and allow these penetrations to be isolated when necessary.
- Leaktight electrical and I&C penetration assembly [PT270]: permits power and control cables and I&C lines to penetrate the containment while maintaining its leaktightness.

The internal containment structure [UJA] is located inside the containment; it supports primary circuit systems and forms an internal sump for collecting coolant in the event of a LOCA.

Hydrogen concentration control system [JMT]: The containment-atmosphere hydrogen concentration control system [JMT] includes equipment for monitoring and reducing the hydrogen concentration. Hydrogen content in the atmosphere is reduced by catalytic recombination of hydrogen with oxygen using passive recombiners and by controlled combustion using igniters. Autocatalytic recombiners distributed around the inner circumference of the containment are used to control the hydrogen concentration during design basis events (DBC). Additional recombiners are located above the water level in the IWSS tank [JNH], into which, among other systems, the pressurizer safety valve system [JEG] and the primary circuit depressurization system [JNF] discharge.

B.I.6.3.2.2.5.2. Design provision for a severe accident [JM02]

The design provision for a severe accident [JM02] is a mitigating provision intended for conditions corresponding to DEC-B. The two main functions are:

- Establishment of a protective barrier against the release of radioactive substances and any mechanical penetrations.
- Protection of the containment barrier against phenomena that could cause it to fail.

The second function is further divided into partial functions that prevent specific severe accident phenomena or mitigate their consequences:

- Primary circuit depressurization.
- Passive and active heat removal from the containment.
- Retention of any molten core material inside the reactor pressure vessel (in-vessel retention).
- Control of hydrogen concentration in the containment.

Design provision [JM02] meets the following fundamental safety requirements:

- Support for the performance of safety functions during severe accidents and exposure to design basis external hazards.
- Optimized controls meeting human-machine interface (HMI) requirements to minimize human error.
- Equipment qualification for environmental and seismic conditions.
- Application of codes and standards corresponding to the safety classification.
- The system design and construction permit testing, maintenance, inspection, and examinations that ensure reliability and performance throughout the life cycle.
- A modular design permitting straightforward assembly, commissioning, and decommissioning in accordance with the applicable strategies.
- A design that reduces activation of the materials used to facilitate decommissioning.
- The design specifies adequate resistance to component aging and degradation throughout the life cycle.
- Sufficient redundancy of system divisions to ensure single-failure resistance in the event of an individual failure, failure caused by an initiating event, or unavailability due to maintenance, examinations, testing, or inspections.
- Separation and segregation of the individual redundant system divisions.

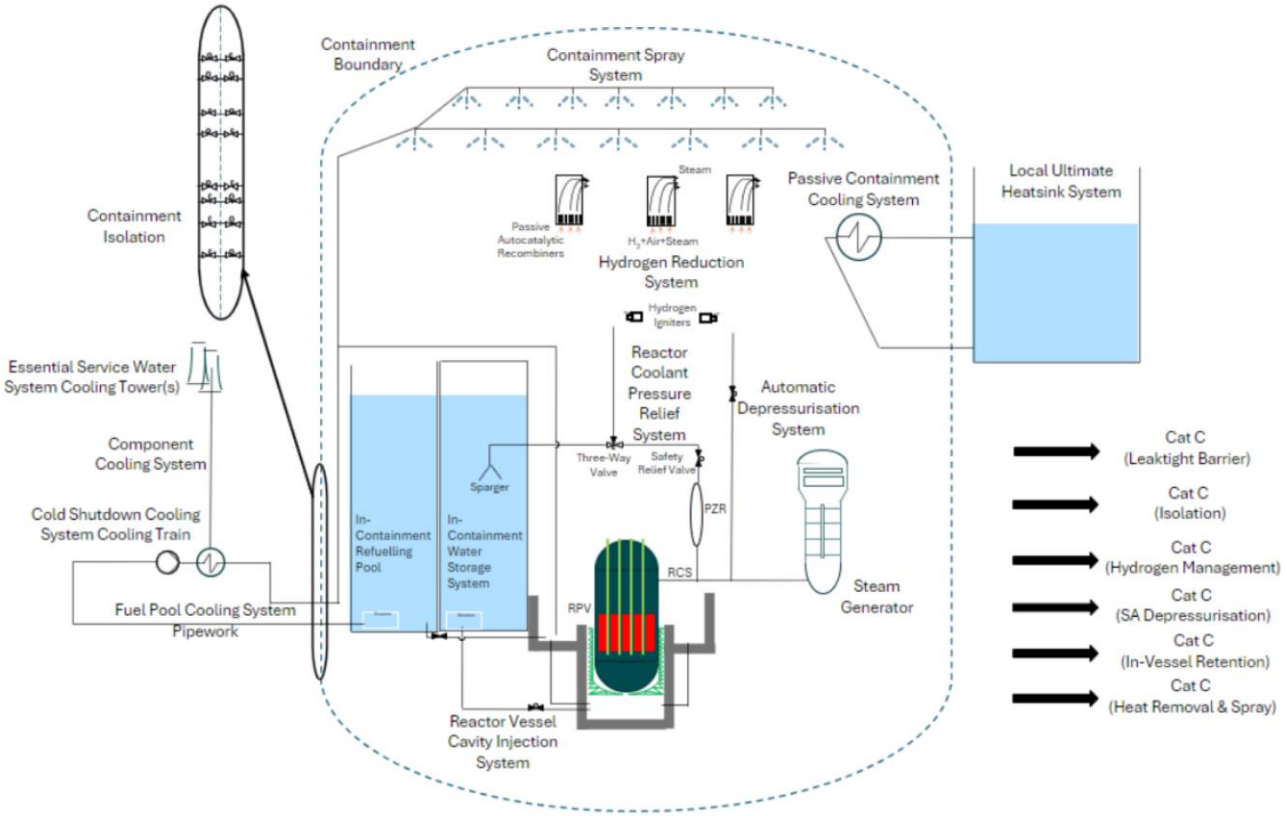
- Functional diversity and automatic system initiation without requiring main control room operator action for the first 30 minutes after an initiating event or action by personnel outside the main control room for the first hour after an initiating event.
- Performance of the safety function during a complete loss of off-site power and a station blackout without support from essential on-site services, such as alternate power supplies, for 72 hours and without off-site services for 7 days.

Design provision [JM02] performs the fundamental safety function of confining radioactive substances under severe accident conditions (DEC-B) and provides the final barrier against their release into the environment so that the maximum doses permitted by legislation for personnel and the public are not exceeded. The containment is isolated automatically, but the isolation valves can be operated manually.

The internal containment arrangement is designed to maximize heat removal by natural convection and minimize the potential for hydrogen accumulation in locations without natural circulation of the gaseous atmosphere. Five generic configurations of isolation components are defined to ensure reliable isolation of the containment interior; these must perform their safety function under all design conditions up to DEC-B. Containment isolation itself is provided by the preceding design provision [JM01]. During a severe accident [JM02], operators can control the isolation valves through the dedicated severe accident management system (SAMS) [JRQ20].

The water supplies for design provision [JM02] are sized to perform the safety functions for 72 hours. For long-term operation, the systems can be replenished with water from the safety coolant supply system [KAX]. Design provision [JM02] remains functional during a complete loss of external electrical power, and the necessary components are powered by emergency diesel generators [BD] and Category I assured AC and DC power supply systems, as described below.

Fig. B.33: Simplified diagram of the principle of design provision [JM02]



Primary circuit depressurization during a severe accident: During DEC-B accident sequences, design provision [JM02] can depressurize the primary circuit to reduce loading on the reactor pressure vessel with a damaged core and, where applicable, prevent high-pressure ejection of molten material from the pressure vessel into water and direct containment heating. These phenomena could jeopardize containment integrity. Depressurization is also important for limiting the natural circulation of hot gases in the primary circuit, which could cause creep rupture of the steam generator heat-transfer tubes and containment bypass.

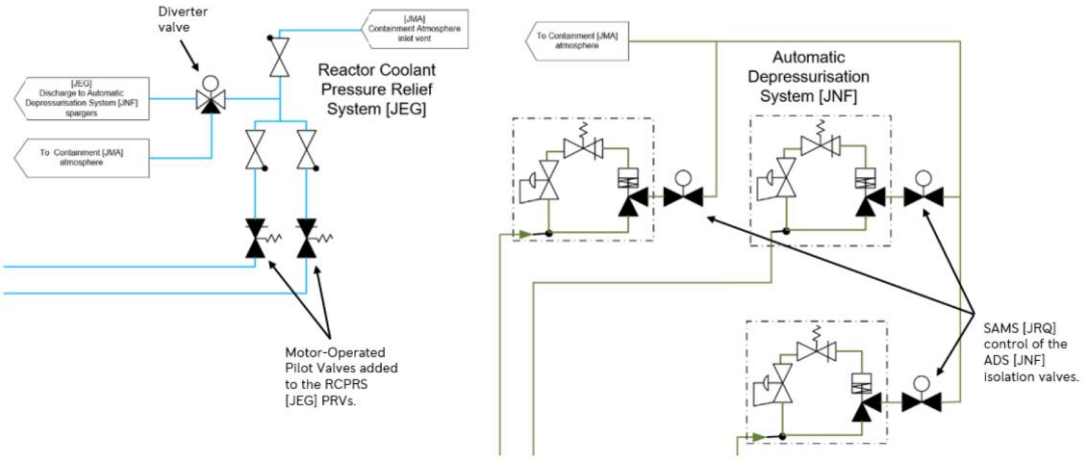
The RR SMR design includes two methods of depressurizing the primary circuit under severe accident conditions:

- The primary means is the set of pressurizer safety valves (Reactor Coolant Pressure Relief System) [JEG], which uses the high-temperature overpressure protection (HTOP) safety valves.
- The secondary means is manual depressurization using system [JNF].

Depressurization is performed only through manual operator action using the severe accident management system (SAMS) [JRQ20]. The SAMS is blocked during normal operation to prevent spurious actuation.

The pressurizer safety valve set [JEG] can be opened manually using pilot-operated solenoid valves independently of primary circuit pressure. The discharge from valves [JEG] can be opened either below the water level in the in-containment water storage system (IWSS) or directly into the containment atmosphere. The flow paths can be realigned manually, with the path directly into the containment atmosphere as the default. If the high-pressure primary circuit depressurization paths cannot be used, the low-pressure paths of system [JNF] can be used as a diverse method. All isolation components in system [JNF] are controlled manually from the SAMS [JRQ20].

Fig. B.34: Simplified diagram of the principle of primary circuit depressurization during a severe accident

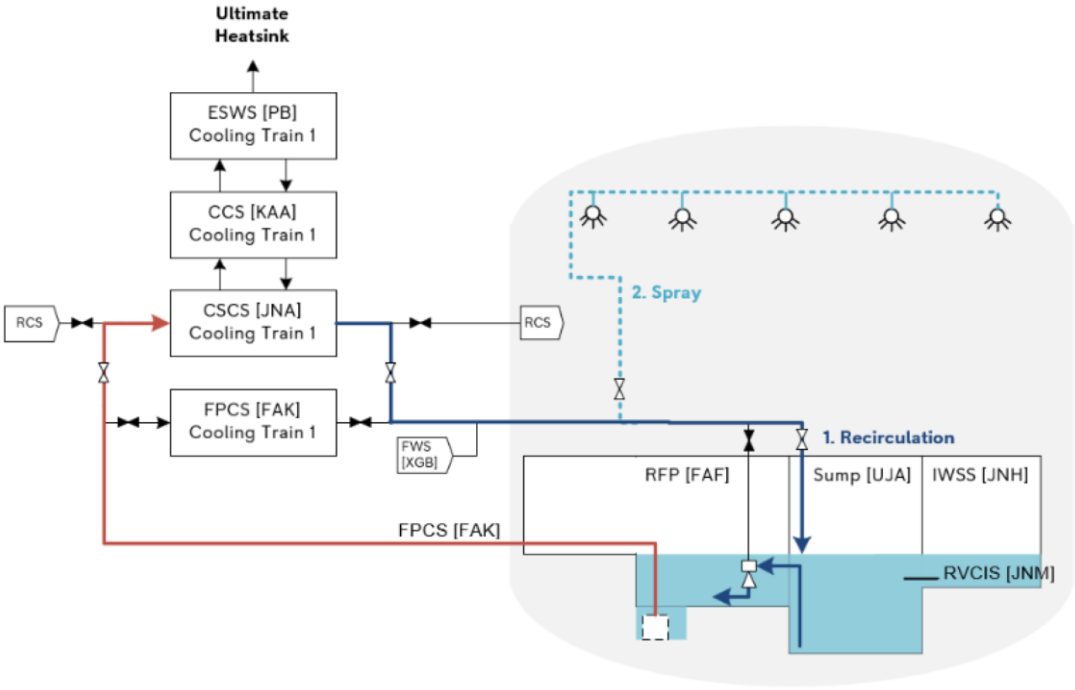


Containment heat removal during a severe accident: Containment heat removal during a severe accident is necessary to prevent containment parameters, namely pressure and temperature, from exceeding the design limits. The RR SMR design uses two heat-removal methods: passive and active. Each system, passive or active, is capable of removing all residual heat from the containment.

The LUHS system [JNK], previously described in the section on design provision [JN01], is used for passive heat removal. During a DEC-B severe accident, this system is controlled through the SAMS [JRQ20], permitting manual control of all necessary components. If one of the three redundant trains of system [JNK] fails, the damaged part can be isolated and the water supply from the isolated system can be transferred manually to another system.

If passive containment heat removal fails during DEC-B, the RR SMR design is equipped with secondary active containment heat removal (ACHR). Heat is then removed from the containment by active systems to the ultimate heat sink through fan cooling towers. The active containment heat removal (ACHR) function is performed by a spray system connected to the irradiated fuel pool cooling system [FAK] and the reactor shutdown cooling system [JNA]. The ACHR circuit is configured by the operator to permit simultaneous cooling of the irradiated fuel storage pool [FAK] and cooling of spray-medium recirculation from the containment sump [UJA] through heat exchangers [JNA] to the primary component cooling circuit [KAA] and the essential service water system [PB]. The spray system is also connected to the fire water system (FWS) [XGB].

Fig. B.35: Simplified diagram of active containment heat removal using the spray system



Control of hydrogen concentration in the containment: The containment hydrogen control function uses the following systems, structures, components, and structural features:

- Sufficient free containment volume [JMA] to dilute potentially released hydrogen.
- A containment geometry that eliminates stagnant spaces without flow in which hydrogen could accumulate.
- The hydrogen combustion system [JMT] to reduce its volume fraction in the containment atmosphere.
- Provision of dedicated recombiners and a venting system for the IWSS water storage tank [JNH] to prevent hydrogen deflagration.
- Variable routing of primary circuit depressurization [JEG] directly into the containment, thereby minimizing the volume of hydrogen in the IWSS.

The large volume of air in the containment reduces the hydrogen concentration by dilution, supported by natural circulation of the internal containment atmosphere and the elimination of stagnant spaces or pockets in which locally high hydrogen concentrations could develop.

During severe accidents, hydrogen concentration is reduced by passive autocatalytic hydrogen recombiners (PAR HRS) [JMT] and hydrogen igniters (HRS) [JMT]. The recombiner systems are designed to achieve an overall hydrogen concentration below 4 % in the containment atmosphere within 12 hours. Recombination begins at a hydrogen concentration of approximately 2 %. Hydrogen igniters are located where high hydrogen concentrations are most likely, particularly at potential primary circuit leak locations during a LOCA. During a severe accident, a potential hydrogen release would be greatest at locations where the primary circuit could be damaged. The hydrogen igniters (HRS) are active components and are initiated automatically by the SAMS [JRQ20] when the hydrogen concentration exceeds 4 %.

Four sensors located inside the containment continuously monitor the hydrogen concentration and transmit their data to the main and backup control rooms and to the technical support center (emergency response team).

System [JEG] lines discharging into the in-containment water storage system (IWSS) are provided for primary circuit depressurization, so hydrogen can also accumulate above the water level in this tank. For this purpose, the tank interior is equipped with recombiners and rupture disks that vent the interior of the tank into the containment in the event of hydrogen deflagration. The operator selects the primary circuit depressurization path, to the IWSS tank or the containment, based on instructions in the Severe Accident Management Guidelines (SAMG) or instructions from the technical support center.

Retention of molten core material (corium) in the reactor pressure vessel (in-vessel retention): Retaining corium in the reactor pressure vessel eliminates two potential hazards associated with severe accident phenomenology. These are the interaction of molten corium with concrete and possible melt-through of the basemat. It also eliminates high-pressure corium ejection from the pressure vessel and direct containment heating. The IVR strategy uses two phases:

- The initial phase, in which the reactor pressure vessel cavity [UJA] is flooded by gravity with coolant from the IWSS tank [JNH]. The reactor cavity is flooded before the core structure collapses.
- The recirculation phase: steam from the coolant boiling in the reactor cavity and removing heat from the pressure vessel is released into the containment, and heat is removed by a passive [JNK] or active spray system. Condensed coolant returns to the reactor cavity from the containment sump [UJA] through recirculation lines under gravity head.

The reactor cavity flooding system comprises two flooding lines from the IWSS tank [JNH] and two recirculation lines connecting the containment sump to the reactor cavity. The lines are redundant, and one line is always sufficient for both flooding and recirculation, including residual heat removal from the damaged reactor core. The reactor cavity is flooded by the operator manually opening the applicable valves using the SAMS [JRQ20].

Fig. B.36: Initial reactor cavity flooding phase (IVR strategy)

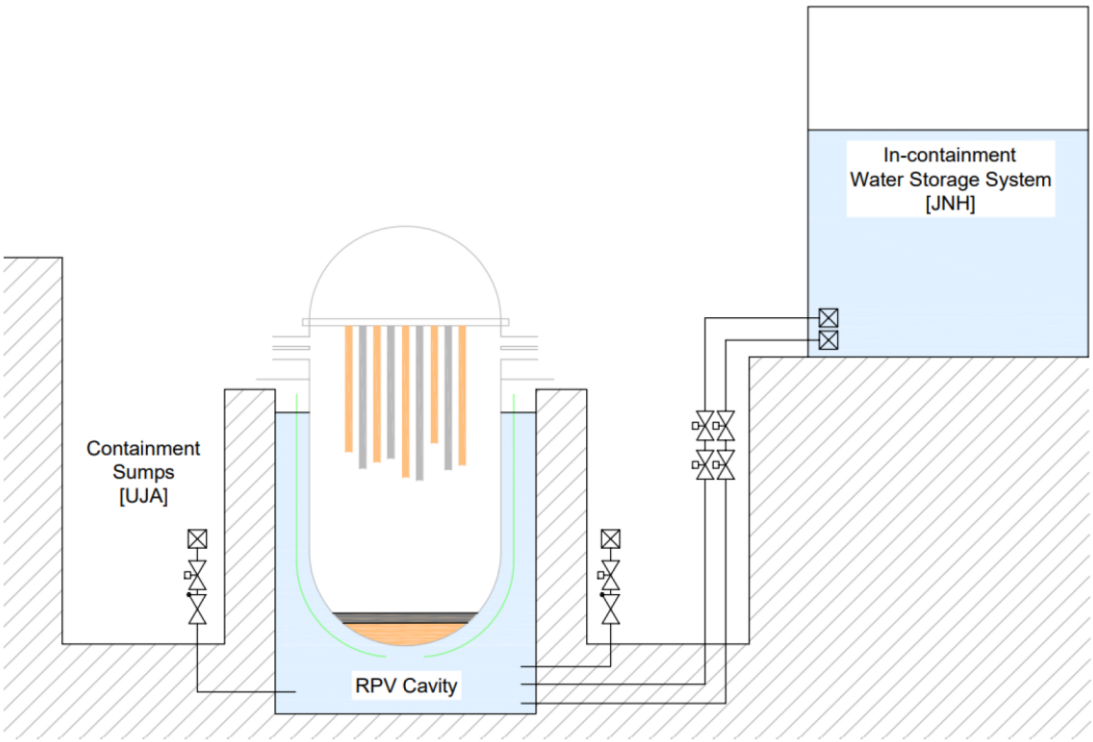
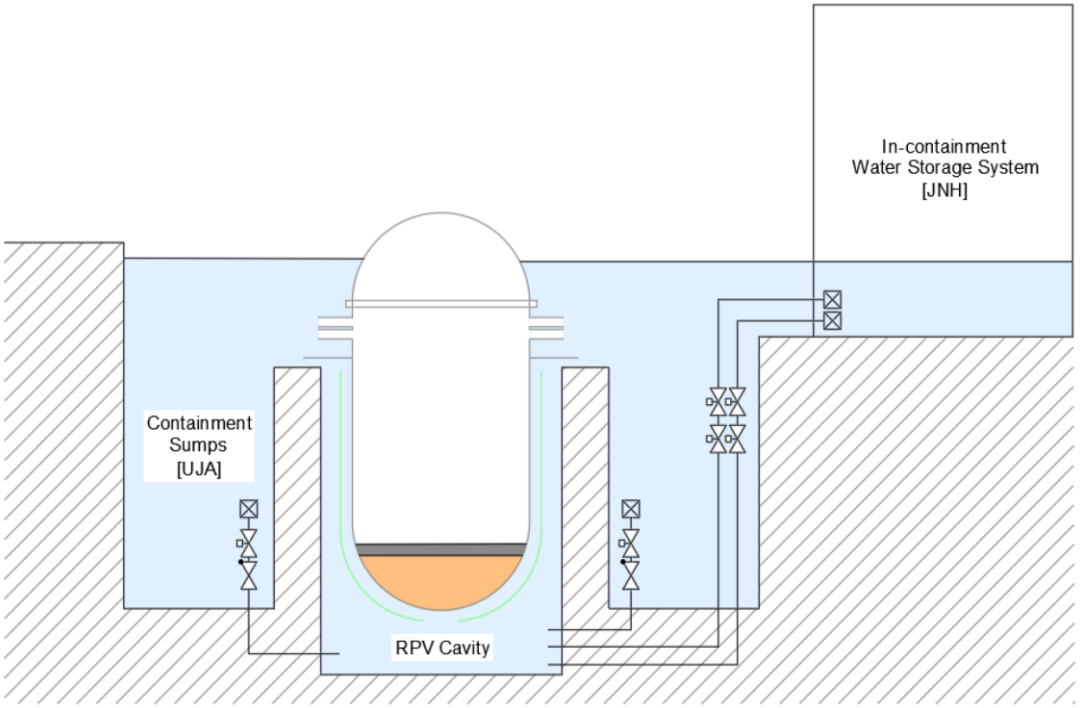


Fig. B.37: IVR strategy recirculation phase, heat removal to the containment



During normal and abnormal operation, the systems performing design provision [JM02] are in standby. For all postulated initiating events, the reactor is shut down by reactor trip [JD01] or by the alternative method [JD02]. Residual heat is removed using the HTHR [JN03], PDHR [JN02], or ECC [JN01] design provisions. At the event level at which design provision [JN01] is used, complete containment isolation [JM01] is initiated. If design provision [JN01] is unavailable, the severe accident design provision [JM02] is declared as a mitigating provision for DEC-B.

Design provision [JM02] is initiated when the transition is made from emergency operating procedures (EOP) to the Severe Accident Management Guidelines (SAMG) on the basis of a high reactor core outlet temperature or an elevated hydrogen concentration in the containment. During DEC-B, the entire procedure for using design provision [JM02] is controlled manually by the operator in accordance with the SAMG through the SAMS control panel [JRQ]. Only the hydrogen igniters [JMT] are initiated automatically. The following operations are therefore controlled manually:

- Primary circuit depressurization using system [JEG].
- Reactor cavity flooding using system [JNM].
- Use of the spray system, if required.

The water supplies for these operations are sufficient for 72 hours. After this period, the water makeup system [KAX] would be used to replenish the tanks of the local passive containment heat removal system [JNK].

B.I.6.3.2.2.5.3. Containment operational state [JM03]

During normal or abnormal operation, the containment and associated systems retain any unplanned releases of radioactive substances during transients or minor faults. Design provision [JM03] is not used during refueling, when the containment is open. Design provision [JM03] thus ensures the required containment state by monitoring its integrity and serves as a preventive line at defense-in-depth levels DiD 1 and DiD 2.

B.I.6.3.2.2.5.4. Design provision for the supply of operating media [KAX]

The design provision for the supply of operating media [KAX] replenishes all necessary items supporting the implemented design provisions, particularly water and diesel fuel for the diesel generators. The safety classification of all components performing design provision [KAX] will correspond to the safety classification of the supported design provisions.

The system supplying media for safety design provisions [KAX] meets the following site-autonomy requirements:

- For DBC-2ii, DBC-3i, DBC-3ii, and DBC-4, system [KAX] will supply operating media after a postulated initiating event from the 72nd hour, until which time the inventories in the systems performing the design provisions are sufficient, through the seventh day, using media inventories located on-site.

- For DEC-A and DEC-B events, system [KAX] will supply operating media after a postulated initiating event from the 24th hour, until which time the inventories in the systems performing the design provisions are sufficient, through the seventh day.

Design provision [KAX] supplies water to support the following safety design provisions:

- Emergency core cooling (ECC) [JN01].
- Passive decay heat removal (PDHR) [JN02].
- Low-temperature decay heat removal (LTDHR) [JN04].
- Severe accident protection (SAC), passive cooling partial function [JM02].
- Severe accident protection (SAC), active containment heat removal (ACHR) partial function [JM02].
- Irradiated nuclear fuel pool cooling (FFPC) [FA02].
- Evaporation of water from the irradiated fuel pool (FPBO) [FA01].

Operating media will be supplied by permanent equipment, including existing tanks, piping, and pumps together with their drive systems; mobile equipment, including hoses and mobile pumps, may also be used. However, system [KAX] will include all equipment necessary to supply operating media for 7 days after an initiating event. Design provision [KAX] will include the capability to share media inventories among system divisions. For example, if one division fails and its media inventories cannot be used, [KAX] will permit these unused inventories to be transferred to an operable division. Media may be transferred passively, by gravity, or actively, using pumps.

The stationary LUHS [JNK] and ESWS [PB] tanks will be used as water sources for design provision [KAX], and their contents can be transferred as required using [KAX] equipment. For example, water from the closed essential service water system (ESWS) circuit may be used to support direct emergency cooling design provisions, whether active, such as ECC, or passive, such as PDHR and SAC. A detailed description of the [KAX] equipment, including the water-consumption balance, will be provided in the design documentation.

System [KAX] also includes equipment for ensuring a sufficient quantity of diesel fuel in the operating and reserve tanks for the emergency diesel generators [BDV], with each diesel generator provided with its own total diesel fuel inventory sufficient for 7 days of operation. The diesel fuel inventory will be located in the immediate vicinity of the diesel generators.

If boron concentrate is required for alternative reactor shutdown (ASF) [JD02], it is not expected to require replenishment during the 7 days following a postulated initiating event. However, this assumption will be verified during subsequent design work.

B.I.6.3.2.2.6. Electrical power supply systems

To facilitate orientation in the following description of the individual portions of the auxiliary power supply systems, their designations are summarized below:

Table B.9: Coding system for individual portions of electrical systems

Code designation	System name
A	External transmission system
AC_	400 kV extra-high-voltage transmission system
B	Internal auxiliary power supply systems
BB_	Normal high-voltage auxiliary power supply system (11 kV)
BC_	Standby high-voltage auxiliary power supply system (11 kV)
BD_	Category II emergency high-voltage power supply system (11 kV)
BF_	Normal low-voltage auxiliary power supply system for process systems (400 V)
BG_	Normal low-voltage auxiliary power supply system for non-process systems (400 V)
BK_	Category II emergency low-voltage power supply system (400 V)
BL_	Diverse Category II emergency low-voltage power supply system (400 V)
BM_	Category I uninterruptible AC power supply system (230 V)
BP_	Category I uninterruptible DC power supply system (220 V)
BQ_	Category I uninterruptible DC power supply system for safety systems (220 V)
MS_	Electrical generator power evacuation system
X__	Auxiliary electrical systems (grounding, lightning protection, internal and external lighting, and similar systems)

Notes to the table:

- The underscore in a designation represents an additional letter in the electrical-system coding used to identify a specific system more precisely.
- Normal: part of the systems powered by the electrical generator or the external grid.
- Standby: part of the systems powered by the 110 kV line
- Emergency: part of the systems powered by the emergency diesel generators.
- Diverse: part of the systems powered by the diverse diesel generators.
- Uninterruptible: part of the systems providing uninterruptible power and supported by batteries.
- Process systems: systems involved in electricity generation whose loss of power results in an unplanned reduction in generation.
- Non-process systems: systems not directly involved in electricity generation whose loss of power does not result in an unplanned reduction in generation.

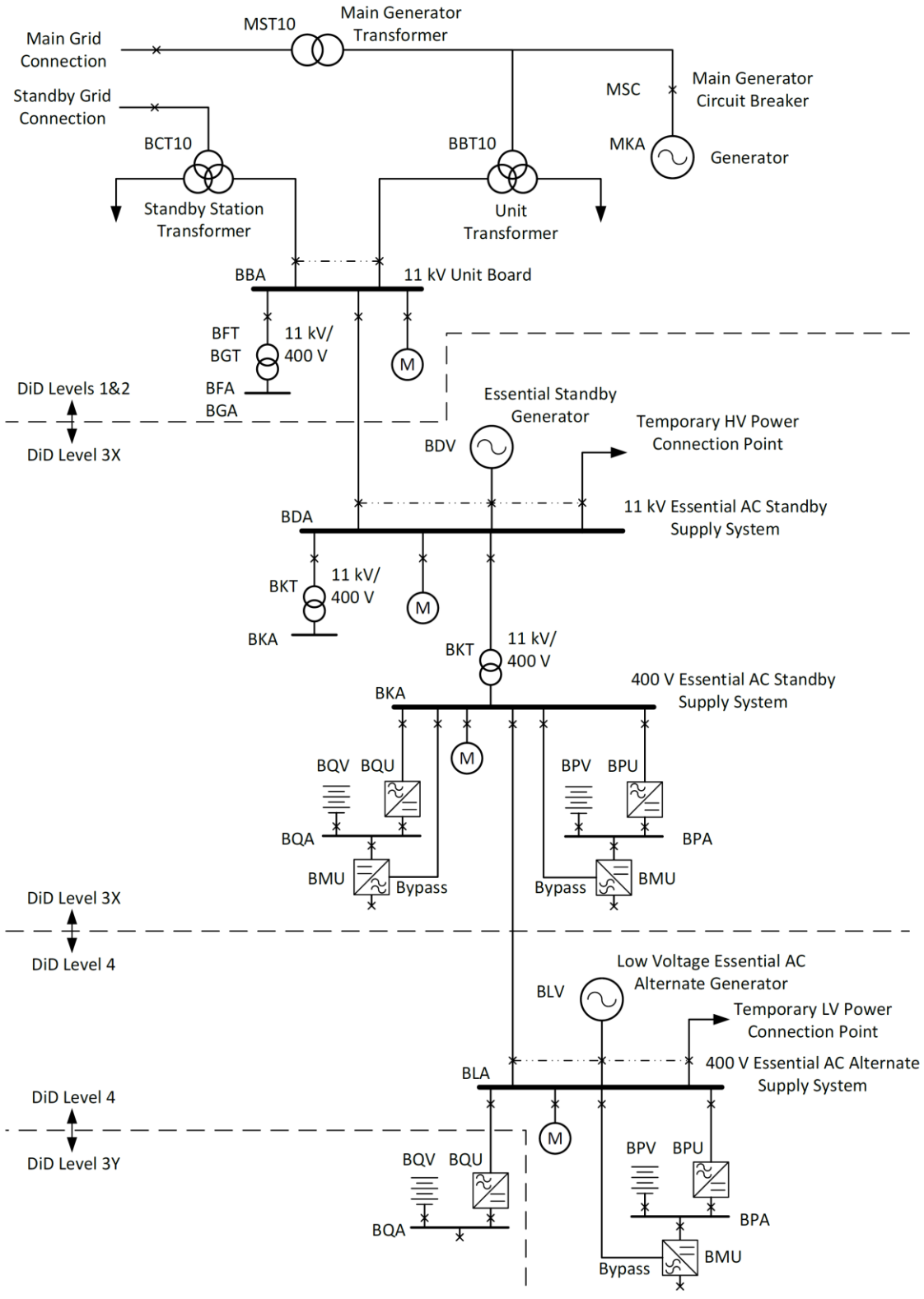
B.I.6.3.2.2.6.1. Description of the RR SMR electrical diagram

An overview diagram of the RR SMR auxiliary power supply is shown in the following figure. The figure does not show the system's division into separate divisions, and only one of the two divisions is described below. The electrical generator [MKA] is connected through a circuit breaker to the distribution system and the main auxiliary transformer [BBT10]. Busbar [BBA] is also supplied from the standby auxiliary transformer [BCT10], which is connected to the external 110 kV standby power supply line. Both the main and standby auxiliary transformers have two secondary windings connected to two 11 kV high-voltage auxiliary power supply divisions.

Equipment for the first defense-in-depth level, DiD 1, as indicated in the figure, includes the functions of the unit transformer [MST10], electrical generator [MKA] and its circuit breaker [MSC], auxiliary transformer [BBT10], 11 kV switchgear [BBA], 11 kV/400 V transformers [BFT] and [BGT], and 400 V switchgear for process and non-process loads [BFA] and [BGA].

Equipment for the second defense-in-depth level, DiD 2, is the electrical generator [MKA] supplying house loads when the electrical system is disconnected from the external grid. This defense-in-depth level also includes operation of the auxiliary power supply system from the standby transformer [BCT10] connected to an independent external 110 kV line. Two low-voltage standby diesel generators [BKV] are also available to supply secondary loads and power plant auxiliary systems; they are not shown in the figure.

Fig. B.38: Overview diagram of the auxiliary power supply



The third defense-in-depth level is divided into two independent, diverse equipment groups designated DiD 3x and DiD 3y. These diverse equipment groups are intended for defense-in-depth levels DiD 3a and DiD 3b.

The DiD 3x equipment group is based on 11 kV emergency AC power sources [BDV], which supply power to the 11 kV switchgear [BDA] and, through transformers [BKT], to the 400 V switchgear [BKA]. The 400 V switchgear [BKA] supplies two battery-charging rectifiers, [BQU] for safety-system power and [BPU] for other uninterruptible loads, as well as power inverters [BMU] that supply the Category I AC switchgear [BMA], which is not shown in the figure. The battery system [BQV] is connected to switchgear [BQA], and system [BPV] is similarly connected to [BPA],

maintaining the switchgear continuously energized with DC voltage. Switchgear [BQA] provides DC power to safety systems, while switchgear [BPA] provides DC power to other important non-safety systems. During normal operation, this switchgear is supplied by the normal feeder from switchgear [BBA]. The emergency diesel generators [BDV] supply switchgear [BDA] if the main non-assured power supply fails, including the downstream 400 V switchgear [BKA] through transformers [BKT] and the associated systems. A standby mobile diesel generator with an output voltage of 11 kV can also be connected to switchgear [BDA].

The DiD 3y equipment group is based on backup DC sources that provide highly reliable uninterruptible power to the systems supporting the individual RR SMR design provisions, but with a limited quantity of electrical energy. The principal systems at this level are the rectifiers (chargers) [BQU] and [BPU] and the batteries [BQV] and [BPV].

The equipment group for the fourth defense-in-depth level, DiD 4, is intended for a failure of the emergency AC supply from switchgear [BKA], namely a station blackout (SBO) scenario. Two 400 V low-voltage AC diesel generators [BLV], serving as diverse equipment, are available together with the downstream switchgear [BLA]. This switchgear is normally supplied from the Category II emergency power supply system switchgear [BKA] and subsequently supplies a number of charger [BPU], battery [BPV], and inverter [BMU] systems. A backup mobile 400 V electrical power source can be connected to switchgear [BLA] if all permanently installed backup electrical power sources fail. This defense-in-depth level primarily supplies the severe accident management system (SAMS) [JRQ20].

B.I.6.3.2.2.6.2. RR SMR electrical power supply division arrangement

The auxiliary electrical power supply systems are arranged in divisions as follows:

- Two 11 kV AC power supply divisions are used at DiD 1 and DiD 2. One division comprises switchgear [BBA01] and [BBA03], and the other comprises switchgear [BBA02]. Among other loads, these three switchgear units supply the three reactor coolant pumps [JEB]. A two-division arrangement is used at this DiD level to supply the other secondary-circuit loads and auxiliary systems.
- At DiD 3x, two independent 11 kV divisions [BDA21] and [BDA22] supplied by two emergency diesel generators [BDV] are used. Three divisions [BQA21], [BQA22], and [BQA23] are provided for the assured (uninterruptible) power supply system, corresponding to the power supply for the individual divisions of the reactor protection system [JRA], and another three divisions [BPA21], [BPA22], and [BPA23] supply the safety-system protection and control system [JRQ10].
- At DiD 3y, four power supply divisions [BQA24], [BQA25], [BQA26], and [BQA27] are used, corresponding to the four-division arrangement of the diverse protection system [JQA].
- At DiD 4, two electrical power supply divisions [BPA27] and [BQA27] are used to supply the severe accident management system (SAMS) [JRQ20].

The independence of the individual divisions is based on their separation both for the Category II assured power supply, systems [BD_], [BK_], and [BL_], and for the Category I uninterruptible power supply systems [BQ_], [BM_], and [BP_]. The principles applied in the RR SMR design are as follows:

- Consistent application of best and proven design practices, including the use of previous operating experience.
- Design in accordance with legislative requirements and applicable codes and standards.
- Development of the electrical-system design in accordance with defined design requirements.
- The design requirements are substantiated.

The cable-routing philosophy for the individual divisions is an important part of the electrical-system design. This philosophy is based on requirements for:

- Physical separation of the cabling of individual divisions.
- Routing of cables in individual bundles and cable trays.
- Routing of cable trays (bundles) inside cable ducts.
- Identification of individual cables and cable trays (bundles).
- Routing of cables and their bundles across the interface between the seismic and non-seismic portions of the RR SMR.
- Cable resistance to harsh environments.

These requirements are applied using a graded approach according to the applicable safety classification of the individual electrical systems.

B.I.6.3.2.2.6.3. Operation of the RR SMR electrical power supply during loss of off-site power

The overall electrical-system concept provides for autonomous SMR operation for 72 hours without an external energy supply and 168 hours (7 days) without an external energy supply but with the necessary operator actions. If the electrical systems operate without failure, the basic autonomous operating period is therefore 168 hours (7 days), with the diesel fuel inventory for the diesel generators [BDV] as the limiting factor. As long as these emergency diesel generators remain in operation, they supply all downstream switchgear and sections, including battery charging. The autonomous operating periods for switchgear at lower voltage levels are therefore defined as autonomous operation without an electrical power supply from the emergency diesel generators [BDV] and, where applicable, [BLV].

In terms of the capacity and performance of the individual electrical power supply systems, the individual system components are sized as follows.

Table B.10: Electrical power supply system capacities

Parameter	Voltage	Number of divisions	Autonomous operating period
High-voltage AC system [BD] (diesel generators [BDV])	11 kV	2	168 hours (7 days)
Low-voltage AC system [BK] (diesel generators [BKV] for secondary systems outside the reactor building)	400 V	2	corresponds to system [BD]
Diverse low-voltage AC system [BL] (diesel generators [BLV])	400 V	2	168 hours (7 days)
Low-voltage uninterruptible DC power supply [BQ] (batteries)	220 V	3	24 hours (2 × 12 hours (RPS))
Low-voltage uninterruptible DC power supply [BQ] (batteries)	220 V	4	24 hours (2 × 12 hours (DPS))
Uninterruptible DC power supply [BP] (batteries)	220 V	3	2 hours (2 × 1 hour) for turbine coastdown, 2 hours (2 × 1 hour) for other important systems, 72 hours (2 × 36 hours) for accident management systems

The emergency diesel generators [BDV] are started automatically upon a loss of off-site power, and their diesel fuel inventory corresponds to an autonomous operating period of 168 hours (7 days). If system [BL] loses its power supply from system [BK], and therefore from diesel generators [BDV], it transfers to its own low-voltage diesel generators [BLV], which have an autonomous operating period of 168 hours (7 days).

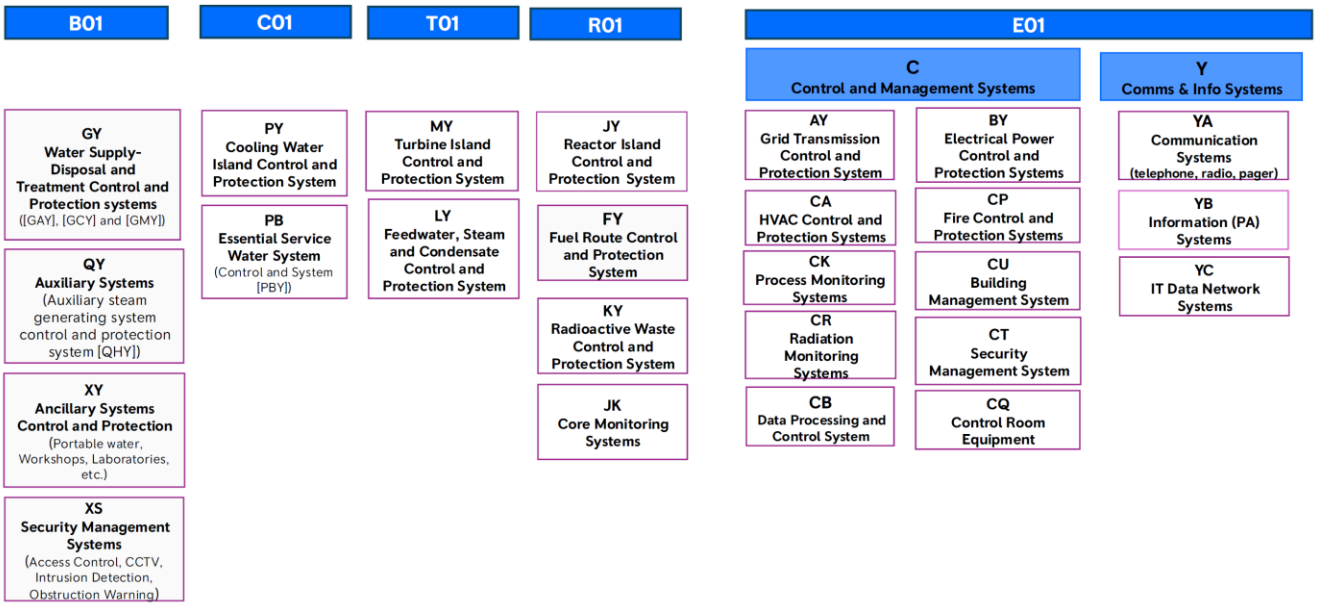
The uninterruptible DC power supply system is divided into two subsystems. System [BQ] supplies the safety systems and includes three divisions for the reactor protection system (RPS) and four divisions for the diverse protection system (DPS). The divisions are further subdivided internally, with the total period of autonomous battery operation equal to 24 hours.

The uninterruptible DC power supply system [BP] is configured as a dual system to the preceding system [BQ], has a more complex internal structure, and supplies other important non-safety loads, such as PAMS, SAMS, and oil pumps for turbine coastdown.

B.I.6.3.2.2.7. Instrumentation and control (I&C) systems

An overall overview of the I&C system architecture used in the RR SMR design is shown in the following figure.

Fig. B.39: Breakdown of the RR SMR I&C systems



Note: designations of the individual RR SMR I&C system components. For completeness, the original English names are also provided in parentheses:
B01: auxiliary power plant systems (Balance of Plant); C01: cooling water systems (Cooling Water Island); T01: secondary circuit systems (Turbine Island);
R01: primary circuit systems (Reactor Island); E01: electrical control systems and other instrumentation (Electrical, Control and Instrumentation).

The most important instrumentation and control (I&C) systems, which are described briefly below, are the reactor island (primary circuit) control and protection systems [JY], comprising:

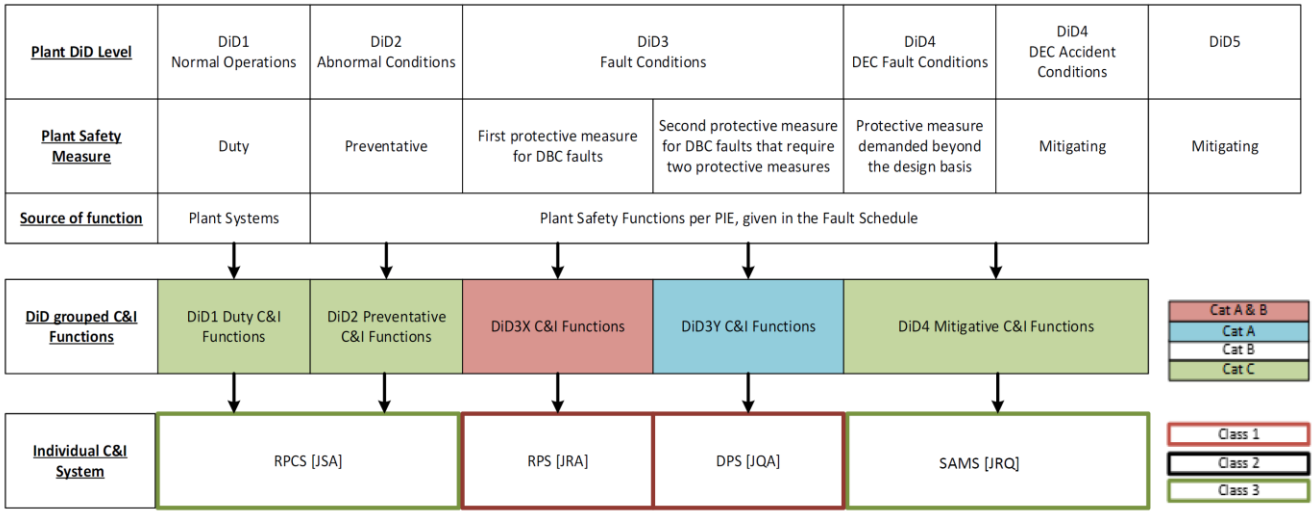
- Reactor protection system (RPS) [JRA].
- Diverse reactor protection system (DPS) [JQA].
- Severe accident management system (SAMS) [JRQ].

The power plant control and monitoring systems, comprising the following, are also described briefly:

- Reactor process control system (RPCS) [JSA].
- Reactor process monitoring system (RPMS) [JSS].

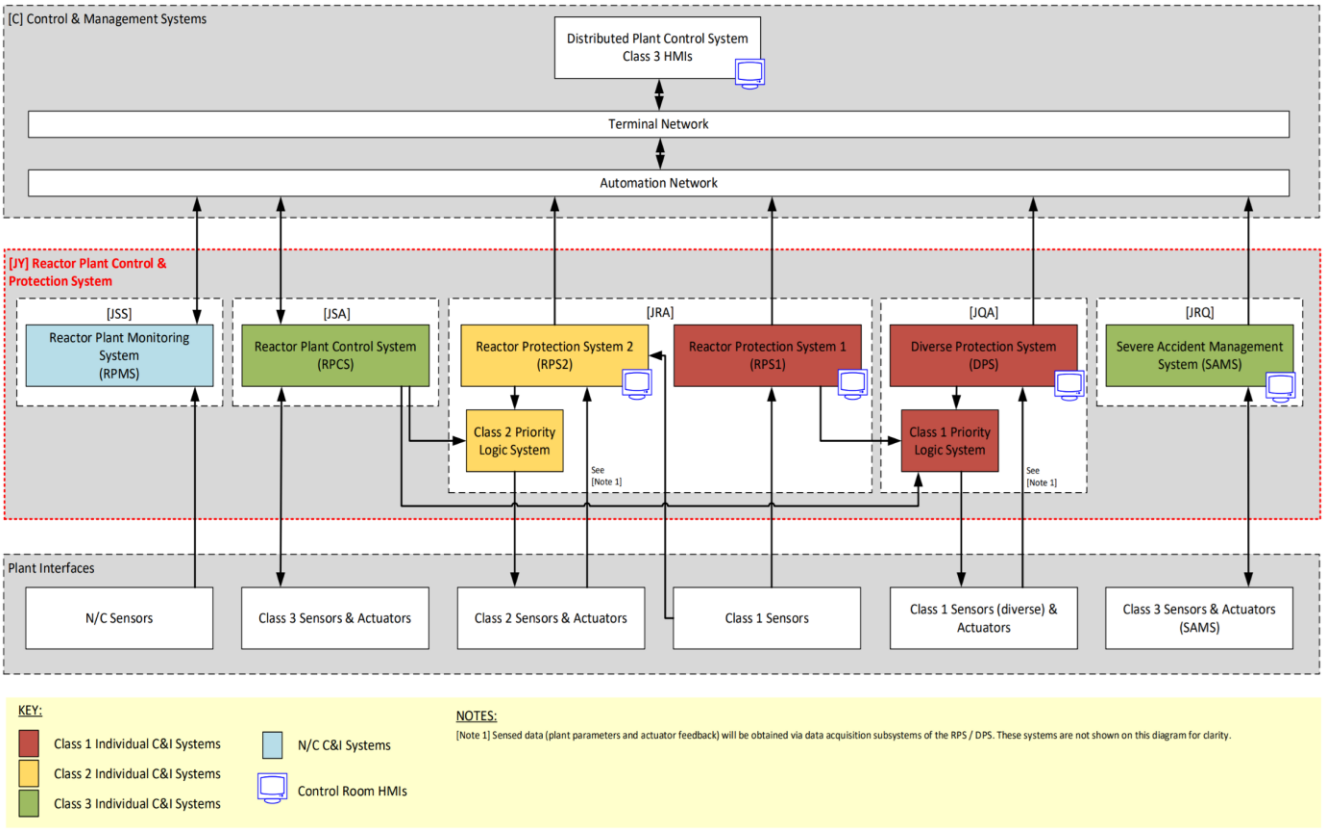
The allocation of functions of the primary circuit I&C control and protection systems [JY] to the individual defense-in-depth levels is shown in the following figure.

Fig. B.40: Allocation of system [JY] functions to the individual defense-in-depth levels



The system [JY] design also includes rules for reducing the probability of human error through the human-machine interface (HMI). The more detailed system [JY] architecture, including the basic interfaces and method of separating sensors for different defense-in-depth levels, is summarized in the following figure.

Fig. B.41: Basic architecture of system [JY]



B.I.6.3.2.2.7.1. I&C system resistance to a single failure

The individual I&C systems are arranged in divisions so that the single-failure criterion is met and the required system reliability objectives are achieved. System redundancy contributes to higher reliability, but increasing it further does not eliminate the possibility of a common-cause failure (CCF). For this reason, the principles of diversity and independence are also applied in the RR SMR design.

The diverse RPS [JRA] and DPS [JQA] systems independently perform the same function. Each diverse system has triple redundancy with two-out-of-three function actuation voting, so the two systems individually and jointly meet both the single-failure criterion and the common-cause-failure criterion.

The reactor process control system (RPCS) [JSA] is implemented in two divisions to ensure sufficient functional reliability. Signal voting logic is implemented differently according to the specific required function. The reactor process monitoring system (RPMS) [JSS] for normal operation is implemented as a single division without redundancy. The reactor protection system (RPS) [JRA] is used to monitor important parameters at defense-in-depth level DiD 3. It is implemented in three independent divisions, as described above, and is equipped with logic that resolves potentially ambiguous data: if the data in the three divisions are not identical, the system evaluates the condition and determines which value is correct.

The SAMS [JRQ] has a two-division configuration, consistent with the two-division configuration of the process systems.

B.I.6.3.2.2.7.2. Independence of I&C systems

I&C system independence is implemented to prevent a failure from propagating from systems with a lower safety classification to systems with a higher safety classification and to prevent failures from propagating between individual redundant divisions. The independence of the reactor protection and control systems [JY] is ensured by the following rules:

- Separation of individual subsystems with different safety classifications so that a failure cannot propagate from a subsystem with a lower safety classification to a system with a higher safety classification.
- Independence of individual subsystems intended for different defense-in-depth levels.
- Independence of individual design provisions to the extent practicable.
- Independence between the human-machine interface in the main control room and the same interface in the backup (emergency) control room. Failure of the interface in one control room must not disable the interface in the other.

Sensors may be shared only if the above independence rules are not violated. Separation is implemented so that no more than one independent division is disabled by an internal or external hazard. Independence is achieved through a combination of physical division separation; separation of electrical power supplies and electrical switchgear used for individual divisions; and independence of functional and communication paths, for example through unidirectional communication. System separation principles are implemented in the RR SMR design through rules governing the design of the civil portion of the power plant and the configuration of modular systems.

B.I.6.3.2.2.7.3 Resistance to common-cause failure (CCF)

The principles of independence, redundancy, and especially diversity are applied in the RR SMR design to ensure resistance to common-cause failure. Diversity is applied primarily to prevent common-cause failure across different defense-in-depth levels and to prevent possible failures within defense-in-depth levels, particularly within DiD 3, between DiD 3a and DiD 3b. According to NUREG-CR-7007, diversity is based on the following principles:

- Design diversity: multiple design provisions with different structural features are used to address the same problem.
- Equipment supplier diversity: hardware components or systems with the same or similar functions from multiple manufacturers are used.
- Functional-logic system diversity: different types of equipment are used for systems that perform logical signal processing to generate output actuation commands.
- Functional diversity: different systems perform different process functions to achieve the same result, namely performance of the safety function.
- Data-processing logic diversity: different programming languages, algorithms, timing, and sequences are used to construct logic functions.
- Signal diversity: the design safety provision is initiated by physically different process parameters.

The reactor protection and control system [JY] applies diverse-arrangement principles in the following cases:

- Diversity among individual I&C systems in different safety classes.
- Diversity among individual I&C systems for different defense-in-depth levels.
- Use of multiple diverse design provisions, particularly different initiating parameters, to respond to the same initiating event.

B.I.6.3.2.2.7.4. I&C system reliability

I&C system reliability requirements are commensurate with their safety significance, both in terms of the contribution of their reliability to that of the entire chain of design provisions and in terms of legislative and design requirements for these systems and consideration of best practices. The reliability requirements for the individual subsystems are:

- Reactor protection system (RPS) [JRA]: probability of failure 1E-03; spurious actuation (spurious failure rate) <1E-03; number of divisions 3; signal voting logic 2/3.
- Diverse reactor protection system (DPS) [JQA]: probability of failure 1E-04; spurious actuation <1E-03; number of divisions 3; signal voting logic 2/3.
- Severe accident management system (SAMS) [JRQ]: probability of failure 1E-01; spurious actuation <1E-01; number of divisions 2; no signal voting logic.
- Monitoring system (RPMS) [JSA]: probability of failure 1E-01; spurious actuation <1E-01; number of divisions 2; no signal voting logic.

For the probability of failure, a shared design value of <1E-05 applies to the individual reactor protection systems [JRA] and [JQA], namely the probability of failure to shut down the reactor using one of the two diverse design provisions; the values above are declared with a high degree of conservatism. The overall objective, namely the probability of failure to shut down the reactor, can be calculated as the product of the partial declared values, yielding 1E-07.

It is important to note that the frequency of spurious actuation is not equal to the frequency of a spurious reactor trip. Spurious actuation of part of a system need not cause a significant transient, namely reactor shutdown, because other provisions may prevent shutdown. For example, if the boron concentrate pumps (DPS) start spuriously, reactor shutdown also requires the primary circuit depressurization valves to open, which need not occur if only part of the system fails through a spurious start. The proposed parameters above are based on current international best practice, and their actual values will be quantified during subsequent phases of RR SMR design preparation.

B.I.6.3.2.2.7.5. I&C system fail-safe criterion

The fail-safe design concept provides that, in the event of the most probable system failures, the system, or the output from its function, automatically enters a safe state. The type of failure must take into account the probability of I&C system failure and the probability of spurious actuation. Potential fault states are appropriately balanced so that the resulting system state after a failure supports the performance of safety functions to the greatest possible extent. Designing a system to meet the fail-safe criterion requires a compromise because some actuators do not have an unambiguously defined "safe state" that applies universally under all conditions, such as containment isolation valves.

The approach to implementing the fail-safe criterion depends on the system's safety classification, the safe response of its behavior, the safety functions performed, and similar factors. Each system is therefore designed individually, and the fail-safe criterion is met using measures such as:

- Fail-safe characteristic: if the system fails, its outputs are placed in a "safe state", meaning a state in which the downstream actuators perform the anticipated safety function. For example, switching off the system outputs.
- Graceful degradation: for example, modification of the output actuation-signal logic from two-out-of-three voting to two-out-of-two voting.
- Backup operating mode: for example, automatic transfer of the system to backup equipment and/or an operator alarm.

For reactor trip functions, detection of a system failure disconnects power from the control rod drive system, which actuates the system and shuts down the reactor. In practice, failure of two of the three protection-system redundancies causes a reactor trip.

For safety systems not intended directly to shut down the reactor, failure of two of the three redundancies causes the outputs to be disconnected, disabling the system on failure without subsequently actuating the output actuators, and initiates a warning signal.

B.I.6.3.2.2.7.6. Qualification of I&C systems

The equipment qualification system demonstrates that systems, structures, and components will perform their specified functions under all normal operating conditions, during abnormal operation, and under accident conditions throughout their service lives. Qualification is divided into qualification for normal operating conditions, including ambient temperature, radiation conditions, and induced vibrations, and qualification for abnormal and accident conditions, including loss of power, failure of ventilation systems, steam or liquid leaks, the maintenance environment, and similar conditions. For equipment that may be exposed to a harsh environment, namely extreme conditions associated with the release of high-energy media, and is required to function under such conditions, qualification is extended to include the applicable evidence.

The I&C equipment qualification program establishes a system of qualification evidence confirming that the applicable equipment remains fit throughout its service life. The qualification program specifies the activities required to optimize qualification and the method of maintaining it through maintenance and surveillance.

B.I.6.3.2.2.7.7. Function prioritization

The signal-prioritization logic systems ([JRA50] and [JQA50]) are used when multiple system outputs must interact with the same component (actuator). Prioritization ensures the correct sequence of control commands so that, if systems in different safety categories issue conflicting demands, the command with the highest priority in the given situation is selected and the actuator cannot enter a hazardous state.

B.I.6.3.2.2.8. Nuclear fuel handling systems

The nuclear component handling system [F] is located in the fuel handling building (Fuelling Block) and includes equipment for handling nuclear fuel and other reactor internals and for storing nuclear fuel to support the following operations:

- Receipt of fresh fuel.
- Nuclear fuel storage and maintenance.
- Two-way transfer of nuclear fuel between the fuel storage structure and the containment.
- Nuclear fuel handling inside the containment, including core loading and handling of reactor components.
- Loading spent nuclear fuel into packages and handling the packages.
- Storage of spent nuclear fuel in dry packages outside the fuel handling building (Fuelling Block).

All fundamental safety functions, namely reactivity control, nuclear fuel cooling, prevention of the spread of radioactive material, and control of radiation exposure, are performed during all nuclear fuel handling operations. The nuclear fuel handling systems are designed using the same defense-in-depth philosophy as the nuclear reactor.

Fig. B.42: Location of the nuclear fuel handling building (3)



B.I.6.3.2.2.8.1 RR SMR operating modes

Operating modes are defined for operation of the RR SMR unit, specifying power operation, transient modes, and refueling modes:

- Mode 1: power operation.
- Mode 2: reactor startup.
- Mode 3: hot state.
- Mode 4A: warm state, heat removal using steam.
- Mode 4B: warm state, without steam removal.
- Mode 5A: cold state, reactor pressurized.
- Mode 5B: cold state, reactor depressurized.
- Mode 6A: refueling with a reduced water level.
- Mode 6B: refueling with the rated water level.

The RR SMR is safely shut down by inserting all control rods into the core, corresponding to the transition from Modes 1 and 2 to Modes 3 through 6. The reactor is shut down in Modes 3 through 6; withdrawal of the first control rod constitutes a transition to Mode 2, reactor startup.

During normal Mode 1 operation, the fuel is located in the reactor core, where a fission chain reaction takes place and the fuel is used to generate electricity. Fresh fuel is located in the fresh fuel area [FAA], where it can be inspected before being inserted into the reactor. Irradiated/spent nuclear fuel is located in the storage pool [FAB]; it may also be loaded into spent nuclear fuel packages in area [FCD] or stored in the external dry spent fuel storage facility [FDB].

During refueling, the reactor upper assembly, pressure vessel head, and reactor internals are removed using the polar crane to provide access to the fuel assemblies. Unplanned withdrawal of one or more control rods while the reactor is being dismantled could cause a core reactivity fault. The entire system is therefore equipped with the following protective systems: [FC01], which stops the polar crane on an increase in neutron flux; [FC11], the design provision for monitoring neutron flux during refueling; and [FC12], which mechanically locks the inserted control rods in place after they are disconnected from their drives. Core neutron flux is monitored continuously throughout refueling to prevent incorrect loading of fuel assemblies. This monitoring is supplemented by semiautomatic loading control and administrative control of the assemblies being loaded.

During a refueling outage, reactor pressure vessel welds are also inspected once every 10 years, with all reactor internals removed. In this case, all nuclear fuel is first removed from the core and transferred to the storage pool [FAB]. The reactor internals are placed in the refueling pool [FAF], and the welds are inspected ultrasonically using a special manipulator. The moving parts of the control rod drives and other reactor internals are also inspected for wear in accordance with the applicable program. Worn drive components can be replaced during these operations. Replacement of parts of the in-core monitoring equipment is also anticipated.

B.I.6.3.2.2.8.2. Functions of nuclear fuel handling systems

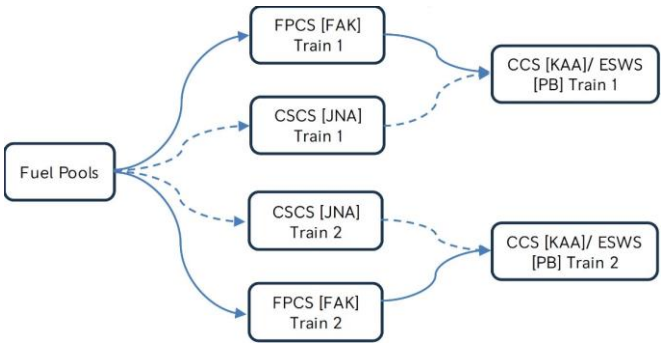
The internal fuel storage system [FA] comprises the fresh fuel storage and inspection area [FAA], irradiated fuel storage pool [FAB], refueling cavity [FAF], refueling pool [FAE], irradiated fuel pool cooling system [FAK], pool purification system [FAL], pool ventilation system [FAN], and pool filling system [FAT].

For fresh fuel, only the fundamental safety function of reactivity control is performed; neither residual heat removal nor prevention of the spread of radioactive substances is required. This function is performed solely by the geometry of the storage rack in the fresh-fuel transport containers together with neutron absorbers, which perform the fundamental safety function at all defense-in-depth levels. Only one fuel assembly is moved at a time during nuclear fuel handling.

Irradiated nuclear fuel is stored in pool racks and covered by sufficient water to remove residual heat. The spacing of the individual storage locations in the storage rack and the use of solid neutron absorbers ensure sufficient subcriticality of the irradiated fuel assemblies. Significant damage to irradiated fuel is practically eliminated through the use of the following design provisions: evaporation of water from the irradiated fuel pool (FPBO) [FA01]; irradiated nuclear fuel pool cooling (FFPC) [FA02]; prevention of criticality of assemblies located in the storage rack with neutron absorbers under operating and fault conditions (Safe, Moderated, Absorber, Unrodded, Geometry, SMAUG) [FA11]; prevention of criticality of assemblies outside storage racks with neutron absorbers (Safe, Moderated, Unrodded, Geometry, SMUG) [FA12]; and irradiated fuel pool cooling during normal operation (DFPC) [FA03].

The irradiated fuel storage pool cooling design provision [FA03] uses active cooling circuits that transfer heat through component cooling system heat exchangers [KAA] to the essential service water system (ESWS) [PB] and the ultimate heat sink. If the function of this design provision is lost or impaired, design provision [FA02] is used. It uses the same active components, system [FAK], as [FA03], but the electrical power supply to the systems changes and different I&C systems are used. In this case, the pool water is maintained at a higher temperature of 80 °C, and the purpose of this provision is to gain time before the pool begins to boil. The shutdown cooling system (CSCS) [JNA], which also includes automatic isolation of any leak, is used as additional redundancy for system [FAK]. The redundant arrangement of the individual heat-removal divisions is shown schematically in the following figure.

Fig. B.43: Functional diagram of heat removal by design provision [FA02]



If design provision [FA02] is also unavailable, heat is removed by design provision [FA01], namely evaporation of water from the irradiated fuel storage pool. In this state, residual heat is removed by boiling the coolant. Non-radioactive steam is discharged to the atmosphere by the passive ventilation system (FPVS) [FAN]. The ventilation system from the containment interspace has three trains. The fuel handling building ventilation system has another three trains. All flow paths are equipped with aerosol filters. If the differential pressure across the filters increases during operation because of filter blockage, a bypass path is opened automatically; its use is anticipated only at the DEC-A level.

Design provision [FA01] requires no active equipment for 72 hours after a fault occurs in Modes 1 through 5B. In Modes 6A and 6B, the operator must supply additional coolant from the LUHS system [JNK]. After 72 hours, the active cooling systems must be restored or an additional water supply provided.

Fig. B.44: Heat removal from the irradiated fuel pool [FAB] in operating Modes 1 through 5B

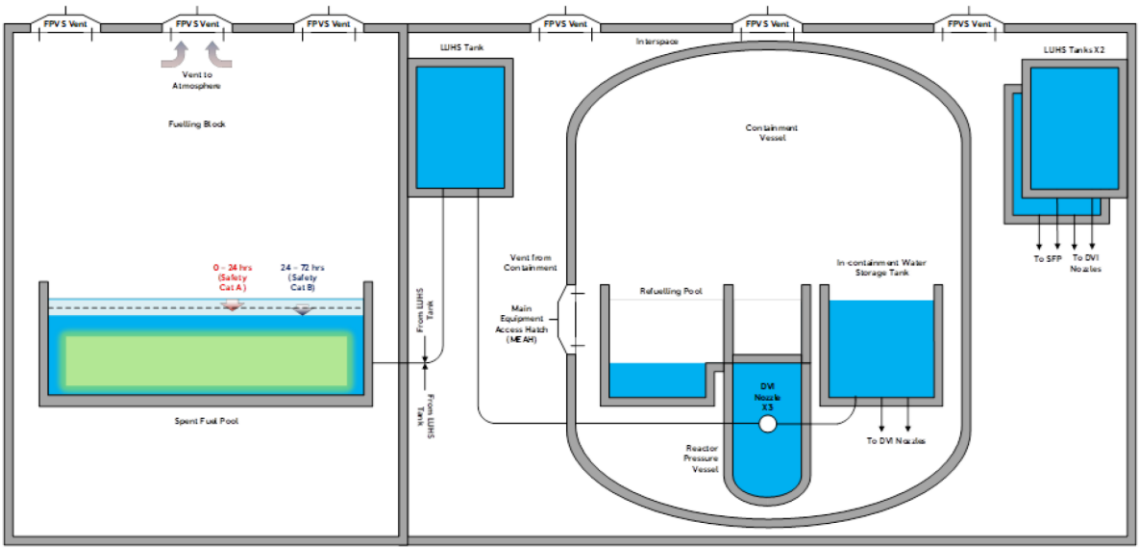
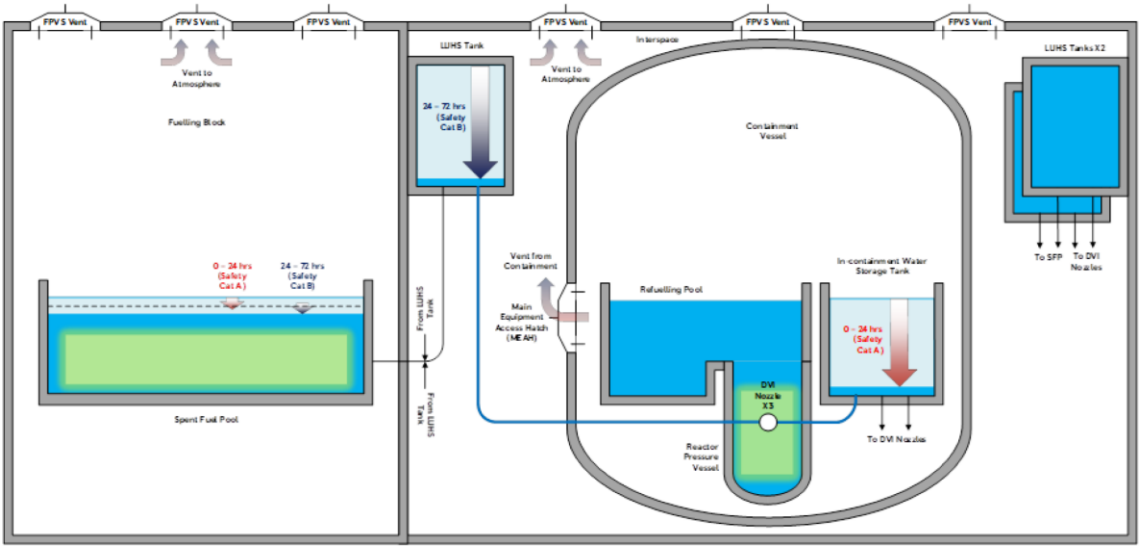


Fig. B.45: Heat removal from the irradiated fuel pool [FAB] in operating Mode 6



The set of design provisions ensuring the safety of the irradiated fuel storage pool is designed to provide practical elimination of an early or large release, with a fuel damage frequency of <1E-07.

B.I.6.3.2.2.8.3. External spent nuclear fuel storage facility [FDB]

The function of the external spent nuclear fuel storage facility is to store packages containing spent nuclear fuel and high-level reactor components (Non-fuel Core Components, NFCC) before their disposal in a deep geological repository. Storage is provided from the receipt of packages loaded from the irradiated fuel pool [FAB] in the irradiated fuel transfer system [FCD] until the contents are repackaged for transport to the deep geological repository.

The external spent nuclear fuel storage facility [FDB] will store all spent fuel assemblies generated during RR SMR operation, as well as high-level components from the reactor core, such as spent sensors or worn parts of control rods and their drives, and potentially other types of intermediate-level waste. The packages perform the fundamental safety functions of reactivity control, namely prevention of criticality; residual heat removal; prevention of the spread of radioactive materials; and radiation shielding. Criticality is prevented through the spatial arrangement of the fuel assemblies and the use of neutron absorbers. Spent nuclear fuel is cooled passively through the package shell to the atmosphere. The leaktight package is considered the final barrier against the release of radioactive substances, following the fuel pellet material and fuel-element cladding,

and thus protects against the release of radioactive substances into the environment. The packages incorporate shielding so that the radiation dose to personnel and the public is as low as reasonably practicable (the ALARP principle).

The indicative design parameters of the RR SMR external spent nuclear fuel storage facility are provided in the following table; they will be refined for the specific design[1].

Table B.11: Indicative parameters of the external irradiated fuel storage facility

Parameter	Value
Minimum number of fuel assemblies to be stored over the entire RR SMR service life	1889
Expected number of damaged fuel assemblies over the service life	6
Number of fuel assemblies per package	24
Number of package storage locations	80
Number of storage locations for packages containing high-level waste from the reactor core	10
Number of unoccupied package positions required for handling	2
Expected interim storage facility area	3,000 m^2
Design life	120 years

The values above should be considered indicative because they will be further refined during subsequent design preparation. Based on the current fuel-cycle configuration, 1889 fuel assemblies are expected to be used over 60 years of RR SMR operation.

After modification of the internal structure, modified packages normally intended for storing spent nuclear fuel can be used to store high-level components generated during nuclear reactor operation. Modifications to the internal structure will correspond to the specific items stored, such as their different dimensions or shapes. These include, for example, spent neutron sources for the first fuel loading, components of neutron-flux sensors, and thermocouples that are expected to be replaced during the reactor service life and are highly activated, and similar items. Spent nuclear fuel packages are also used to store these active components. If using such packages is not appropriate, for example for certain intermediate-level waste, other suitable and approved packages will be used. The RR SMR design therefore does not provide for any other storage location for high- and intermediate-level waste.

B.I.6.3.2.3. Protection against external hazards in the RR SMR design

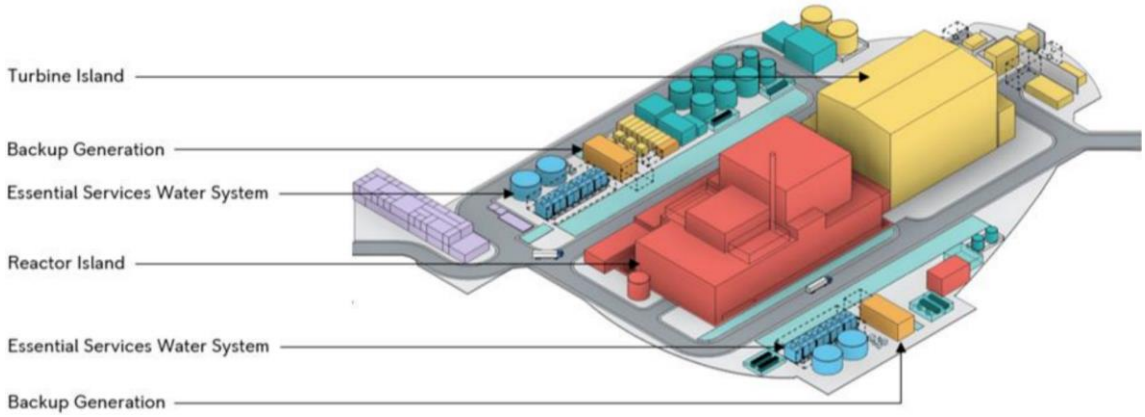
The SMR ETE design will comply with all requirements and principles applied in Czech legislation, WENRA and IAEA requirements, and generally applicable technical regulations for nuclear installations. A detailed description of the hierarchy of the individual legislative and normative documents is provided above in Chapter B.I.6.2.2. Basic requirements for nuclear power plants (page 86 of this Documentation). In the hierarchy of these regulations, the fundamental legislative document is Act No. 263/2016 Coll., the Atomic Act, as amended, together with its implementing decrees, particularly Decree No. 329/2017 Coll. with respect to protection against external hazards.

B.I.6.3.2.3.1. Overview of significant structures

The SMR ETE Project will include the reactor building (Reactor Island), turbine building (Turbine Island), essential service water system (ESWS) structures, emergency diesel generator building (Backup Generation), and other structures for power plant auxiliary systems. The structures are summarized schematically in the following figure.

[1] The spent nuclear fuel storage facility does not form part of the SMR ETE Project; for the purposes of Act No. 100/2001 Coll., on Environmental Impact Assessment, as amended, it is a separate project subject to assessment. It will be constructed when required, either on the SMR site or at another selected site, taking into account the state of knowledge and the technical level of storage facilities at the time of its preparation.

Fig. B.46: Structures in the RR SMR reference design

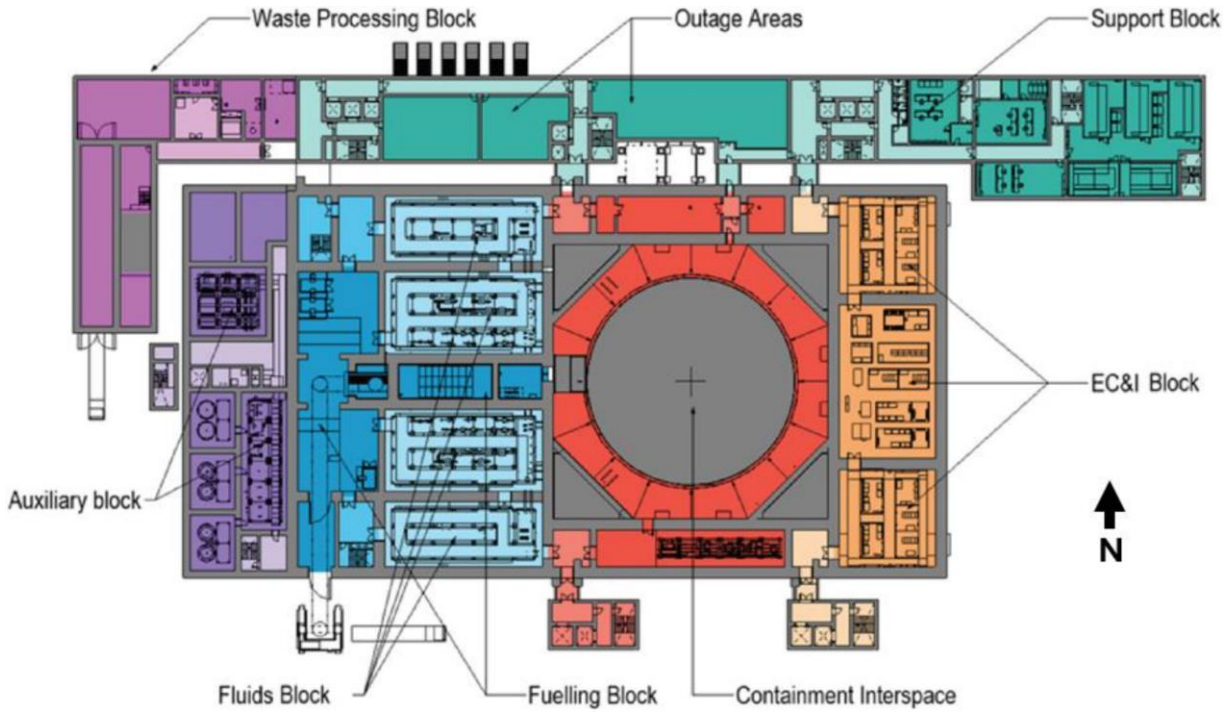


Rolls-Royce documentation uses cardinal directions to identify and locate individual design elements and facilitate orientation in the documents. "North" is upward in plan views of the site layout, and the "east-west" axis passes through the reactor building and turbine building, with the reactor building "west" of the turbine building.

B.I.6.3.2.3.2. Reactor building and its components

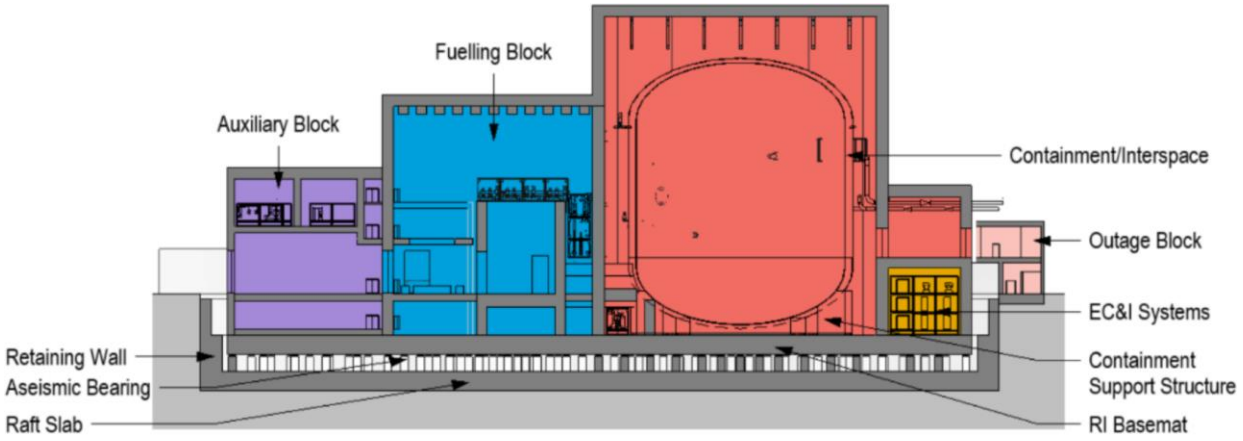
The reactor building will house the reactor, equipment for transferring, handling, and storing fresh and irradiated fuel, and associated auxiliary nuclear systems. It will be approximately 137 m long along the "east-west" axis and 84 m wide along the "north-south" axis. Most reactor building structures will be supported by foundations 123.2 m long along the "east-west" axis and 70 m wide along the "north-south" axis, with the upper foundation surface 11.2 m below ground level. The significant structural components of the reactor building are shown in the following figure.

Fig. B.47: Schematic horizontal section through the reactor building in the RR SMR reference design



A section through the reactor building viewed from the "south" is shown in the following figure:

Fig. B.48: Schematic vertical section through the reactor building structures in the RR SMR reference design



B.I.6.3.2.3.2.1. Containment

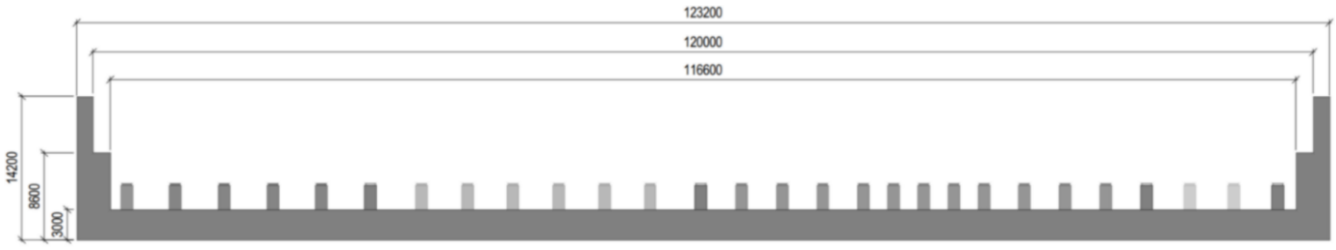
The containment comprises two parts: an outer reinforced-concrete structure (Hazard Shield) and an inner leaktight steel vessel (Containment). The outer reinforced-concrete structure will protect the inner steel portion and all systems, structures, and components important to nuclear safety against external hazards, including accidental or intentional aircraft impacts. It will be approximately 91 m long and 61 m wide and will extend 45 m above ground level. The containment will include the internal containment structures (Containment), interspace (Interspace), fuel handling building (Fuelling Block), electrical, control and instrumentation systems (EC&I Systems), and auxiliary systems building (Auxiliary Block). The resistance of the entire containment system will be sufficient to ensure performance of the fundamental safety functions during accidental and intentional aircraft impact.

B.I.6.3.2.3.2.2. Monolithic raft slab and retaining wall

The reinforced-concrete monolithic raft slab (Raft Slab) will support the reactor building structures, which will be supported on their own reinforced-concrete basemat (RI Basemat). The retaining wall (Retaining Wall) will form an integral part of the reactor building foundation structure and will retain the surrounding soil and groundwater. The retaining wall will be physically separated from the containment and the basemat.

The monolithic raft slab will provide the principal transfer of loads from the reactor building containment, basemat, and containment support structure to the ground and external environment. A series of concrete pedestals will be installed on top of the monolithic raft slab to support and provide access to the seismic isolation bearings. The structural role of the retaining wall is to resist earth pressure, hydrostatic pressure, hydrodynamic pressure, and surcharge loads. The retaining wall will also support bridging structures that provide access to the containment and limit horizontal movement of the basemat during an earthquake corresponding to design extension conditions (BDBE).

Fig. B.49: Schematic section through the monolithic raft slab and retaining wall in the RR SMR reference design



B.I.6.3.2.3.2.3. Seismic isolation system

The seismic isolation system will be constructed on the monolithic raft slab (Raft Slab) and will comprise a series of concrete pedestals and seismic isolation bearings (Aseismic Bearing) supporting the basemat (RI Basemat). Seismic isolation will be provided by special bearings that prevent horizontal acceleration from being transmitted to the reactor building structures during an earthquake.

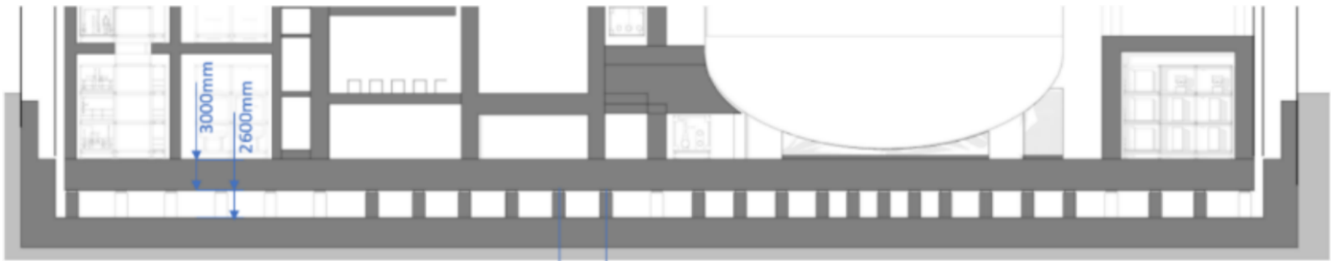
The seismic isolation bearings will directly support the containment basemat and containment support structure. They will thus transfer loads through the reinforced-concrete pedestals to the monolithic raft slab foundations. In addition to transferring vertical loads, the seismic isolation bearings will prevent horizontal vibration from a seismic event from being transmitted to the containment and reactor building structures. Adding seismic isolators will change the dynamic behavior of the reactor building structure by reducing horizontal secondary acceleration at the containment and reactor building basemat level. The seismic isolation system will be designed to prevent a cliff-edge effect if the design earthquake level is exceeded by equipping the system with stops that limit basemat movement during a BDBE.

B.I.6.3.2.3.2.4. Containment basemat and support structure

The reinforced-concrete basemat (RI Basemat) will support systems, structures, and components inside the containment. The containment support structure (Containment Support Structure) will support the steel pressure vessel (Containment) and provide access to the containment for construction, checks and inspections, maintenance, and testing.

The basemat, shown in the following figure, is a reinforced-concrete slab that will provide the principal load transfer between buildings and blocks in the reactor building and the supporting seismic isolation bearings. The containment support structure transfers the loads from the steel vessel itself and the internal containment structures to the basemat.

Fig. B.50: Schematic diagram of the basemat and containment vessel support structure in the RR SMR reference design



B.I.6.3.2.3.2.5. Leaktight containment vessel

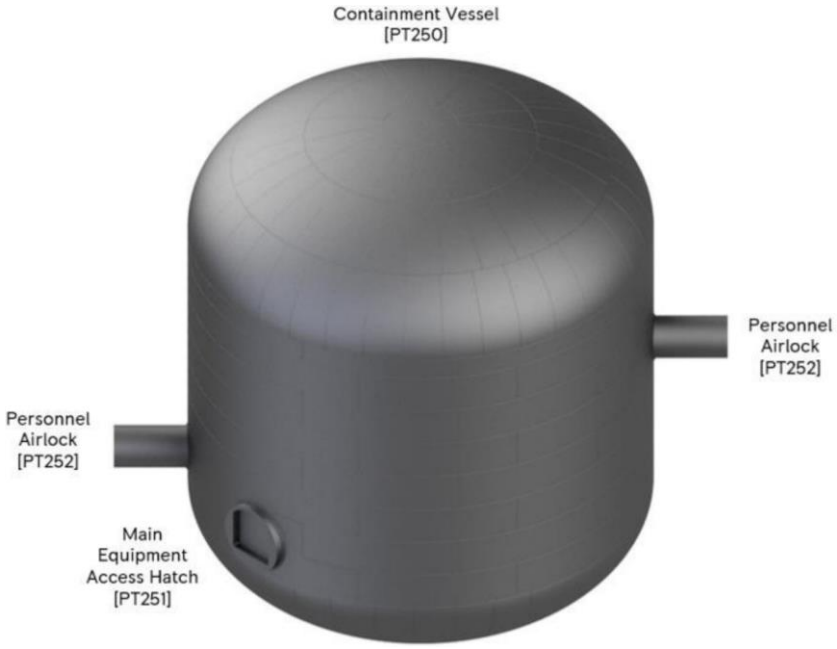
The leaktight containment will consist of a steel pressure vessel that performs the fundamental safety function of "retaining radioactive materials" during normal operation and accident conditions. The containment will be designed for a maximum internal pressure of 0.685 MPa and a temperature of 164 °C. Its leaktightness will be ensured at these parameters, which correspond to the design load under DEC-B conditions.

The containment will comprise the following components:

- The steel containment vessel itself (Containment Vessel), which will form the barrier against the release of radioactive substances into the environment. It will be a vertical welded pressure vessel comprising a central cylindrical section and upper and lower semielliptical domes.
- The main equipment access hatch (Main Equipment Access Hatch), which will provide access to internal equipment during outages. Double elastomeric seals will be used to seal it during operation.
- Two personnel airlocks (Personnel Airlock), which will provide personnel access to the containment interior during outages. The hinged doors will open toward the containment interior and will be designed to withstand the maximum design overpressure reached under accident conditions. The doors will be interlocked to prevent simultaneous opening before the containment is unsealed.
- A nuclear fuel transfer canal, which will provide a leaktight passage between the refueling cavity inside the containment and the irradiated nuclear fuel storage pool inside the fuel storage building. The canal will be sealed outside refueling periods.
- A system of piping penetrations and isolation valves that will permit media to pass through the leaktight containment and, when necessary, isolate the containment interior from the environment.
- Electrical and I&C penetrations that will permit the supply of electrical power and transmission of I&C signals through the containment pressure boundary while maintaining its leaktightness.

A schematic diagram of the containment pressure vessel is shown in the following figure.

Fig. B.51: Schematic diagram of the steel containment pressure vessel in the RR SMR reference design



The lower part of the containment system will be supported externally by a support structure comprising a central concrete pedestal and three monolithic concrete support structures distributed evenly around the circumference of the outer lower containment dome. Support structures for the individual process-system components will be located inside the containment.

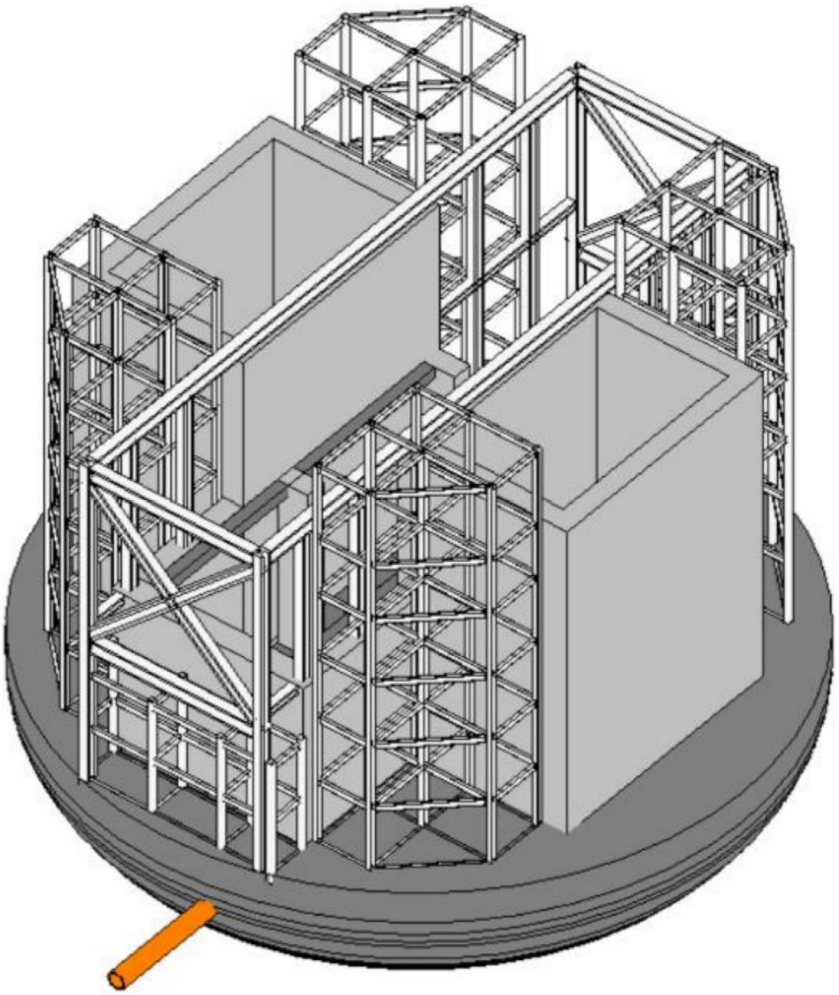
B.I.6.3.2.3.2.6. Internal containment structures

The internal containment structures will support important systems located inside the steel containment vessel. Access into and out of the containment will be provided through the main access opening (hatch) on the "east" side of the pressure vessel and two personnel airlocks, one to the "southeast" and one to the "northwest".

Structures inside the containment pressure vessel will support and protect the reactor pressure vessel and other primary-circuit components, the refueling pool, irradiated nuclear fuel pool, refueling machine, and main overhead crane.

A schematic diagram of the internal containment structures is shown in the following figure.

Fig. B.52: Schematic diagram of the internal containment structures in the RR SMR reference design



B.I.6.3.2.3.2.7. Interspace

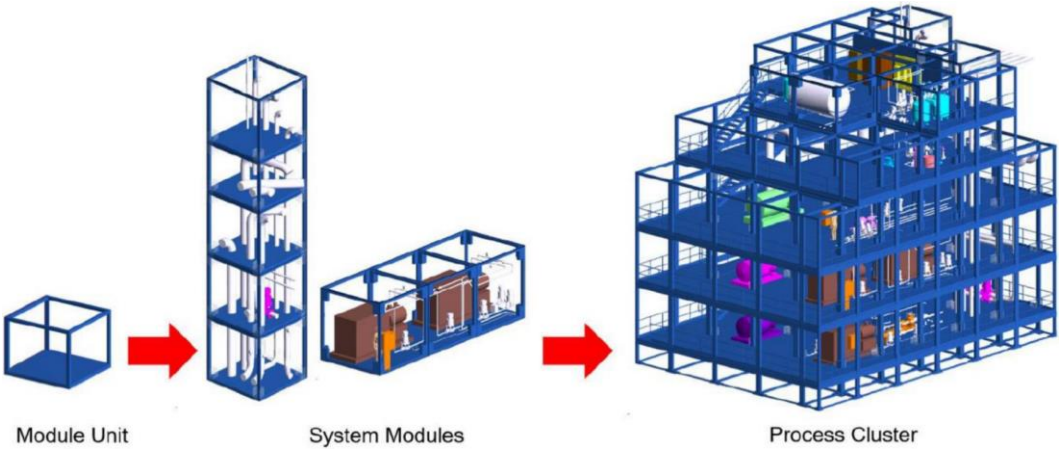
The interspace (Interspace) is the area that will surround the containment pressure vessel and will include the personnel entry airlocks, equipment access hatches into and out of the containment pressure vessel, accumulators, reinforcement, and passive ultimate heat sink tanks. Structures in the interspace will separate the individual safety-system divisions and support piping, process tanks, and auxiliary systems in the interspace. The structures will also secure the main steam lines and feedwater piping leading into and out of the containment.

B.I.6.3.2.3.2.8. Reactor building process clusters

Several blocks or zones in the reactor building will house a number of "process clusters". Process clusters are defined as assemblies of "system modules" in separate structural framing systems. Modular units and system modules contain mechanical, electrical, and plumbing equipment and will be assembled at an off-site factory. System modules are constructed from modular units, and their dimensions may vary depending on the systems they contain.

The modular arrangement is shown in the following figure.

Fig. B.53: Schematic arrangement of modules, system modules, and a process cluster in the RR SMR reference design



B.I.6.3.2.3.2.9. Fuel storage area

The fuel storage and handling area (Fuelling Block) will provide a route for receiving, handling, storing, and dispatching fresh and irradiated fuel. The entry route for fresh-fuel containers will be located "west" of the fuel storage building. Vehicle access will be provided to the fresh-fuel receiving and inspection portion of the building, which will be used to accept and inspect fresh fuel.

The fuel storage building will contain the irradiated/spent fuel storage pool, fuel transfer cavity, and equipment for transferring spent fuel from the storage pool into packages. The fuel storage building will be connected to the containment by a canal (corridor) that permits fuel to be transferred into and out of the containment. The following equipment will be used for fuel handling:

- a manipulator for handling in the irradiated fuel storage pool,
- a fuel transfer machine for transferring fuel between the containment and the fuel storage building,
- a fresh-fuel lift,
- a crane for handling in the irradiated fuel storage pool,
- a multipurpose lifting mechanism for handling containers and packages.

The fuel storage and handling building will be used to store and protect standard fresh nuclear fuel containers. It will also include equipment for handling fresh and irradiated fuel and auxiliary systems.

B.I.6.3.2.3.3. Other civil structures

B.I.6.3.2.3.3.1. Essential service water system structures

The essential service water system (TVD) structures will protect and support equipment that removes heat to the ultimate heat sink. They will include the following components:

- TVD makeup tank foundation (Division 1),
- TVD makeup tank foundation (Division 2),
- fan cooling tower basin (Division 1),
- fan cooling tower basin (Division 2),
- TVD piping duct (Division 1),
- TVD piping duct (Division 2),
- aboveground TVD piping support structure (Division 1),
- aboveground TVD piping support structure (Division 2),
- aboveground TVD piping support structure foundations (Division 1),
- aboveground TVD piping support structure foundations (Division 2).

The TVD structure components are shown in the following figures.

Fig. B.54: Schematic view of the equipment in one TVD division in the RR SMR reference design

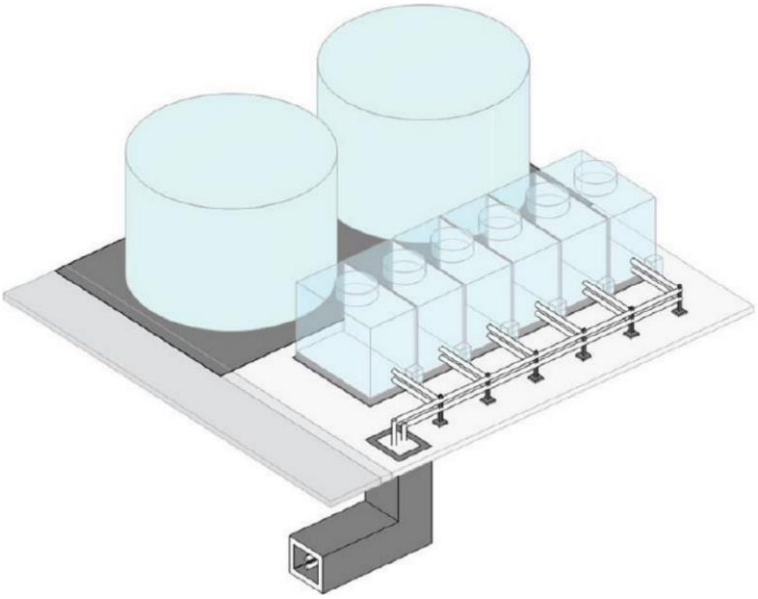
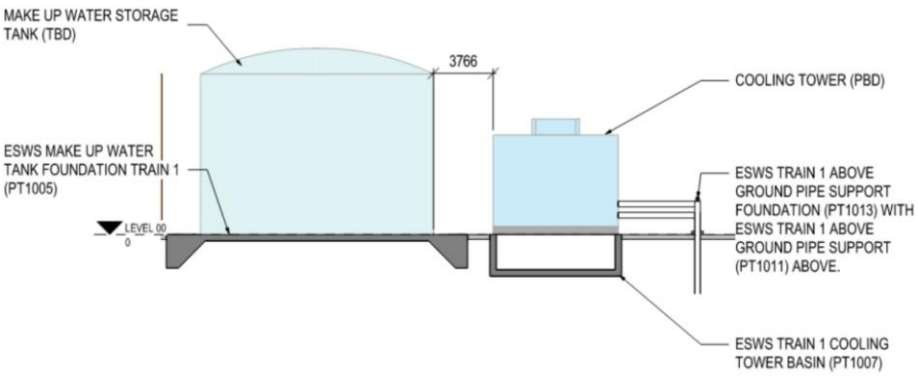


Fig. B.55: Schematic section through the structures of one TVD division in the RR SMR reference design



B.I.6.3.2.3.3.2. Emergency electrical power source

The emergency electrical power source will serve as an emergency power supply system for safety-classified components. It will include the following components:

- foundation for the high-voltage AC diesel generator module (Division 1),
- foundation for the high-voltage AC diesel generator module (Division 2),
- cable and service duct for Emergency Power Division 1,
- cable and service duct for Emergency Power Division 2.

B.I.6.3.2.3.4. General design principles

The SMR ETE Project will be designed to ensure the performance of the four fundamental safety functions, namely reactivity control, nuclear fuel cooling, retention of radioactive substances, and control of radiation exposure, during and after events resulting from external or internal hazards in all phases of the nuclear installation life cycle. The fundamental safety functions will be decomposed into high-level safety functions with defined functional requirements, namely specific physical or technical parameters that must be met.

Design provisions will be assigned to the high-level safety functions, and their performance will provide protection against the consequences of postulated initiating events (PIE), including events caused by external or internal hazards. The functional requirements necessary to perform the high-level safety functions will be assigned to specific safety systems, structures, and components that will implement the applicable design provisions. These components will be safety-classified according to their safety significance (for details, see Chapter B.I.6.3.1. Safety concept and basic safety criteria (page 99 of this Documentation) and its applicable subsections).

Functional requirements categorized according to their safety significance will be assigned to specific civil structures. Civil structures will perform the four fundamental structural safety functions listed in the following table.

Table B.12: Description of structural safety functions

Structural safety function	Function definition	Function example
Protection	Prevent damage to systems, structures, or components from external or internal hazards.	The seismic isolation system (seismic isolation bearings) must protect systems, structures, and components by reducing horizontal accelerations at basemat level and reducing the subsequent secondary response to which the systems are exposed.
Support	Prevent or limit movement of components under an applied force, either translationally along three perpendicular axes or rotationally about three perpendicular axes.	The basemat supports the containment.
Retention of contents	Retain a liquid within specified boundaries.	The irradiated fuel storage pool structure must retain the cooling medium to cool the fuel.
Shielding	Reduce the intensity of ionizing radiation to which people or systems, structures, and components could be exposed.	The irradiated fuel storage pool structure must shield operating personnel from ionizing radiation.

For civil structures to which functional requirements have been assigned through a design provision, their safety classification will be determined by the classification of the component in the highest safety class.

Each civil structure will also be assigned a seismic classification defining its resistance in response to a seismic event. Seismic resistance requirements for civil structures will be defined in the seismic design basis (Seismic Design Basis), which will combine the seismic design requirements and the permissible maximum deformation, displacement, tensile force, or stress in the applicable structure.

The assignment of safety classes and seismic classifications will comply with the applicable legislative requirements, particularly Decree No. 329/2017 Coll.

B.I.6.3.2.3.5. Analysis and design methodology

Methodologies have been developed in accordance with the applicable civil engineering codes for global and local structural assessments of reinforced-concrete and steel structures, geotechnical analyses, and methods for assessing static and dynamic soil-structure interaction effects. Software products to be used for the engineering assessment of the proposed civil structures have also been specified together with the methodologies. All analysis results will be verified and validated in accordance with a plan prepared in advance.

B.I.6.3.2.3.5.1. Load levels

Loads used in the design of civil structures will be derived from loads during normal operation and loads resulting from design basis internal and external hazards. Civil-structure loads will be categorized as:

- normal loads,
- severe environmental conditions,
- extreme environmental conditions,
- abnormal load.

Normal loads will include dead loads; live loads; roof live loads; crane loads; force reactions from operating piping and equipment; operating temperature loads with an intensity corresponding to a 100-year return period; loads from liquids in tanks and piping; earth-pressure and groundwater-pressure loads; operating wind loads with an intensity corresponding to a 100-year return period and a 10-minute value; operating snow loads with an intensity corresponding to a 100-year return period; and operating rain loads.

Severe environmental conditions will include the "operating" earthquake, design temperature loads with an intensity corresponding to a 10,000-year return period, design wind loads with an intensity corresponding to a 10,000-year return period, design snow loads with an intensity corresponding to a 10,000-year return period, and design ice loads with an intensity corresponding to a 10,000-year return period. Loads caused by the "operating" earthquake (SL-1, with an intensity corresponding to a 100-year return period) take into account the self-weight of structural and nonstructural components, self-weight of permanently installed equipment, the applicable portion of live loads, the applicable portion of crane loads, hydrodynamic liquid loads, dynamic earth pressures, and hydrodynamic groundwater pressures.

Extreme environmental conditions will include the design basis earthquake, tornado loads, and external flooding. Design basis earthquake loads will be defined from the applicable design earthquake spectra (SL-2, with an intensity corresponding to a 10,000-year return period[1]). Design loads on systems, structures, and components caused by the design basis earthquake will take into account the self-weight of structural and nonstructural components; self-weight of permanently installed equipment; a proportionate, realistic portion of live-load occupancy; a proportionate, realistic portion of

[1] Under Decree No. 329/2017 Coll., on Nuclear Installation Design Requirements, the design basis earthquake will be greater than or equal to PGA = 0.1 g. The declared resistance of the RR SMR reference design is PGA = 0.3 g.

	crane loads; hydrodynamic liquid loads; dynamic earth pressures; and hydrodynamic groundwater pressures. The tornado load will be defined as the pressure associated with wind speed and pressure changes caused by rapid temperature changes and flowing air. The tornado load will also include tornado-generated missiles. The external flooding load will be defined as the hydrostatic-pressure load acting on civil structures and corresponding to the maximum possible flood level.
Abnormal load	will include accident temperature, namely internal temperature and temperature gradients caused by accident conditions such as a LOCA; loads from internal portions of piping and other equipment, namely internal moments and forces in equipment arising under accident conditions; differential-pressure loads, namely loads from pressure differences between individual civil-structure spaces arising under accident conditions; piping-whip loads, namely internal moments and loads caused by the rupture of high-energy piping; water-jet loads, namely the load from a jet of water from high-energy piping acting on a small area; and internal-missile loads, namely loads caused by the kinetic energy of a projectile absorbed by the surface of a civil structure.

B.I.6.3.2.3.5.2. Combination of loads

Combinations of individual loads caused by external or internal phenomena will be defined at the level of the individual mechanisms through which these phenomena act. These will include additive loads from two relevant natural hazards or hazards caused by human activity and combinations of loads from different mechanisms of two different external or internal hazards. Loads will be combined at two levels. For combination of loads, the phenomena whose action mechanism produces the greatest effect will always be selected; for example, a snow layer will produce the maximum static load on structures. For dynamic loading of civil structures, the maximum wind load and maximum seismic-event load will be treated separately.

At the first level, external phenomena and their mechanisms will be combined at intensities corresponding to a 100-year return period. The result will be a combined load corresponding to the DBC level. At the second level, external and internal phenomena and their mechanisms will be combined at intensities corresponding to 10,000 years for the primary load and 100 years for the secondary load. The result will be a combined load at the BDBE level. For certain phenomena, more than two loads will be combined simultaneously. These will typically be phenomena caused by summer storms, winter storms, and dust and sandstorms.

All important structures and freestanding structures will be designed to withstand combinations of external phenomena without impairing the fundamental safety functions.

B.I.6.3.2.3.5.3. Special design requirements for seismically isolated structures

Impact and displacement restraints will be provided along both perpendicular horizontal axes of the reactor building support structure to prevent excessive displacement of the seismic isolation system during a beyond design basis seismic event (BDBE, Beyond Design Basis Event). The maximum horizontal distance between the support structure and the restraint will be defined as the clear distance to the stop. The support structure will be provided with a stop at a value of at least the 90th percentile BDBE displacement. The stop will be designed to withstand the impact load associated with a BDBE.

B.I.6.3.2.3.5.4. Design requirements for seismic isolation bearings

Low-damping laminated rubber bearings will be selected as part of the seismic isolation system to protect the basemat-supported reactor building structures. These elastomeric bearings will be designed so that they are not permanently damaged by an SL-2 design basis earthquake (DBE). Their damage is acceptable during a BDBE, in which the seismic-event intensity exceeds the SL-2 design value, but their gravity-load-bearing capacity will be maintained.

B.I.6.3.2.3.5.5. Aircraft crash effects (BDBE)

In the SMR ETE design, events associated with an aircraft crash, whether accidental or intentional, will be treated as events corresponding to design extension conditions (BDBE). The assessment of an accidental aircraft impact will be based on an analysis of impact-frequency data, which determined that the average frequency of accidental aircraft crashes in the critical area of the Temelín site is below the threshold for design basis events (DBE, Design Basis Event).

To ensure SMR ETE resistance to an aircraft crash, design provisions will be implemented that ensure performance of the fundamental safety functions during such an event. The design provisions will be based on redundancy of important systems and their separation so that an aircraft crash cannot affect both redundant portions simultaneously. Important systems and structures will be located in the containment, which will provide the power plant's primary protection against impact. For SMR ETE, the US NRC approach established in 10 CFR § 50.150, Aircraft Impact Assessment, will be applied, and the WENRA requirements in Safety of New NPP Design 2013, Position 7, will be met. An event associated with an aircraft crash, including a large commercial aircraft, must not cause core melting and may result in only a limited radiological impact.

An important consideration in containment design is that an event associated with an aircraft crash is classified under design extension conditions (BDBE). This results in the following key aspects of containment design:

- Best-estimate parameters will be used to assess the properties of containment construction materials.

- The methodology for assessing impacted structures will include:
  - local analyses of impacted structures with respect to possible penetration, spalling, perforation, and punching,
  - a global assessment of impacted structures by a team of experts,
  - an assessment of overall structural stability under impact, including shear and uplift loads.
- Nonlinear finite-element analysis will be used to substantiate the behavior of civil structures exposed to aircraft impact.
- The analysis acceptance criteria for aircraft impact, such as permissible structural deformation, will be consistent with best available practice but less stringent than the acceptance criteria for a design basis event (DBE).

The aircraft-crash consequence assessment will also include accompanying impact-related hazards and the possible occurrence of an aviation-fuel fire.

B.I.6.3.2.4. Radiation protection in the RR SMR design

The fundamental radiation protection principles, which are based on a hierarchical system of technical equipment and control activities and will form part of the RR SMR design, are as follows:

- Passive design equipment for providing radiation protection.
- Safety features, such as door interlocks, and warning devices.
- A system for classifying internal spaces according to potential radiation exposure of workers.
- Safety documentation.
- Radiation protection rules and administrative oversight of compliance.
- Radiological measurements.
- A sufficient number of qualified experts to manage radiation protection.
- Personnel education and training, including supervision of hazardous activities.
- Personal protective equipment.

At the top of the hierarchy of radiation protection measures will be passive engineered features, such as protective shielding walls and structural portions of buildings, which perform their protective function by their mere presence. The next level in the hierarchy comprises active systems, namely safety features such as automatic or remotely operated door interlocks, which require system or human action to perform the safety function correctly. The next element will be a system for classifying internal building spaces and dividing them into individual access zones, such as the controlled area and manned and unmanned spaces. Safety features, as described above, will generally be installed at the boundaries of these spaces together with warning devices informing people whether entry is permitted and of the radiation conditions and similar matters.

The entire system of design provisions and other protective features will be described in safety documentation forming the basis for radiation protection rules, such as rules for movement within the controlled area, authorization to enter individual spaces, and provision of protective equipment to people for different types of work. Current radiation conditions and contamination of items and people will be monitored by radiological measurements. High-quality radiation protection also requires a sufficient number of highly qualified specialists who establish current radiation protection rules and continuously supervise compliance with them, namely dosimetric control specialists. All personnel with access to spaces where contamination or ionizing radiation may be present will receive regular training and will be supervised while performing work activities. Sufficient personal protective equipment will be available for all people entering the controlled area, and the radiation protection rules will specify its use.

The following rules will be applied as part of the RR SMR design to minimize sources of ionizing radiation:

- Elimination: systems and components intended to perform SMR ETE design functions will be assessed for their potential effect on the source term, namely the source of potential ionizing radiation, with the aim of eliminating structural features, components, or procedures that could increase the source term and consequently increase potential human exposure.
- Substitution: if hazardous components or structural features cannot be excluded under the elimination rule because they are necessary to meet design requirements, they will be designed without materials known to have an adverse effect on the source term and radiation conditions, such as cobalt or certain technologies that create hardened layers on component surfaces. Where possible, such materials will be replaced with other materials.
- Minimization and localization: if components, structural features, or materials known to contribute to the source term must be used in the reactor because they are the only means of performing a particular function, their use in the design will be minimized even though they cannot be eliminated completely. Minimization of use applies to the number of such components, the mass of material used, and the wetted area. Minimization also applies to materials present in the reactor unintentionally, such as impurities in construction materials, chemical additives, and residual constituents of reagents used for water treatment. Minimizing such admixtures in the reactor will be a design requirement. Localization includes assessing each specific location in the reactor in the context of the potential source term. For example, materials located in the reactor core will be heavily irradiated by the neutron flux, and even small quantities of certain materials may therefore result in high activity levels.

- Immobilization: certain materials will contribute to the source term only if they interact with the neutron flux in the reactor core. Consequently, even highly activatable materials can be prevented from contributing to the source term if they are immobilized in systems outside the reactor core and reactor cavity. Material can be immobilized by various means, such as optimizing chemistry or encapsulating it, for example by using coatings, to prevent contact with reactor coolant and minimize corrosion or solubility.
- Mitigation: in some cases, this is the only measure that can realistically be applied. Mitigation is defined as reducing the impact of the source term, namely the highly radioactive substances present, even though these substances have already been generated. This impact can be reduced by removing highly active material from the primary circuit, for example using filters or ion-exchange resins, or by using methods that prevent its accumulation in undesirable locations such as bends or dead legs of piping.

The following dose-rate levels will be used in the RR SMR design to establish the individual controlled-area zones:

- Normal work area: dose rate <0.5 μSv/h
- Supervised area (green zone): dose rate <7.5 μSv/h
- Controlled area (yellow zone): dose rate 7.5 μSv/h to 25 μSv/h
- Controlled area (orange zone): dose rate 25 μSv/h to 100 μSv/h
- Controlled area (red zone): dose rate 100 μSv/h to 500 μSv/h
- Controlled area (black zone): dose rate >500 μSv/h

The design will provide the following measures for access to the zones listed above: Access to a normal work area is not restricted with respect to radiation exposure. However, an individual's annual dose must not exceed 1 mSv in these zones. Normal access to the green zone is permitted, but the environment is monitored continuously; if a larger number of people occupy such a space, the dose rate must not exceed 0.5 μSv/h. An individual's annual dose must again not exceed 1 mSv. Work in the yellow zone will be limited to a specified period in accordance with the ALARP principle, and the typical dose rate in this zone should be below the lower limit, namely <7.5 μSv/h. The orange zone is not normally accessible, and occupancy is permitted only for the minimum time necessary to perform required work activities. Entry into the red zone is prohibited, and prescribed routine personnel inspections cannot be performed there. Entry is possible when essential, but is administratively restricted and subject to special authorization. Doors must be secured against entry by locking. Entry into the black zone is prohibited and blocked by a physical barrier, and prescribed routine personnel inspections cannot be performed there. Doors must be double-locked. Individually issued authorization will be required to enter these zones.

The RR SMR design will implement the following additional radiation protection measures for the nuclear island:

- The reactor and other nuclear-island components will be radiation-shielded using civil structures or modular barriers that reduce ionizing radiation doses.
- Where shielding cannot be provided by civil structures or modular barriers, local shielding will be used for individual components containing radioactive media.
- Protective civil-structure features intended to protect against external hazards will be designed using conservative methods so that they also provide adequate shielding against ionizing radiation.
- Active components, namely potentially radioactive components, will be located where they are adequately shielded from the surrounding environment.
- The design will divide the nuclear-island structures into two portions, referred to as "west" and "east". Active systems, structures, and components will be located on the "west" side, while the "east" side will be considered clean. The continuously staffed main control room will be located on the clean side, but inside a protective civil structure so that it is protected against external phenomena.
- Auxiliary-operation buildings, such as the medical office, laboratories, and storage areas, will be located outside the nuclear-island building itself and will be considered a clean zone.

The RR SMR design will provide effective measures to minimize the generation of solid and liquid radioactive waste. Gaseous and liquid radioactive discharges will also be minimized. An environmental sampling and monitoring system will be designed to control the spread of radiation.

For radiation protection during a radiation extraordinary event, all control centers, namely the main control room, backup control room, emergency control center, technical support center, operational support center, and access control point, are equipped to remain habitable up to a severe accident (DiD 4). The RR SMR design will also provide a passage corridor between the main control room and the backup (emergency) control room so that personnel are not exposed to increased radiation, because the main control room will be located inside the reactor building while the backup (emergency) control room will be outside that building. This arrangement of the two control rooms ensures that no postulated initiating event inside the primary-island building jeopardizes the backup control room outside that building.

Both the main control room and backup control room will be provided with sufficient shielding and ventilation so that the personnel dose remains <20 mSv even during a severe accident. They will also be provided with safe access and egress routes and sufficient personal protective equipment against radiation.

B.I.6.3.2.5 Safety categorization and classification in the RR SMR design

Defense in depth for the SMR ETE Project (RR SMR) will be achieved through practical and independent design provisions that perform the fundamental safety functions and associated high-level safety functions and prevent an event from progressing to accident conditions.

Each high-level safety function will be assigned to a category corresponding to its significance:

- Safety Category A: a function having a fundamental effect on nuclear safety.
- Safety Category B: a function making a significant contribution to nuclear safety.
- Safety Category C: another function contributing to nuclear safety.

The category of the applicable safety function will be used to classify the systems, structures, and components that perform the function:

- Safety Class 1: any system, structure, or component forming the primary means of performing a Safety Category A function.
- Safety Class 2: any system, structure, or component that makes a significant contribution to performing a Safety Category A function or forms the primary means of performing a Safety Category B function.
- Safety Class 3: any other system, structure, or component contributing to the performance of a categorized safety function.

The classification method above corresponds to the technical documentation for the RR SMR reference design. During preparation of the RR project, the classification method will need to be brought into conformity with the approach under Decree No. 329/2017 Coll., on Nuclear Installation Design Requirements, although it does not differ fundamentally.

B.I.6.3.2.6. Categorization and classification of security equipment in the RR SMR design

The following categories will be used to categorize system security functions in the RR SMR design:

- Category A: functions that play the primary role in achieving the required security outcome and whose failure would lead directly to the most serious consequences. Functions in this category are expected to provide continuous or immediate protection by directly interrupting an attack scenario and to remain effective when exposed to threats.
- Category B: functions that supplement Security Category A functions in achieving the required security outcome, or functions that play the primary role where their failure would result in less serious consequences.
- Category C: functions that supplement Security Category B functions in achieving the required security outcome, or functions that play the primary role in achieving the basic security level consistent with the required security outcome.

Three security classes will be defined for systems, structures, and components that perform security functions, based on the most significant security function assigned to them. Security classes in the security field are not identical to the safety classes used for systems, structures, and components that ensure nuclear safety. The relationship between the security function category and the security class of systems, structures, and components is shown in the following table.

Table B.13: Security classification of systems, structures, or components meeting security function requirements

		Contribution of the equipment assessed to performance of the security function		
		The equipment is the principal or sole means of meeting the requirement	The equipment makes a significant contribution to meeting the requirement	The equipment makes an insignificant contribution to meeting the requirement
Security function category	A	Security Class 1	Security Class 2	Security Class 3
	B	Security Class 2	Security Class 3	Security Class 3
	C	Security Class 3	Security Class 3	Security Class 3

When a component is classified, its contribution to performance of the security function will be taken into account, and the classification of the component or system will reflect requirements for its quality and performance according to the following principles:

- Security Class 1 equipment and components will be subject to the most stringent requirements for quality; performance, meaning effectiveness and availability; tamper resistance; supply chain security; and security throughout the service life.
- Security Class 2 and 3 equipment and components will be subject, using a graded approach, to lower requirements for quality; performance, meaning effectiveness and availability; tamper resistance; supply chain security; and security throughout the service life.

Because of the sensitivity of security matters, the specific requirements for systems, structures, and components will not be described in greater detail.

B.I.6.3.2.7 Seismic classification in the RR SMR design

Systems, structures, and components important to the performance of safety functions will generally be seismically classified in the RR SMR design as follows:

- Seismic Resistance Class 1: all systems, structures, and components that will perform safety functions during a seismic event, for both DBC and DEC. Systems, structures, and components must be capable of performing their safety function during and after a design basis earthquake (DBE).
- Seismic Resistance Class 2: all systems, structures, and components whose low resistance could adversely affect the functions of Seismic Resistance Class 1 systems, structures, and components or that are necessary for long-term management of a DBE-level seismic event. Systems, structures, and components must retain limited functionality during and after a DBE.
- Seismic Resistance Class 3: all other systems, structures, and components. No DBE-related seismic resistance requirements are defined for Seismic Resistance Class 3 systems, structures, and components.

However, no systems, structures, or components may be affected by a seismic event or other ground motion with an intensity corresponding to a 100-year return period.

B.I.6.3.3. Operating concept

B.I.6.3.3.1. Nuclear fuel and spent nuclear fuel management

The basic commodity required for operation of the New NPP is nuclear fuel. It will be purchased on the global market, which has sufficient uranium resources to manufacture nuclear fuel over the anticipated SMR ETE service life.

Current strategies for the safe and cost-effective management of spent nuclear fuel vary from country to country and can be described as follows:

- an open cycle, in which spent nuclear fuel is stored and, at the end of the storage period, declared radioactive waste, meaning that the spent nuclear fuel is disposed of,
- a closed cycle, in which spent nuclear fuel is regarded as a potential future source of energy, meaning that the spent nuclear fuel is reprocessed.

Open cycle:

In the open cycle, spent nuclear fuel is stored for several decades under either dry or wet conditions, and the decay heat output generated by the spent fuel decreases significantly over the storage period.

Dry storage consists of storing spent nuclear fuel in packages or in storage racks located in storage vaults. As in other countries using this storage method, the Czech Republic uses packages that ensure nuclear safety through subcriticality; radiation protection through shielding; prevention of radioactive-substance releases from spent nuclear fuel into the environment through leaktightness; heat removal; and protection against external hazards through robustness and strength. The packages are placed in a storage building that provides additional protection against external hazards, increases protection against ionizing radiation by providing additional shielding, creates a suitable working environment and facilities for periodic inspections by operating personnel, and also contributes to physical protection and nuclear material security. Alternatively, they may be placed in the open on a concrete slab because the package itself provides the primary protection against external hazards and ionizing-radiation effects; this method is not used in the Czech Republic. If the packages are placed in a building, residual heat generated by the spent nuclear fuel is removed by natural ventilation, so forced ventilation, and therefore an electrical power supply for fans, is not required. This method is used exclusively in the Czech Republic.

Wet storage consists of placing spent nuclear fuel in a pool filled with water containing the required concentration of boric acid. The advantages of this method include the smaller space required for the storage building because residual heat is transferred to water more intensively than with dry cooling by ambient air. Conversely, a pool cooling and makeup system and a coolant purification system are required. These systems require electrical power for the pumps, and an independent ultimate heat sink must also be available. Automatic controls are also required to maintain the pool level, temperature, and cooling-water flow. All these systems must be housed in a suitable building to protect them against external hazards such as atmospheric effects, flooding, and earthquakes. This method is mentioned only for completeness and is not used in the Czech Republic.

After the storage period ends, under either storage method, the spent nuclear fuel will be enclosed in robust, long-term-resistant disposal packages that meet the acceptance criteria for disposal in a deep geological repository.

Closed cycle:

In the closed cycle, spent nuclear fuel is reprocessed to recover usable fissile materials, namely uranium and plutonium. During reprocessing, spent nuclear fuel is separated into several principal components: uranium, plutonium, and high-level waste containing minor actinides and fission and activation products. Uranium and plutonium can be recycled into nuclear fuel for reactors, while the remaining materials are considered waste products and must subsequently be stored or disposed of. The closed spent nuclear fuel cycle is not used in the Czech Republic.

Spent nuclear fuel management is defined by the Concept of Radioactive Waste and Spent Nuclear Fuel Management in the Czech Republic[1]. The basic strategy is an open cycle involving disposal of spent nuclear fuel in a deep geological repository, which should be ready for operation in 2050[2]. Under Section 110 of Act No. 263/2016 Coll., the Atomic Act, as amended, spent nuclear fuel management is subject, among other requirements, to the requirements applicable to radioactive waste until a decision is made that the spent nuclear fuel constitutes radioactive waste. According to this Concept, responsibility for the safe management of RAO and VJP is divided between holders of permits for RAO management, including RAO collection, sorting, processing, conditioning, and storage, and the state, which guarantees the safe disposal of RAO.

In accordance with the Concept, spent nuclear fuel will be stored before disposal in the deep geological repository. Extension of the operating lives of existing units and the anticipated commissioning of new units, which also concerns the SMR ETE Project, will increase the volume of spent fuel, meaning that new storage capacity will need to be provided in the future. According to the Concept, new storage facilities may be located directly at existing nuclear power plant sites. Where space or other constraints apply, the possibility of using the Skalka site for a future central storage facility is also considered, as is construction of a central storage facility at the selected future deep geological repository site.

B.I.6.3.3.2. Radioactive waste management

Under Section 3(2)(a) of Act No. 263/2016 Coll., the Atomic Act, as amended, radioactive waste is defined as "an item that is a radioactive substance or an object or equipment containing or contaminated by such a substance, for which no further use is anticipated and which does not meet the conditions established by this Act for the release of a radioactive substance from a workplace". Requirements for the safe management of RAO, including technical requirements for facilities and workplaces where RAO is managed, are contained in Decree No. 377/2016 Coll., on Requirements for the Safe Management of Radioactive Waste and Decommissioning of Nuclear Installations or Category III or IV Workplaces, as amended.

To manage RAO, the future SMR ETE operator must obtain a valid Permit under Section 9(3) (a) of Act No. 263/2016 Coll., the Atomic Act, as amended. To obtain the Permit, the operator will prepare an RAO Management Strategy reflecting the principles contained in the Concept of Radioactive Waste and Spent Nuclear Fuel Management. Documentation will also be prepared to the extent specified in SÚJB Guide BN-JB-OD-1.1. This Documentation will also include safety analyses and the resulting limits and conditions for RAO management.

RAO conditioned at the SMR ETE workplace and RAO management facility that meets the disposal acceptance criteria will be disposed of at the existing Dukovany Radioactive Waste Repository. Once it is full, RAO will be disposed of in an expanded or new repository or in the deep geological repository; for future options for disposing of RAO from SMR ETE, see Annex 6.3 to this Documentation. RAO that does not meet the acceptance criteria for repositories currently in operation will be stored in the applicable storage areas at SMR ETE until suitable repositories have been constructed. SÚRAO is responsible for the preparation, construction, and operation of radioactive waste repositories.

The SMR ETE design will rigorously apply the requirement to minimize radioactive waste (RAO) by preventing and/or reducing its generation and sorting RAO directly at source; processing it, meaning separating reusable substances from RAO and returning them for reuse; and releasing radioactive substances from the workplace where radiation activities are performed, in accordance with Section 76 of Act No. 263/2016 Coll., the Atomic Act, as amended. This RAO minimization will make effective use of the disposal capacity at the existing RAO repository.

The system for managing radioactive waste from SMR ETE operation is based on the fundamental classification of RAO by physical form, under Section 3(4) of Decree No. 377/2016 Coll., into gaseous, liquid, and solid waste.

The following text describes the RAO management systems used in the RR SMR reference design[3].

B.I.6.3.3.2.1. Gaseous radioactive substance treatment system

The primary function of the gaseous radioactive substance treatment system [KPL] is to treat gases containing hydrogen and volatile fission products. The system operates by purging tanks in which radioactive gases may accumulate. The vented gases are conveyed by forced flow from a compressor through a drying unit to a delay bed, where the passage of gaseous fission products is retarded and their radioactivity is thereby reduced through natural isotope decay. The treated gases are conveyed by the ventilation system [KLF] to the ventilation stack [UKH] and released into the atmosphere as a radioactive discharge.

Low-pressure nitrogen is used as the tank purge gas, except in the primary coolant volume control tank, which forms part of the normal makeup and letdown system [KBA], where hydrogen is introduced to maintain coolant chemistry. The gaseous mixture of hydrogen, nitrogen, and fission products, primarily xenon and krypton, is conveyed through pressurized piping to system [KPL], where the gas volumes from the individual sources

[1] The currently applicable Concept was approved by Government Resolution No. 597/2019 of August 26, 2019. An update to this Concept (the 2024 draft) is currently at an advanced stage of preparation and discussion. The information in this Documentation therefore reflects the updated Concept, which also addresses the management of RAO and VJP from small modular reactors.

[2] Nuclear power was included in the taxonomy of sustainable activities under Regulation (EU) 2020/852 of the European Parliament and of the Council of June 18, 2020, on the establishment of a framework to facilitate sustainable investment (the "Taxonomy Regulation"). One of the conditions specified in the taxonomy concerns construction of a deep geological repository by 2050. The updated Concept therefore states and presents a plan to commission the deep geological repository in 2050; the original Concept, which formally remains in force, specified 2065.

[3] For this reason, terminology or RAO categorization that may not correspond to Czech conventions is used in some places. For consistency with the reference design, a direct translation of the original English term, namely the system name, is used.

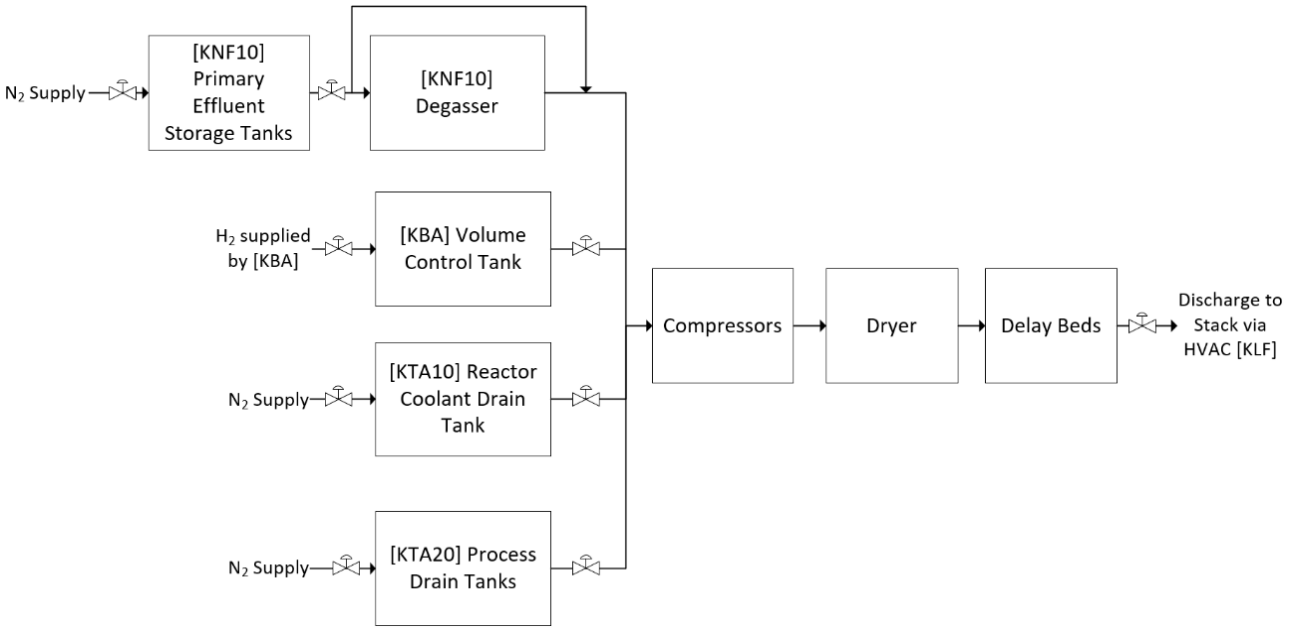
are mixed and the mixture is then treated in the drying and delay line. The purge gas is not recycled; it passes through the line and is discharged to the ventilation stack. The concentrations of the individual gases are measured continuously by analyzers.

A compressor at the inlet to the drying and delay line draws gases from the individual sources. The compressor is equipped with a controller to maintain stable system pressure. If the outlet pressure is high, compressor recirculation opens so that downstream system components are not overpressurized and the passage of the gas mixture through the delay bed is not accelerated, which would reduce the retention time. To remove moisture and maximize delay-bed performance, the line includes a dryer (Dryer) operating by condensation or passage through a desiccant medium; its detailed design will be developed in the next design phase.

A solid sorbent, activated carbon, is used as the delay-bed fill, in which radioactive krypton and xenon isotopes are retained for a period that permits their natural radioactive decay. The delay line is actually configured as two lines in series, with the first serving as a guard bed if the sorbent becomes saturated with an undesirable impurity and its sorption capacity is reduced, and the second serving as the operating bed. The specific design will be further refined.

The system [KPL] outlet is connected to the ventilation system [KLF], in which the treated mixture is diluted many times with air and discharged to the ventilation stack. Samplers for measuring system efficiency are located downstream of the delay beds.

Fig. B.56: Simplified diagram of the gaseous radioactive substance treatment system [KPL]



System [KPL] operates continuously during normal and abnormal operation.

B.I.6.3.3.2.2. Liquid radioactive substance treatment system

The liquid radioactive substance treatment system [KNF] interfaces with the primary circuit drain and controlled-leakage system [KTA]. Individual drainage waters are collected selectively according to their radioactive-substance content so that their treatment methods can be optimized. The basic architecture of system [KTA] comprises:

- Collection of water from primary circuit drains and controlled leakage [KTA10].
- Collection of wastewater from active processes and floor drainage, referred to in the Czech context as the "special drainage system" [KTA20].
- Collection of active drains from the chemistry control system [KTA30].
- Collection of non-active drains (normal drainage system) [KTA40].

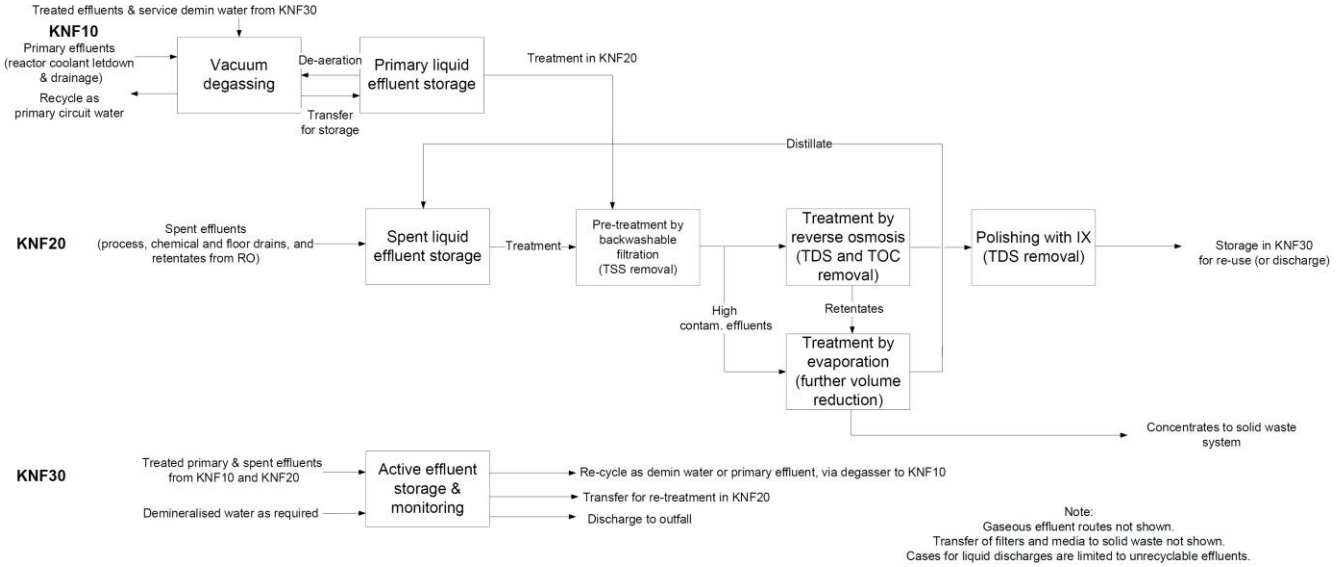
The drain system [KTA] performs the fundamental safety functions of "ensuring the retention of radioactive substances" and "controlling radiation exposure" at defense-in-depth levels DiD 1 and DiD 2, corresponding to normal and abnormal operation.

The liquid radioactive waste management system [KNF] itself collects and treats liquid radioactive substances so that they are suitable for reuse in process systems or discharge into the environment. The basic architecture of system [KNF] is as follows:

- Primary wastewater processing and treatment system [KNF10].
- Wastewater processing and treatment system [KNF20].
- Wastewater and watercourse-discharge monitoring system [KNF30].

System [KNF] collects liquid radioactive substances and treats them, including removal of radionuclides and chemical contaminants, for reuse in process systems or controlled discharge into the environment with radiation monitoring.

Fig. B.57: Simplified diagram of the liquid radioactive substance treatment system [KNF]



The primary water treatment system [KNF10] collects primary circuit drains and controlled leakage with a low contaminant content. This water is generally returned to the primary circuit. However, if chemical analysis shows that the drainage water does not meet the primary coolant specifications, it is routed to the wastewater treatment system [KNF20].

In system [KNF20], individual wastewaters are divided among tanks according to their origin and chemical composition, including primary circuit drains, wastewater from chemistry control systems, special floor drainage, and heavily contaminated water. A range of separation techniques is used to treat this water, including mechanical filtration, purification in ion-exchange columns, and reverse osmosis. Evaporators are used to concentrate liquid radioactive substances that cannot be recycled further, after which the liquid radioactive substances are converted to solid form.

If treated wastewater is unsuitable for recycling and its parameters meet the criteria for release into the environment, it can be discharged in a controlled manner through system [KNF30]. However, because the primary coolant chemistry does not use a liquid absorber, namely a boron salt solution, and the coolant therefore has a low tritium content, wastewater is only exceptionally discharged from system [KNF20] to system [KNF30].

Non-active wastewater from the non-active water drain system [KTA40] passes through the wastewater monitoring and discharge system [KNF30]. However, if activity is detected in these drains, which is unlikely, the non-active water drain system can also be redirected to the treatment line [KNF20], and the water can be treated in the same manner as active water, with contaminants separated and transferred for solid RAO treatment.

B.I.6.3.3.2.3. Solid RAO management system

The method of managing solid RAO [KM] will be developed in greater detail during the next design phase as the RAO Management Strategy. The following text presents a conceptual design for this method, which may be modified further based on specific national requirements and existing systems for RAO management and disposal.

In the solid RAO management system [KM], processing methods are divided into two activity-based categories with corresponding technological systems:

- Low-level wet solid RAO, referred to in Czech terminology as "liquid RAO", such as concentrates from the liquid radioactive substance treatment system, solids captured on filters, spent ion exchangers, and similar waste; and very low-level and low-level dry solid RAO, such as activated process components generated during maintenance, ventilation filters, and used protective equipment [KMA10].
- Intermediate-level wet solid RAO [KMA20].

The solid RAO storage system [KME] is divided[1] into:

- Temporary storage areas for dry low-level waste (LLW) [KME10].
- Temporary storage areas for dry and wet intermediate-level waste (ILW) [KME20].
- Intermediate-level waste storage facility [KME30].

[1] The activity classification stated corresponds to the country of origin of the RR SMR reference design.

Temporary storage areas for low-level solid RAO [KME10] are intended for collecting and sorting dry low-level and potentially active (VLLW) waste. Dry LLW includes, for example, used HEPA filters from ventilation systems, semipermeable RO membranes from the liquid radioactive substance treatment system, flushed and dried filters from steam generator blowdown purification systems, and used protective equipment. Low-level waste is sorted and stored in special cages. Waste containing radioactive substances that can be released from a workplace where radiation activities are performed is also sorted and stored separately. The storage cage system is variable and permits the cage size to be changed for different waste types.

Both shielded cast-iron packages and unshielded steel packages are available for the temporary storage of dry intermediate-level waste [KME20]. The specific type of package will be refined during subsequent design preparation phases. The dry solid ILW storage area provides a dedicated space for one shielded cast-iron package for temporarily storing intermediate-level solid RAO before further processing.

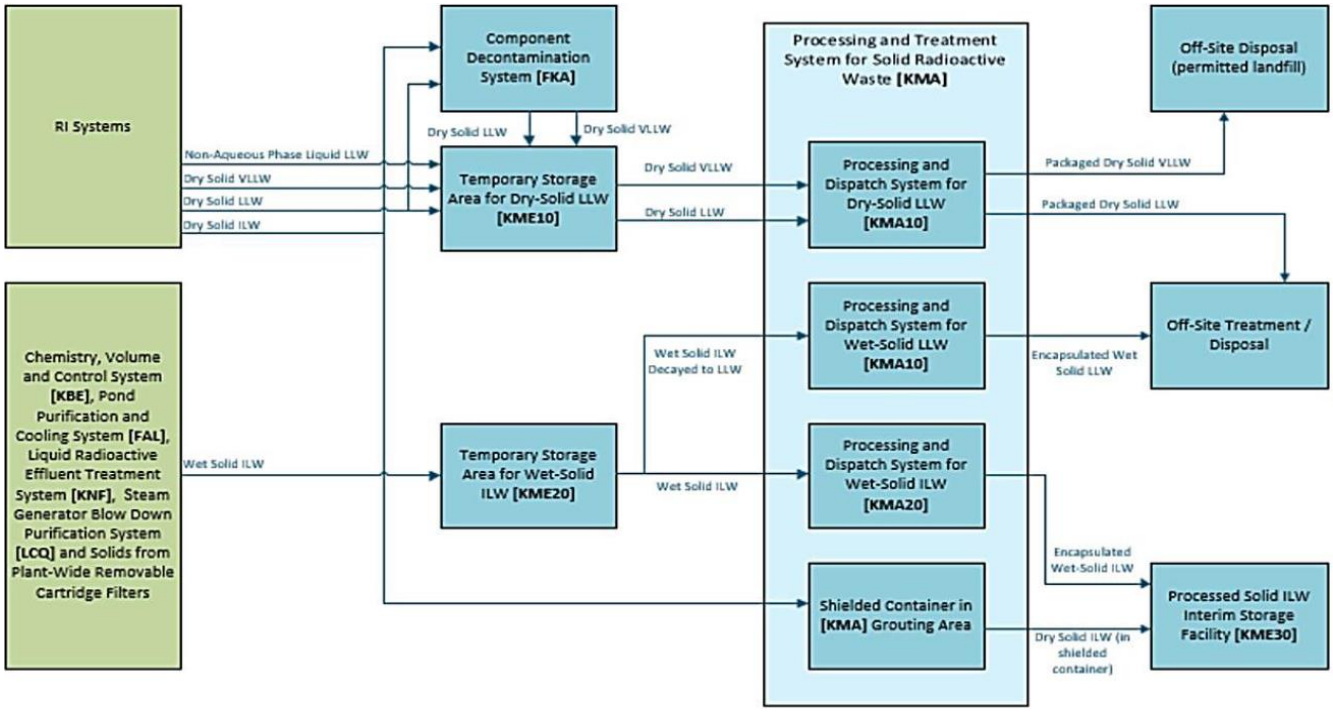
Wet solid RAO is conveyed through shielded piping to temporary storage in system [KME20] tanks. It is conservatively assumed that all wet solid RAO is intermediate-level when generated; however, during temporary storage, radioactive isotopes decay and the activity of some waste decreases to the low-level waste range. Wet solid RAO is therefore stored in storage tanks divided by wet RAO type into:

- 2 × concentrate tanks,
- 2 × filtered-solids (slurry) tanks,
- 3 × ion-exchange resin tanks (2 × ILW/LLW storage tanks and 1 × ILW storage tank).

The concentrate and slurry tanks are located in one common cell, and the ion-exchange resin tanks are located in a second common cell.

The long-term storage area for ILW RAO that does not meet the acceptance criteria for the applicable solid RAO repository [KME30] is a shielded interim storage facility that permits packages containing radioactive waste to be stored in a manner that protects workers and the environment against the risks associated with long-term storage. This interim storage facility will include an area for receiving and dispatching packages, generally steel drums containing conditioned RAO. It will also be equipped with a monitoring system, RAO handling equipment, and personnel facilities.

Fig. B.58: Simplified diagram of the solid RAO management method [KM]



B.I.6.3.3.2.4. Requirements for the transport of nuclear material and radioactive waste

Safety requirements for transporting nuclear material and radioactive waste are governed by Act No. 263/2016 Coll., the Atomic Act, as amended; Act No. 111/1994 Coll., on Road Transport, as amended; and Government Decree No. 1/2000 Coll., on Transport Rules for Public Rail Freight Transport, as amended. The following implementing legislation relating to the transport of radioactive substances has been issued pursuant to the above legislation:

- SÚJB Decree No. 379/2016 Coll., on Type Approval of Certain Products in the Peaceful Use of Nuclear Energy and Ionizing Radiation and on the Transport of Radioactive or Fissile Material, as amended,
- SÚJB Decree No. 422/2016 Coll., on Radiation Protection and Security of a Radionuclide Source, as amended, and
- SÚJB Decree No. 361/2016 Coll., on the Security of Nuclear Installations and Nuclear Material, as amended.
- SÚJB Decree No. 359/2016 Coll., on details of ensuring radiation extraordinary event management, as amended,

The main transfers of radioactive substances associated with SMR ETE operation are the transport of fresh nuclear fuel from the manufacturer (supplier) to SMR ETE, the transport of conditioned RAO from SMR ETE to an RAO repository, the transport of VJP from SMR ETE to a VJP storage facility, and the transport of VJP from the VJP storage facility to a permanent repository. The principles established in the legislation above form the basis for managing the risks associated with transporting radioactive substances:

- The transport of radioactive or fissile substances specified by implementing legislation, Decree No. 379/2016 Coll., must be authorized by SÚJB under Section 9(4) of Act No. 263/2016 Coll., the Atomic Act.
- Transport must be conducted in accordance with approved procedures and the associated requirements of national and international legislation and the Czech Republic's international obligations and treaties.
- Transport procedures must take potential risks into account and minimize the probability of an accident.
- The substances transported must be placed in approved transport packages, or storage and transport packages, demonstrably ensuring that radioactive substances are not released into the environment in the event of an accident and, for fissile nuclear material, that subcriticality does not fall below the permitted limit, even if flooded with water. The shielding capability of the package must also be ensured.
- The dose rate at the package surface and at the specified distance from it, and surface contamination, must not exceed the limits specified in the applicable legislation.

Compared with the transport of other dangerous goods (from an energy perspective, the transport of other types of fuel), the transport of radioactive substances poses much less risk to the environment and the population, and the quantities transported and frequency of transport are low. The potential for releases of radioactive substances into the environment during transport is minimized. Procedures are prepared for each transport of radioactive substances to limit any radiological consequences of an accident so that public health is not endangered. For the transport of radioactive substances, SÚJB Decree No. 379/2016 Coll., as amended, establishes strict dose-rate limits both at the surface of the package in which radioactive substances are transported and at a specified distance from that package. Only a package approved by the State Office for Nuclear Safety will be used for transport.

B.I.6.3.3.3. Radiation situation monitoring

The radiation monitoring applied in the SMR ETE design will effectively perform the following functions:

- personnel monitoring: personal dosimetric monitoring,
- workplace monitoring: continuous and periodic monitoring of the working environment, SMR ETE spaces, technological equipment, and media,
- discharge monitoring: continuous and periodic monitoring of the activity of discharges to air and watercourses,
- environmental monitoring: continuous and periodic monitoring of radiation conditions around SMR ETE,
- connection to nationwide radiation monitoring.

SMR ETE radiation monitoring will be designed in accordance with Czech legislation to perform these functions under all operational states and during emergencies and to interface appropriately with radiation monitoring at the operating power plant (ETE1,2).

Personnel monitoring: Personal monitoring of SMR ETE radiation workers will be performed in accordance with the applicable legislation, SÚJB Decree No. 422/2016 Coll., on Radiation Protection, as amended, by determining individual doses through the monitoring, measurement, and assessment of their external and internal exposure. Radiation workers will be assigned to Category A and, where necessary, Category B. When assigning a radiation worker to a category, the radiation worker's expected exposure during normal operation and potential exposure are taken into account. A Category A radiation worker is a radiation worker who could receive an effective dose exceeding 6 mSv per year. A Category B radiation worker is a worker who is not reasonably expected to receive an annual dose of 6 mSv. Personal monitoring of external exposure of Category A radiation workers will be provided by a personal dosimeter. A personal dosimeter, or multiple dosimeters or similar devices used simultaneously, must be capable of measuring all types of radiation contributing to a radiation worker's external exposure with sufficient accuracy to determine the dose to organs and tissues for which limits have been established. Personal monitoring of Category B workers will

also be provided by a personal dosimeter and by calculating individual doses from workplace-monitoring data and records of time spent at the workplace.

In SMR ETE spaces where the potential for exceeding exposure limits as a result of a single exposure cannot be excluded, workers will be equipped with electronic personal dosimeters that provide a clear alarm when the preset level of the monitored quantity is exceeded.

In SMR ETE spaces where a radiation worker could be internally exposed, radionuclide intakes or committed effective doses from internal exposure for individual radiation workers will be determined by measuring radionuclide activity in the worker's body or excreta. If this cannot be applied, radionuclide intake or committed effective dose may be determined by measuring radionuclide activity concentrations in workplace air and subsequently converting them to radionuclide intake or committed effective dose.

Radiation workers will be informed of their personal-monitoring results in an understandable manner.

Workplace monitoring:

SMR ETE workplace monitoring will be performed in accordance with the applicable legislation, SÚJB Decree No. 422/2016 Coll., on Radiation Protection and Security of a Radionuclide Source, as amended, by monitoring, measuring, assessing, and recording quantities and parameters characterizing ionizing-radiation fields and the occurrence of radionuclides at the workplace. Depending on the types of ionizing-radiation sources used, workplace monitoring will include monitoring of:

- the ambient dose equivalent rate at the workplace,
- activity concentrations in workplace air and surface activity at the workplace, or
- measurement of stray radiation, namely ionizing radiation originating from an ionizing-radiation source outside the main radiation beam.

The effectiveness of protection against external and internal exposure will be verified by the measurements above at ionizing-radiation sources, at locations where work is performed with such sources, and at locations where radiation workers or other individuals may be present. When work is performed with an unsealed radionuclide source, radioactive-contamination monitoring (surface activity) will be carried out so as to indicate deviations from normal operation and inadequate performance or failure of barriers preventing dispersion, and to confirm that surface radioactive-contamination values are not exceeded, in accordance with Annex 18 to SÚJB Decree No. 422/2016 Coll., on Radiation Protection, as amended.

Radionuclide activity concentrations in air will be monitored continuously.

Discharge monitoring:

SMR ETE discharge monitoring will be performed in accordance with the applicable legislation, SÚJB Decree No. 422/2016 Coll., on Radiation Protection and Security of a Radionuclide Source, as amended, by monitoring, measuring, recording, and assessing quantities and parameters characterizing released radioactive substances, particularly by determining the balance of total activity discharged and radionuclide activity concentrations.

Discharge monitoring will include, among other activities:

- systematic monitoring of radionuclides making a non-negligible contribution to public exposure and discharged to the atmosphere and watercourses over a specified period ("balance measurement"),
- continuous radionuclide monitoring capable of rapidly indicating deviations from normal operation, and
- operational monitoring of other potential pathways for releasing radioactive substances from the workplace in the event of a leak so that the release can be included in the discharge balance.

Discharges will be monitored at their source. Discharges to the atmosphere will be monitored at the ventilation stack or, depending on the SMR ETE design, at the turbine-building stack.

Discharges to watercourses will be monitored in the control tanks, at the liquid-discharge outlet from the system for monitoring liquid radioactive substances and their discharges to the final wastewater collector, in accordance with the SMR ETE design. Monitoring of the control tank before discharge will ensure that radioactive substances in unauthorized volumes or concentrations are not discharged from SMR ETE. Monitoring discharges from the wastewater sump will provide continuous information on the discharged volumes and liquid activity so that measures to restrict or stop discharges can be taken in a timely manner.

In accordance with SÚJB Decree No. 422/2016 Coll., on Radiation Protection and Security of a Radionuclide Source, as amended, recording, investigation, and intervention levels will be established for discharge monitoring.

The recording level for discharge monitoring will be established so that:

- for balance measurements, it meets the requirements for the minimum detectable value of the monitored quantity under SÚJB Decree No. 360/2016 Coll., on Radiation Situation Monitoring, as amended, and
- for continuous radionuclide monitoring, it permits monitoring of all operational states.

For balance measurements, the investigation level will be established at the expected radionuclide-discharge balance value, taking into account the length of the monitoring period; for monitoring deviations from normal

operation of SMR ETE discharge systems, it will be established as the upper limit of normally occurring values of the monitored quantity.

The intervention level will be established so that:

- for discharge balance measurements, measures can be taken in a timely manner to prevent authorized limits from being exceeded or permit conditions from being breached, and
- when monitoring deviations from normal workplace operation, measures can be taken to remedy the resulting condition and prevent undesirable progression.

Environmental monitoring: The area around SMR ETE will be monitored in accordance with the applicable legislation, SÚJB Decree No. 422/2016 Coll., on Radiation Protection and Security of a Radionuclide Source, as amended, by monitoring, measuring, assessing, and recording quantities and parameters characterizing ionizing-radiation fields and the occurrence of radionuclides around the workplace, particularly:

- the ambient dose equivalent rate,
- radionuclide activity concentrations, and
- radionuclide specific activities.

The recording level will be established so that it meets the requirements for the minimum detectable value of the monitored quantity under SÚJB Decree No. 360/2016 Coll., on Radiation Situation Monitoring, as amended.

The investigation level will be established as the upper limit of normally occurring values of the monitored quantity.

The intervention level will be established in accordance with public-exposure optimization requirements.

Each of the four monitoring areas mentioned above will be governed by its own SMR ETE monitoring program, which will define, among other matters:

- monitored quantities,
- the method, scope, and frequency of measurement,
- the method of recording and retention period for measurement results,
- procedures for assessing measurement results,
- monitoring-level values and measures to be taken when they are exceeded,
- dose-optimization constraint values,
- a description of the measurement method,
- the types and parameters of measuring instruments and equipment used.

The monitoring programs will be formulated to permit:

- verification of compliance with exposure limits,
- demonstration that radiation protection is optimized,
- timely identification of deviations from normal workplace operation.

The SMR ETE monitoring programs will be approved by SÚJB. The exact scope of measured quantities, frequency, and other monitoring-program parameters mentioned above will reflect current knowledge of environmental conditions at the site and new radiation-protection findings and will form part of the documentation for the licensed activity of siting a nuclear installation. The SMR ETE monitoring system can be expected to be conceptually similar to that used for ETE1,2, using state-of-the-art equipment.

In accordance with Act No. 263/2016 Coll., the Atomic Act, as amended, the SMR ETE operator will also monitor radiation conditions in the Czech Republic under SÚJB Decree No. 360/2016 Coll., on Radiation Situation Monitoring, as amended, to the extent specified in the monitoring program applying to the site of the nuclear installation and the emergency planning zone established for SMR ETE.

When managing radiation-situation monitoring during an accidental exposure situation, SÚJB initiates emergency monitoring and, according to its extent and in accordance with the monitoring program, may specify the scope and method of SMR ETE participation in emergency monitoring.

The holder of the SMR ETE operating permit, who also holds the permit to release radioactive substances from the workplace, is required to:

- ensure that discharges and the environment are monitored in accordance with the monitoring program, including emergency monitoring as described above,
- provide a measurement laboratory, namely LRKO, and ensure its participation in comparative measurements organized by SÚJB and the European Commission,
- permit SÚJB to monitor discharges on the SMR ETE site under the "national monitoring program" and provide the necessary cooperation,
- conduct emergency-monitoring drills as part of an emergency exercise under Act No. 263/2016 Coll., the Atomic Act, as amended,
- submit discharge- and environmental-monitoring data to SÚJB, and
- prepare an annual report on discharge and environmental monitoring and submit it to SÚJB.

The annual discharge- and environmental-monitoring report will be prepared in accordance with Annex 5 to SÚJB Decree No. 360/2016 Coll., on Radiation Situation Monitoring, as amended, and will include, among other information, the quantity of radioactive substances discharged by SMR ETE into the environment and an assessment of the resulting public radiation exposure.

Selected SMR ETE discharge-monitoring results will be submitted to SÚJB in standardized form, in accordance with Tables 1 and 2 of Annex 6 to SÚJB Decree No. 360/2016 Coll., on Radiation Situation Monitoring, as amended. As for the operating ETE1,2 units, selected environmental-monitoring results will be submitted to SÚJB by remote access immediately after they are obtained. Selected information from nationwide monitoring, namely sparse-network monitoring, including the results of nuclear-installation discharge monitoring, is subsequently transmitted to the European Commission by remote access under the Treaty establishing the European Atomic Energy Community.

Nuclear power plant discharge- and environmental-monitoring results submitted to SÚJB or obtained directly by SÚJB as part of nationwide monitoring are publicly available in summary form in the SÚJB Annual Reports (https://sujb.gov.cz/dokumenty-a-publikace/vyrocni-zpravy), while operational environmental-monitoring data are available online in the MonRaS system (https://sujb.gov.cz/aplikace/monras/?lng=cs_CZ).

B.I.6.3.3.4. Non-radioactive waste management

Non-radioactive waste generated during SMR ETE operation that cannot be used further will be transferred to authorized entities contractually responsible for its recycling, other recovery, or disposal in accordance with the waste-management hierarchy. Waste will be managed in the same manner as at ETE1,2, in accordance with Act No. 541/2020 Coll., on Waste, as amended.

B.I.6.3.3.5. Water connections and systems

SMR ETE will be equipped with water supply and treatment systems and systems for treating and discharging wastewater and stormwater.

The Vltava River is the cooling-water source at the Temelín site. The capacity of this source is assessed for the SMR ETE Project on the basis of historical data, taking into account anticipated climate developments, options for operating the water-management system, and the requirements of other users. The primary and secondary circuits are closed systems in which only insignificant water losses occur. The RR SMR reference design always has sufficient water supplies for safety systems that shut down the reactor and remove residual heat, and for the fire-protection systems forming part of the design. When the reactor is shut down, no additional external water supply is required for 72 hours; when system [KAX] is used, this period is extended to 168 hours (7 days).

During reactor power operation, the tertiary cooling circuit, which removes the waste heat generated during electricity production, has the greatest consumption. In the event of a hypothetical acute water shortage in the river, complete failure of the Hněvkovice pumping station, or complete failure of the raw-water supply mains, the capacity of the existing water reservoir on the ETE1,2 site (2 × 15,000 m^3), to which SMR ETE will also be connected, can be used. In such a situation, however, electrical output would have to be reduced immediately and, if the failure persisted, all units at the Temelín site, including SMR ETE, would ultimately have to be shut down; when the power plant is not generating, consumption by the tertiary circuit ceases. In this case, the procedure would be coordinated with all sources at the site, namely SMR ETE, ETE1,2, and New NPP ETE; the transmission system operator, ČEPS, a.s.; and the river basin administrator, Povodí Vltavy, s.p. For such cases, ETE1,2 have backup sources and standard procedures for managing these events in accordance with legislation, which will also be implemented for SMR ETE.

If the raw-water makeup supply is completely lost, the power plant, specifically the operating units, is shut down automatically within a short time. If raw-water makeup is interrupted, water lost through cooling-tower evaporation cannot be replaced, and the tertiary-circuit circulating-water pumps are automatically shut down on low level in the suction sumps. Without these pumps, heat cannot be removed from the turbine condenser, and condenser vacuum is lost virtually immediately. Loss of vacuum automatically isolates the steam supply to the turbine, thereby shutting down the turbine. Turbine shutdown immediately causes a significant reduction in reactor power and subsequently, because of further process interlocks, complete reactor shutdown. This shutdown would therefore occur even without operator action; operating procedures are available for these states, and operators would shut down ETE1,2 earlier, immediately after confirming the loss of raw-water makeup.

The same applies to SMR ETE. Water consumption in the non-power state is negligible compared with power operation and essentially only covers residual heat removal from the reactors of the shut-down units. The nuclear facilities at the Temelín site as a whole, namely ETE1,2, New NPP ETE, and SMR ETE, can be maintained in a shut-down state for approximately 30 days without additional water makeup to the power plant site, using only the water supplies at the site, including the TVD cooling basins and raw-water and TVD piping, and, where applicable, the water inventory in the gravity reservoir. For the existing ETE1,2 units, this period applies without using the water inventory in the gravity reservoir. If the raw-water supply from the Hněvkovice pumping station has still not been restored after this 30-day period, water can be supplied by alternative means to maintain the shut-down reactors in a safe state: delivery of water to the site by tanker trucks, use of the potable-water system, or emergency pumping of water from available sources using fire hoses at up to 16 l/s when considering ETE1,2, New NPP ETE (2 × 1,700 MW_e), and SMR ETE (500 MW_e), or a proportionally smaller quantity if New NPP ETE is not considered.

B.I.6.3.3.5.1. Water supply systems

Water supply systems include the potable-water system, raw-water system, and fire-water system.

The potable-water system will supply water for welfare purposes, namely employees' personal consumption, including sanitary and catering needs. Potable water will also be used as utility water, for example for cleaning. Potable water will be supplied from the existing water connection for ETE1,2. The existing potable-water abstraction permit and limit are sufficient for both the SMR ETE operating and construction phases.

Raw water for SMR ETE is expected to be supplied from the existing raw-water abstraction and supply system serving the currently operating ETE1,2 units from the Hněvkovice Reservoir on the Vltava River. Raw water will be used to replace losses in the SMR ETE cooling circuits, produce demineralized water for SMR ETE operation, and meet the needs of the fire-water system. The technical capacity of the existing water supply system is sufficient for the potential concurrent operation of ETE1,2, New NPP ETE, and SMR ETE, but the permitted raw-water abstraction limit will need to be increased.

The SMR ETE site fire-water system will be functionally independent of the existing system for ETE1,2 and of any system intended for New NPP ETE. A permanent fire-water inventory will be provided on the SMR ETE site in separate fire-water tanks or as a reserve in raw-water/cooling-water storage tanks.

B.I.6.3.3.5.2. Wastewater and stormwater treatment and discharge systems

These systems collect, treat, and discharge industrial and sanitary wastewater and also discharge stormwater.

A number of industrial wastewaters will be generated during SMR ETE operation. These will primarily include the following types of industrial wastewater:

- wastewater from the controlled area,
- blowdown from cooling systems,
- chemically aggressive wastewater from water treatment and purification systems,
- oily wastewater.

An industrial wastewater sewer system for collecting, treating, and discharging industrial wastewater will be constructed on the SMR ETE site. The system will be divided into subsystems according to the characteristics of the wastewater. After the necessary treatment, including purification, neutralization, and oil removal, the wastewater will be routed to the wastewater collection sump on the SMR site, then transferred to the existing wastewater discharge system for ETE1,2, and discharged to the Vltava River through the Kořensko attenuation and metering structure. The kinetic energy in the wastewater mains is utilized by a horizontal Pelton turbine. The technical capacity of the existing wastewater system is sufficient for the wastewater generated by ETE1,2, New NPP ETE, and SMR ETE, but the permitted wastewater discharge limits will need to be increased.

In addition to the industrial wastewater sewer system, a sanitary sewer system will be constructed on the SMR ETE site. Treated sanitary wastewater will be discharged together with industrial wastewater.

A new storm sewer network will be constructed to collect, discharge, and treat stormwater from building roofs, roads, and paved areas on the SMR ETE site. Stormwater will be discharged to a new stormwater retention basin within the SMR ETE site. Its controlled outflow will connect to the existing final sewer collector, through which it will be discharged together with stormwater from the ETE1,2 and New NPP ETE sites through the existing safety basins and the Býšov retention basin to the Strouha receiving watercourse and onward to the Vltava River. Some stormwater from the unfenced portion of the SMR ETE site will be discharged through a separate stormwater drainage network to Dvorčice Pond. A line will also be constructed from the retention basin within the SMR site to Dvorčice Pond, permitting stormwater from the SMR retention basin to be pumped to Dvorčice Pond if necessary. Some collected stormwater may also be conveyed via appropriate retention facilities to Karlovec Pond.

B.I.6.3.3.6. Connection to external power grids

SMR ETE electrical power evacuation is planned to the Kočín substation. Power evacuation is planned through no more than two 400 kV overhead lines in a corridor east of the existing corridor defined by the lines for ETE1,2 (3,4). The design will also be extended to include an underground or overhead 110 kV cable line from the Kočín substation to provide a backup auxiliary power supply for SMR ETE.

B.I.6.3.3.7. Heat supply

Heat for SMR ETE internal needs will be produced using electricity generated on site or, during outages, electricity supplied from the distribution system; heat export to external district-heating systems does not form part of the Project.

An auxiliary boiler house equipped with three electric steam boilers with a total input of approximately 5 MW_e is designed to produce steam for SMR ETE startup and operation, including startup and shutdown, with total production of up to 16 t/h of saturated steam at a pressure of 1.2 MPa.

B.I.6.3.3.8. Transportation connections

SMR ETE is expected to be connected to the road network, and a connection to the rail network is also under consideration. The road connection will be provided by connecting to Road II/138 along the southern boundary of the Project site. The rail connection may be provided by extending the existing siding serving ETE1,2. The access siding runs from Temelín railway station, which is located on Line No. 192, Číčenice to Týn nad Vltavou.

B.I.6.3.3.9. Personnel provision

Up to 400 workers are expected to operate and maintain SMR ETE during normal operation.

B.I.6.3.4. Construction data

Civil and structural work will take place in the areas defined in Chapter B.I.3. Project location (page 68 of this Documentation).

The main construction site will be located in the SMR ETE area, which also defines the Project site and its permanent location. Areas C, G, H, I, and J are designated for temporary construction facilities, while areas B1, B2, B3, D, E1, E2, F1, and F2 are considered reserve areas. Construction sites for electrical equipment, namely tower footings and work strips for underground lines, will be located temporarily in Areas EL, the electrical power evacuation corridor, and SE, the construction-site electrical supply corridor.

The main construction site will be accessed from Road II/138, which will be closed to public traffic during construction of the SMR ETE Project in the section between Roads II/105 and II/141, namely in the area of the SMR ETE construction site and associated construction facilities. Existing traffic will be diverted along Roads II/141 and II/105. The closed section of Road II/138 will remain accessible only to traffic associated with SMR ETE construction, access to the Temelínec landfill and sludge pond site, and integrated rescue system vehicles. For construction purposes, Road II/138 will be widened between Road II/105 and the ETE service road. The ETE service road will also be modified and widened by constructing truck passing bays on both sides of the road. Access roads will also be constructed from Roads II/138 and II/105 to the main SMR ETE construction site and the individual construction-facility areas. A temporary road connection between construction-facility areas H and I will also be constructed by means of a bridge over Dvorčický Stream.

Rail transport will use the existing siding for ETE1,2. Existing infrastructure already under preparation for transporting oversized and heavy components for New NPP ETE will be used to transport oversized and heavy components.

In view of construction traffic intensity, SMR ETE construction work will be coordinated with other construction activities at the site, namely construction of New NPP ETE, so that the main SMR ETE and New NPP ETE construction activities do not coincide and construction traffic on the public road network does not accumulate significantly, specifically so that the total heavy-construction-traffic intensity previously assessed in the EIA process for New NPP ETE is not exceeded.

Construction organization itself will include the following steps:

- preparatory work,
- main civil work,
- combined civil and erection work,
- erection work,
- commissioning.

Preparatory construction-site work will consist primarily of preparing and implementing site delineation and security, material and energy supply systems, and technological, personnel, and transportation links. The construction site will be equipped with the necessary construction and erection equipment; heavy earthmoving equipment and tower cranes are expected to be used. Construction itself will begin with topsoil stripping, earthwork, and excavation associated with preparing the foundation bed and draining the construction site. This will be followed by foundation work, namely reinforcement and concreting of the generating-unit basemat and other structures, followed by construction of the buildings themselves.

During and after the civil work, mechanical systems and piping will be installed progressively, followed by the installation of electrical equipment and instrumentation and control systems. Erection work will conclude with flushing, post-installation cleaning, individual equipment tests, progressive tests of individual subsystems, and verification of their readiness for generating-unit commissioning.

Temporary construction-facility areas will be reclaimed and returned to their original use after construction is completed.

The anticipated construction period is approximately 5 years. The total construction workforce will average approximately 750, with a short-term peak of up to 2160.

B.I.6.3.5. Information on the termination of operation and decommissioning

Decommissioning of SMR ETE will be subject to a separate environmental and public-health impact assessment process under the legislation applicable when it is prepared; at present, the applicable legislation would be Act No. 100/2001 Coll., on Environmental Impact Assessment, as

amended. Complete decommissioning of SMR ETE will require an SÚJB permit under Section 9(7) of Act No. 263/2016 Coll., the Atomic Act, as amended.

Termination of SMR ETE operation and decommissioning will proceed in accordance with the applicable legislation. For the purposes of Act No. 263/2016 Coll., the Atomic Act, as amended, decommissioning means "administrative and technical activities aimed at complete decommissioning or decommissioning of a nuclear installation, Category III workplace, or Category IV workplace with restrictions on its use for further activities associated with the use of nuclear energy or activities within exposure situations". Complete decommissioning means "bringing a nuclear installation, Category III workplace, or Category IV workplace to a state permitting its use for another purpose or unrestricted use of the site on which it was located".

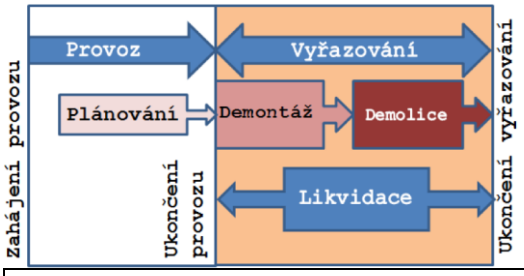
SMR ETE decommissioning will be performed on the basis of approved documentation submitted to SÚJB together with an application for the applicable permit for each decommissioning stage. The documentation to be submitted for the licensed activity comprising the individual stages of nuclear-installation decommissioning is specified in Annex 1 to the Atomic Act. A draft Concept for Safe Termination of Operation will be prepared during the initial licensing proceedings associated with SMR ETE construction, namely the permit to site the nuclear installation. For the nuclear-installation construction permit, a Concept for Safe Termination of Operation will be prepared, including the method of managing the resulting radioactive waste. A Decommissioning Plan will be prepared during commissioning and subsequently updated at least once every 5 years. The contents of the Concept for Safe Termination of Operation and Decommissioning Plan are specified in SÚJB Decree No. 377/2016 Coll., on Requirements for the Safe Management of Radioactive Waste and Decommissioning of Nuclear Installations or Category III or IV Workplaces, as amended. Drafts of these documents will be based on current knowledge of suitable decommissioning technologies and procedures, IAEA recommendations, and applicable Czech legislation. Knowledge and technical equipment will certainly develop in the future, and experience from decommissioning Generation I and II nuclear units will also become available for assessment. This information will be used to refine and update the Concept for Safe Termination of Operation and Decommissioning Plan throughout the preparation, implementation, commissioning, and operation of the New NPP.

The main activities during the termination-of-operation phase include reactor shutdown and inspection of the condition of all equipment; transfer of VJP from the reactor core to the VJP storage pool and, after the decay heat output of individual fuel assemblies decreases, its progressive transfer to the spent nuclear fuel storage facility; draining and drying of non-operating systems; sampling to determine the radioactive inventory of shut-down, drained, and dried systems; removal of operating fluids from systems; decontamination to reduce dose rates; processing and conditioning of decontamination waste; disposal of hazardous materials and waste; processing and conditioning of spent ion exchangers and other operating waste no longer required; ionizing-radiation monitoring; physical protection of the site; radiation extraordinary event management; separation of equipment remaining in operation; procurement of basic equipment and materials for decommissioning activities; and dismantling and demolition of equipment no longer required.

The start of decommissioning is characterized by the state in which all nuclear fuel has been removed from the nuclear installation being decommissioned and transferred to another nuclear installation. The objective of decommissioning will be to permit the SMR ETE site or parts of it to be used for further activities associated with the use of nuclear energy or activities within exposure situations, or for other purposes without restriction, meaning complete decommissioning. Under the current legislation, two decommissioning methods are considered:

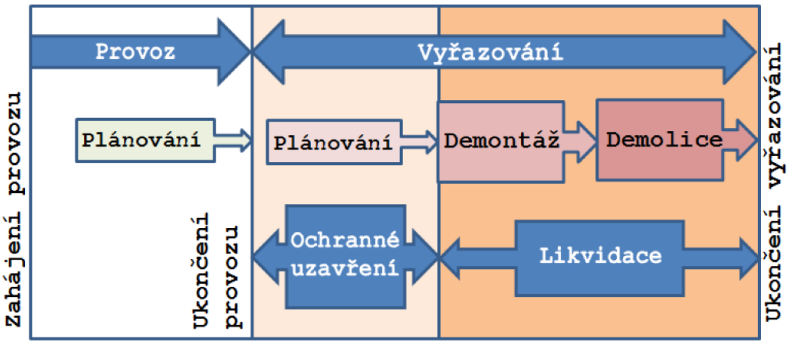
- immediate decommissioning, in which decommissioning proceeds continuously without interruption from commencement to completion,
- deferred decommissioning, in which decommissioning activities are divided into several successive, substantively and temporally defined stages with possible time intervals between them, under Section 43(h) of the Atomic Act, in order to reduce the activity of isotopes with relatively short half-lives.

Fig. B.59: Immediate decommissioning



	Start of operation
	Operations
	Scheduling
	Termination of operation
	Decommissioning
	Dismantling
	Demolition
	Disposal
	Completion of decommissioning

Fig. B.60: Deferred decommissioning



	Start of operation
	Operations
	Scheduling
	Termination of operation
	Decommissioning
	Scheduling
	Dismantling
	Demolition
	Protective enclosure
	Disposal
	Completion of decommissioning

One objective of decommissioning activities is to remove contamination from process systems that has accumulated during operation on their internal surfaces and on the surfaces of civil structures. Using technologies for sorting, processing, and conditioning radioactive waste, RAO must be conditioned in accordance with the disposal acceptance criteria and transported to a repository. Throughout the process, emphasis will be placed on maximizing the segregation of potentially non-radioactive waste to minimize the quantity of RAO requiring disposal in radioactive waste repositories.

A Decommissioning Plan will be prepared for the future decommissioning of SMR ETE. The purpose of this plan will be to define the scope of work in the SMR ETE decommissioning project and provide the most accurate possible estimate of decommissioning and radioactive-waste-management costs. The plan will provide more detailed information on the seven decommissioning phases:

- Phase 1 (approximately 5 years): preparation of the nuclear installation for termination of operation. The preparatory work program will begin at least five years before final cessation of generation to avoid delays in the transition from operation to nuclear-installation decommissioning. This phase will include decommissioning planning, physical preparation, documentation and procedures, and organizational readiness. Project teams will be established during this period to manage the transition from termination of operation through decommissioning.
- Phase 2 (approximately 5 to 16 years): fuel removal and basic cleanup after termination of operation. Nuclear fuel removal, including initial cooling of irradiated fuel in the spent fuel pool, and its transfer to the spent fuel storage facility will be performed using operating fuel-handling equipment, operating procedures, and the operating method of ensuring safety. Basic activities, such as radiation monitoring, spent fuel pool cooling control, and electrical power supply, will be provided in the same manner as during SMR ETE operation. Because the spent fuel storage facility is expected to remain at the site after termination of operation until the spent nuclear fuel is disposed of in the deep geological repository, preparations will also be made during this period for that storage facility to provide the activities above directly, such as constructing a separate radiation control room and providing a new electrical power supply network, so that activities performed by the original SMR ETE can be transferred progressively to these new entities. Basic SMR ETE cleanup will also be performed during this period, meaning the processing and conditioning of operational radioactive waste, such as used ventilation filters, and decontamination of the primary circuit and, where applicable, other activated systems, structures, or components. Conditioned radioactive waste meeting the disposal acceptance criteria will be transported to an RAO repository. Conditioned RAO that does not meet the disposal acceptance criteria will be stored in the intermediate-level waste storage facility.
- Phase 3 (approximately 4 to 6 years): decommissioning of the nuclear reactor. This phase will include complete decommissioning of all SMR ETE equipment and structures on the power plant site, except the storage facilities for intermediate-level waste, such as certain active reactor internals or reactor components, and spent nuclear fuel. It therefore includes decommissioning all reactor building systems, structures, and components, including the reactor itself and the primary circuit.
- Phase 4 (approximately 60 to 70 years): storage for approximately 60 years of intermediate-level waste that does not meet the acceptance criteria for disposal in repositories operating at that time, high-level waste, and spent nuclear fuel in the applicable packages. Significant activities during this period will include maintenance of storage-area structures, including hot cells for possible replacement of shielding components or resealing of packages. Regular radiation-condition monitoring and inspection of the inventory of all stored radioactive items

will also be performed during this phase. Equipment for transporting the stored waste to the final repository will also be prepared during this period.

- Phase 5 (approximately 2 years): transport of intermediate-level waste, excluding spent nuclear fuel, to the final repository. This phase will proceed in coordination with preparation of the final repository for intermediate-level waste disposal. After this RAO has been transported, the applicable storage structures will be decommissioned and removed.
- Phase 6 (approximately 5 to 10 years): disposal of high-level waste and spent nuclear fuel. This phase is primarily intended for transporting packages containing spent nuclear fuel from the spent nuclear fuel storage facility to the deep geological repository. Because packages approved for both storage and transport will be used, the fuel assemblies will not need to be handled for transfer to the deep geological repository, meaning that they will not need to be reloaded into other packages.
- Phase 7 (approximately 6 years): final site cleanup and delicensing. This final phase will include removing and clearing all remaining structures and materials, followed by monitoring, remediation, and earthwork to achieve the agreed final state of the site. If necessary, and if no nuclear installations remain at the Temelín site, the environmental permits and licenses for the nuclear site will be terminated.

The Decommissioning Plan will describe the sequence in which systems may be removed. This will take system interdependencies into account and ensure that all required functions of facilities being disposed of are replaced in a timely manner. The work schedule will describe in detail all modifications and preparatory activities required before decommissioning, such as preparation of disposal sites, decontamination methods, and the method of managing radioactive waste.

B.I.6.4. Specific information on other facilities at the site

This chapter describes specific data and requirements relating to other facilities at the Temelín site and their relationship to the SMR ETE Project.

B.I.6.4.1. Overview of other facilities at the site

The following nuclear installations are located at the Temelín site:

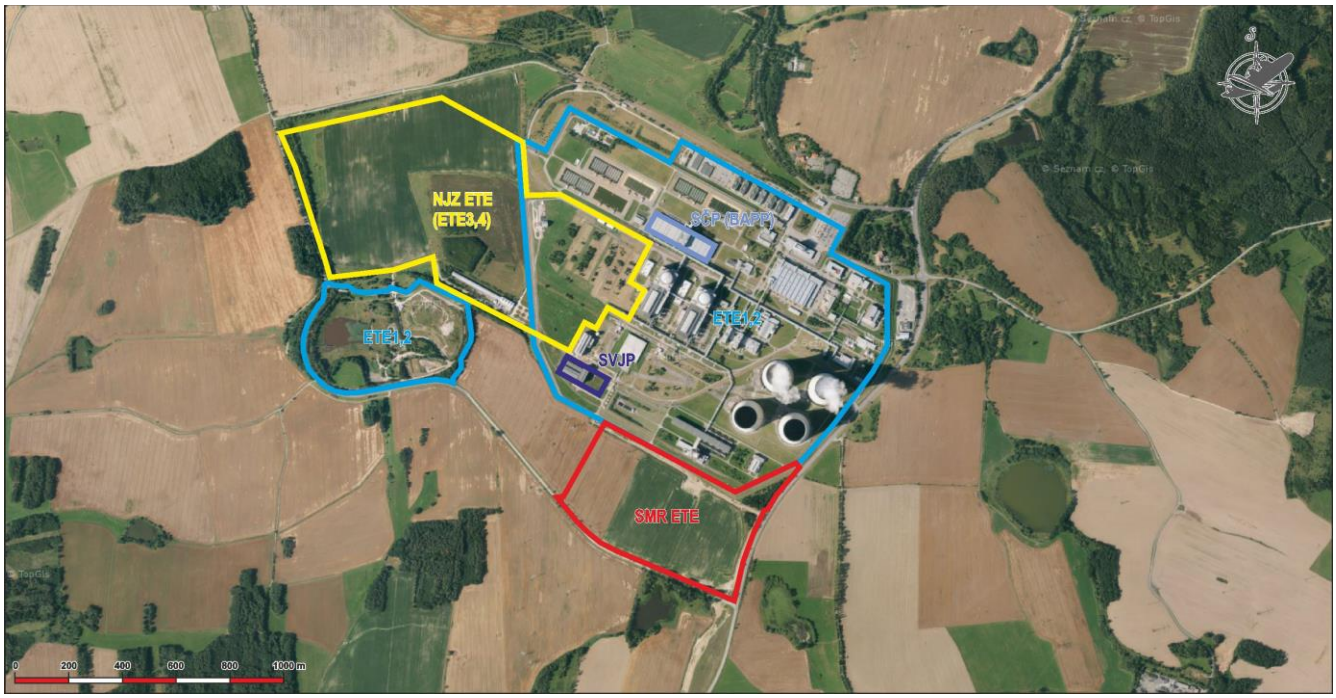
- Temelín Nuclear Power Plant (ETE1,2),
- Temelín fresh nuclear fuel storage facility (SČP),
- Temelín spent nuclear fuel storage facility (SVJP).

New NPP ETE (ETE3,4) has also been under preparation at the site for a long time, and an expansion of the storage capacity of the spent nuclear fuel storage facility (SVJP) above is currently being prepared.

Each of these facilities is subject to a separate approval procedure and a separate regulatory regime.

The locations of these facilities are shown in the following figure.

Fig. B.61: Overview of the locations of other facilities at the site



For completeness, construction of a deep geological repository at the nearby Janoch site is mentioned; if this site is selected, it should be ready to begin operation in 2050. However, this repository will not be located at the Temelín Nuclear Power Plant site, and no decision has been made on its implementation.

More detailed information on the nuclear facilities referred to above is provided in the following text.

Temelín Nuclear Power Plant (ETE1,2)

Temelín Nuclear Power Plant comprises two generating units (HVB1 and HVB2), each with a thermal output of 3,120 MW_t and a net electrical output of 1,083 MW_e. Construction of the power plant began in 1987, with an original plan to construct four units. After 1989, the originally planned need for 4,000 MW_e of installed capacity was reassessed, and in 1993 the Government of the Czech Republic gave final approval for completion of the power plant, with only two of the four originally planned units being completed. Unit 1 generated its first electricity in 2000, and the power plant was commissioned in 2002 and 2003.

The power plant consists of two single-unit installations with VVER-1000 pressurized water power reactors of the standard V-320 design, operated both in base-load mode and frequency-control mode. Each unit has a two-circuit technological configuration. The primary circuit comprises one reactor with a rated thermal output of 3,120 MW_t and four coolant circulation loops, including the reactor coolant piping, reactor coolant pumps, and the primary side of the horizontal steam generators.

According to the assumptions of the State Energy Policy (2015), HVB1 is expected to be shut down no earlier than 2060 and HVB2 in 2062. Based on the results of an internal assessment, ČEZ, a. s., announced in July 2026 the objective of operating ETE1,2 units for 80 years and adapting their investment and modernization programs to this objective while maintaining all safety standards.

New NPP ETE (ETE3,4)

New NPP ETE is being prepared as a two-unit plant with Generation III+ pressurized water reactors and a total net installed electrical output of up to 2 × 1,700 MW_e.

Fresh nuclear fuel storage facility (SČP)

The fresh fuel storage facility is located in a separate room inside the auxiliary service building for primary systems (BAPP) of Temelín Nuclear Power Plant, which is shared by both operating units of ETE1,2. The fresh fuel storage facility equipment is used to receive fresh nuclear fuel at the power plant, inspect and store it, and prepare it for refueling. The storage section is equipped with storage racks, which form part of the transport package during transfer to the main generating unit, for storing fuel assemblies in the facility and transferring them to the main generating unit for reactor refueling. The operating capacity of the fresh fuel storage facility is 13 storage racks containing 18 fuel assemblies each, for a total of 234 fuel assemblies.

Although it is a separate nuclear installation, the SČP forms a direct part of ETE1,2.

Spent nuclear fuel storage facility (SVJP)

The spent nuclear fuel storage facility is designed as a separate structure. The SVJP implemented on the Temelín Nuclear Power Plant site is based on the dry-storage principle. The SVJP structure consists of a rectangular hall divided into two main sections: a receiving section and a storage section. The storage capacity is 152 packages containing spent nuclear fuel, representing 1,370 t U. An expansion of SVJP storage capacity to a total of 304 packages, or 2,740 t U, is currently under preparation.

Packages containing spent nuclear fuel from ETE1,2 are transferred progressively to the SVJP and stored there for approximately 60 years. At the end of the storage period, the spent nuclear fuel will be transported to the deep geological repository for permanent disposal.

Deep geological repository at the Janoch site (HÚ)

In accordance with the updated Concept of Radioactive Waste and Spent Nuclear Fuel Management, the Czech Republic's basic strategy for disposing of spent nuclear fuel and radioactive waste that is unacceptable for near-surface repositories is direct disposal in a deep geological repository, which will be ready for operation by 2050[1].

Information from the Czech Radioactive Waste Repository Authority (SÚRAO), a state organizational unit established to perform activities associated with radioactive waste disposal, concerning preparation of the repository is provided in Annex 6.3 to this Documentation.

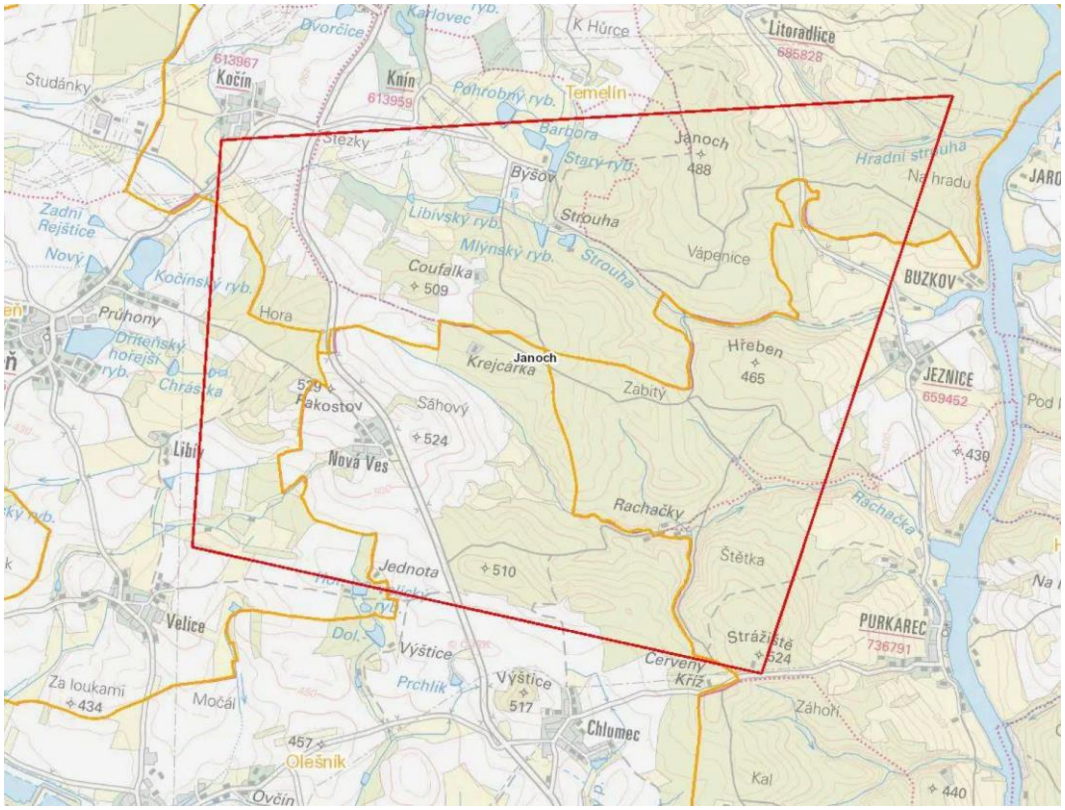
The deep geological repository is intended for the final disposal of high-level waste under suitable geological conditions, where a combination of engineered barriers and a homogeneous, stable host-rock mass will provide long-term isolation of this waste from the environment for hundreds of thousands of years. Under a Resolution of the Government of the Czech Republic dated December 21, 2020, four potential sites for the deep geological repository are under consideration: Březový potok (Plzeň Region), Horka (Vysočina Region), Hrádek (Vysočina Region), and Janoch (South Bohemian Region). No decision has therefore been made to implement the deep geological repository at the Janoch site, and it is mentioned

[1] The original Concept, which formally remains in force, specified 2065.

only for completeness. If its implementation is approved, its environmental impacts, including relevant combined and cumulative impacts at the site, will be assessed in a separate environmental impact assessment (EIA) process to which the repository is subject by law.

The general boundaries of the Janoch site are shown in the following figure.

Fig. B.62: Boundaries of the Janoch exploration area



Source: SÚRAO

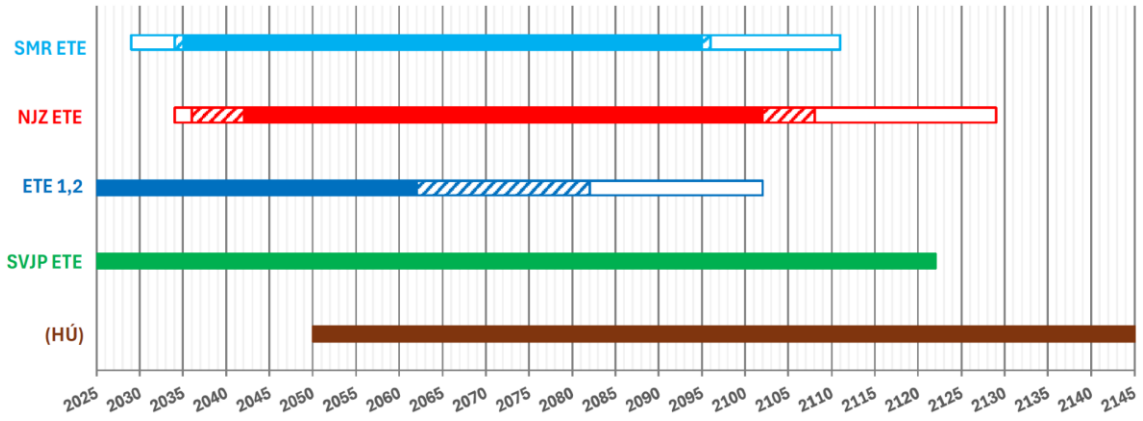
B.I.6.4.2. Schedule for construction, operation, and decommissioning of other facilities at the site

A schedule for the construction, operation, and decommissioning of individual nuclear installations at the site has been prepared to specify the timing of the combined impacts of SMR ETE and other facilities at the site. The schedule includes the following existing and known planned nuclear installations:

- the planned New SMR power plant at the Temelín site (SMR ETE), the Project itself,
- the planned New NPP ETE (or ETE3,4),
- the existing Temelín Nuclear Power Plant, including the fresh nuclear fuel storage facility (ETE1,2),
- the existing spent nuclear fuel storage facility at the Temelín site, including its expansion (SVJP ETE).

The deep geological repository (HÚ) is also included for information.

Fig. B.63: Timing of the combined impacts of nuclear installations at the Temelín site



Legend: solid line: anticipated operating period,
hatched line: variability in the anticipated operating period,
open line: anticipated construction/decommissioning period.

The stated operating dates for individual nuclear installations are indicative and are based on the current schedule for their construction, commissioning, and decommissioning. The schedule also shows possible timing uncertainties and overlaps schematically; these will be refined further. Actual nuclear-installation operating and decommissioning dates may also be affected by the implementation of advanced long-term operation (LTO) programs, through which nuclear-installation service lives can be extended beyond the currently assumed design lives while taking into account all operational safety requirements.

For combined and cumulative impacts, the determining condition is the concurrent power operation of all three power-generation facilities, namely SMR ETE, New NPP ETE (ETE3,4), and ETE1,2, with a total assumed electrical output of up to 6,100 MW_e. This condition therefore represents the most significant bounding case for combined impacts and is assessed to the maximum extent in this Documentation. The combined impacts of SMR ETE operation with different life-cycle phases of other nuclear installations at the site will be less significant and are therefore also conservatively covered in this Documentation by the stated bounding case. The bounding electrical output assumed in this manner remains unchanged if the operating lives of ETE1,2 are extended, so such an extension does not affect the results of assessing the combined and cumulative impacts of SMR ETE with other facilities at the site.

For the combined and cumulative impact assessment, the environmental impacts of constructing SMR ETE concurrently with New NPP ETE (ETE3,4) are also considered. However, a condition has been set that the main SMR ETE and New NPP ETE construction activities will not coincide. The combined deployment of construction machinery, particularly the associated heavy construction traffic volume, will therefore not exceed the level previously assessed in the New NPP ETE EIA documentation. Consequently, during SMR ETE construction work, no additional load is imposed on the area beyond the load assessed previously. Regardless of this fact, however, the construction impact is conservatively assessed for the bounding case of maximum concurrent construction work.

B.I.6.4.3. Method for ensuring nuclear safety of other facilities at the site

The method of ensuring the nuclear safety of the other nuclear installations at the site described above will correspond to the method used for the Project (see Chapter B.I.6.2.2. Basic requirements for nuclear power plants (page 86 of this Documentation), specifically Subsection B.I.6.2.2.2. Requirements for nuclear safety). All relevant provisions of the Atomic Act and its implementing legislation will therefore be applied to the other nuclear installations, including consideration of international documents issued by WENRA and the IAEA.

B.I.6.4.3.1. Provision of fundamental safety functions

The nuclear safety of a nuclear installation is ensured through performance of its fundamental safety functions. Under Section 45 of Act No. 263/2016 Coll., the Atomic Act, as amended, the following may be regarded as the fundamental safety functions for an installation containing a nuclear reactor:

- Permit the nuclear reactor to be shut down immediately and safely when necessary and maintained in a subcritical state.
- Prevent the uncontrolled development of a fission chain reaction.
- Make it physically impossible for a critical or supercritical state to arise outside the nuclear reactor interior.
- Ensure removal of heat generated by nuclear fuel and process systems.
- Provide shielding and prevent the release of radioactive substances and the spread of ionizing radiation into the environment.

For an installation without a nuclear reactor, namely a nuclear fuel storage facility, the fundamental safety functions are defined as follows:

- Make it physically impossible for a critical or supercritical state to arise.
- Ensure removal of the heat generated.

- Provide shielding and prevent the release of radioactive substances and the spread of ionizing radiation into the environment.

All nuclear installations at the Temelín site must perform these fundamental safety functions, with technical and organizational means used to ensure them according to the type of nuclear installation, namely a reactor or nuclear fuel storage facility.

B.I.6.4.3.2. Resistance of existing nuclear installations to external hazards

All structures and other external structures and systems affecting nuclear safety are designed to resist external phenomena of natural origin and phenomena caused by human activity. External-phenomenon intensities corresponding to a 10,000-year return period are used to assess the resistance of structures and safety-significant components. Under Decree No. 329/2017 Coll., on Nuclear Installation Design Requirements, the resistance of structures is also assessed for realistically possible combinations of external phenomena.

The levels of these hazards are monitored continuously and reassessed every ten years according to the current state of scientific and research knowledge. Reassessment is also performed when new facts affecting the external-hazard analyses arise, such as the occurrence of a new or unusually intense external phenomenon at the site. Such new facts may also include potential external-hazard sources arising from construction of SMR ETE, and the impacts of these sources on all nuclear installations at the Temelín site will be duly assessed. Where deficiencies are identified, appropriate nuclear-safety-enhancement measures are and will be implemented.

B.I.6.4.3.3. Organizational measures

Following the conclusions of the periodic safety review and implementation of the National Action Plan after the stress tests, substantial safety enhancements were made to ETE1,2, including strengthening their capability to manage severe accidents and limit radioactive-substance releases during such accidents. Each ETE unit is equipped with separate technical equipment for managing accident conditions. The main control rooms and backup control rooms for both ETE units also remain habitable, enabling ETE1,2 to be shut down and cooled even if a severe accident occurs on either the unit itself or the adjacent unit.

Periodic safety reviews of ETE1,2, SMR ETE, and other facilities at the site will regularly assess the potential for interaction among nuclear installations at the site; all nuclear installations will be mutually independent through complete separation of their technological systems. Potential interaction among the nuclear installations can therefore occur only through the risk of hazardous substances spreading from one site to an adjacent site, which will be considered in the analyses of potential external hazards.

The current trend of continuously enhancing the safety of ETE1,2 will be maintained during concurrent operation with SMR ETE and other facilities at the site. Periodic safety reviews will be performed at regular intervals, and the resulting measures reflecting developments in requirements for nuclear safety and the state of knowledge will be implemented.

Appropriate organizational measures will address the need to ensure sufficient qualified personnel for the long-term operation of ETE1,2, SMR ETE, and other facilities at the site. These measures include a long-term staffing plan, new-personnel training programs, implementation of a knowledge-management system in accordance with IAEA standards, and programs for cooperation with educational institutions to ensure suitable and qualified candidates for future staffing needs. This establishes the conditions necessary to ensure the nuclear safety of nuclear installations already operating at the Temelín site in the future as well.

B.I.6.4.3.4. Nuclear safety oversight

An internal nuclear safety department independent of the operations department oversees compliance with all operating procedures and nuclear safety.

Overall nuclear safety oversight is provided by the State Office for Nuclear Safety, which has independent inspectors stationed at the Temelín site.

B.I.7. Estimated start and completion dates

7. Estimated Project commencement and completion dates

Expected start of implementation:	after 2029
Expected start of operation:	after 2034

B.I.8. List of affected local government units

8. List of affected local government units

B.I.8.1. Identification of affected local government units

Affected local government units, namely regions and municipalities, are those in whose territory the Project is physically located, meaning those containing any Project siting area: the SMR siting area, which is the main construction site; the electrical power evacuation area; and the construction areas for construction facilities, including their immediate surroundings.

Territorial self-governing units that could be affected by the designated emergency planning zone are also considered affected. This zone has not yet been established for the Project; it will be established by SÚJB in proceedings under Decree No. 359/2016 Coll., on details of ensuring radiation extraordinary event management, as amended. The SMR siting area is located within the existing inner ETE emergency planning zone, which has a radius of 5 km. Conservatively and in accordance with current international practice[1], all local government units located at least partly within 5 km of the boundary of the SMR siting area, meaning essentially within the existing inner emergency planning zone for ETE1,2, are therefore considered affected.

Identification of affected local government units does not affect the right of any entity, including foreign entities, to participate in the environmental impact assessment process.

B.I.8.2. List of affected local government units

In view of the facts above, the affected local government units are listed below:

Region:	South Bohemian	South Bohemian Region U Zimního stadionu 1952/2 370 01 České Budějovice tel.: +420 386 720 111 IDDS: kdib3rr
Municipalities:	Temelín	Municipality of Temelín Temelín č.p. 104 373 01 Temelín tel.: +420 385 734 311 IDDS: tsmb3jy
	Dříteň	Municipality of Dříteň Dříteň č.p. 1 373 51 Dříteň tel.: +420 387 991 121 IDDS: rqibekv
	Olešník	Municipality of Olešník Olešník č.p. 15 373 50 Olešník tel.: +420 387 985 605 IDDS: r9ramzj

[1] According to IAEA safety guides (IAEA Safety Guide No. GS-G-2.1, Arrangements for Preparedness for a Nuclear or Radiological Emergency), an inner emergency planning zone radius of 0.5 to 3 km is recommended for reactors with an output of 100-1,000 MW. This is smaller than the existing inner ETE emergency planning zone.

Hluboká nad Vltavou	Town of Hluboká nad Vltavou Masarykova 36 373 41 Hluboká nad Vltavou tel.: +420 387 001 322 IDDS: cdxbedz
Týn nad Vltavou	City of Týn nad Vltavou náměstí Míru 2 375 01 Týn nad Vltavou tel.: +420 385 772 200 IDDS: tn8b4c3
Všemyslice	Municipality of Všemyslice Neznašov 9 373 02 Všemyslice tel.: +420 385 721 737 IDDS: zahb64r
Protivín	Municipality of Protivín Masarykovo náměstí 128 398 11 Protivín tel.: +420 382 203 333 IDDS: x48bszz

B.I.9. List of follow-up decisions and administrative authorities

9. List of follow-up decisions pursuant to Section 9a(3) and the administrative authorities that will issue them

The Project is subject to the following follow-up proceedings under Section 3(g) of Act No. 100/2001 Coll., on Environmental Impact Assessment, as amended:

- proceedings for a Project permit under the Building Act.

The competent administrative authority is:	Transport and Energy Construction Authority Nábřeží Ludvíka Svobody 1222/12 110 00 Praha 1 tel.: +420 210 082 300 IDDS: 7mnrnuu

B.II.
DATA ON INPUTS

II. Data on inputs (particularly for construction and operation)

B.II.1. Land

1. Land (for example, type, protection class, land take)

Land take:

SMR siting area, main construction site: up to 29.7 ha, of which: ZPF: approximately 21.3 ha; PUPFL: no requirements; others: approximately 8.4 ha

The stated value represents the area of the main construction site, designated the SMR area in Annex 1.1 to this Documentation. The SMR Project itself, including related structures and operating areas, will be located within this area. For conservative purposes, the entire area is assumed to be subject to permanent land take.

The existing ETE1,2 site covers approximately 123.3 ha, defined by the boundary of permanent land take formed by the perimeter fence of the existing power plant and excluding the waste-management area at Temelínec; according to the New NPP ETE EIA documentation, the total land take for ETE1,2 and New NPP ETE will not exceed approximately 187.2 ha. The total permanent land take for the combined impact of ETE1,2, New NPP ETE, and SMR ETE will therefore not exceed 216.9 ha.

electric connection: up to 1 ha

The stated value is a conservative estimate of the land take for the built-up areas of aboveground portions of electrical lines, namely the foundations of towers for the power evacuation line to the Kočín substation and the resulting relocations of existing lines. In total, this represents permanent land take of no more than several thousand m^2. The electrical power evacuation corridor, designated Area EL in Annex 1.1 to this Documentation, has a total area of approximately 73.5 ha, but does not as a whole constitute an area of land take.

construction-site facility areas: up to 74.0 ha, of which: ZPF: approximately 72.4 ha; PUPFL: no requirements; others: approximately 1.6 ha

The stated value represents the total area of the construction-facility siting areas excluding reserve areas, designated areas C, G, H, I, and J in Annex 1.1 to this Documentation: area C approximately 13.9 ha, area G approximately 9.5 ha, area H approximately 25.8 ha, area I approximately 5.6 ha, and area J approximately 19.2 ha. For conservative reasons, complete temporary land take is assumed for these areas; after construction is completed, the areas will be reclaimed and returned to their original use. The construction-site electrical supply corridor, designated Area SE in Annex 1.1 to this Documentation, has a total area of approximately 10.8 ha, but does not constitute an area of permanent or temporary land take because the underground line will be constructed within one year, including restoration of the land to its original condition.

Areas B1 (approximately 7.7 ha), B2 (approximately 14.9 ha), B3 (approximately 4.0 ha), D (approximately 6.4 ha), E1 (approximately 17.5 ha), E2 (approximately 36.3 ha), F1 (approximately 18.5 ha), and F2 (12.6 ha) are considered reserve areas whose temporary use is not anticipated or is anticipated only to a limited and temporary extent. The total area of these reserve areas is approximately 117.9 ha.

B.II.2. Water

2. Water (for example, water source and consumption)

Water abstraction:

raw water: up to 12,000,000 m^3/year

The stated value is the bounding value for raw-water abstraction for SMR ETE operation. The Vltava River will be the raw-water source. Raw water will be abstracted at the existing abstraction point, namely the pumping station on the left bank of the Hněvkovice hydraulic-structure reservoir, and conveyed through the existing discharge mains to the existing ETE water reservoir and from there to the SMR water-treatment systems.

The existing permitted surface-water abstraction for ETE1,2 is 47,000,000 m^3/year, while actual abstraction has long ranged from approximately 35,000,000 to 40,000,000 m^3/year. According to the New NPP ETE EIA documentation, surface-water abstraction for the concurrent operation of ETE1,2 and New NPP ETE is expected to be up to 109,000,000 m^3/year or, taking into account the currently permitted surface-water abstraction for ETE1,2, which is 5,000,000 m^3/year higher than in the EIA documentation, 114,000,000 m^3/year. The total raw-water abstraction from the combined operation of ETE1,2 units, New NPP ETE, and SMR ETE will therefore not exceed 126,000,000 m^3/year.

Raw-water demand for construction will be no more than several hundred thousand m^3/year and will be met from the existing raw-water source. Raw-water abstraction will decrease progressively during termination of operation and decommissioning.

potable water: up to 31,000 m^3/year

The stated value is the bounding value for potable-water abstraction for SMR ETE operation. Potable water will be supplied from the existing Temelín site supply source/system from the Zdoba water reservoir. Potable water will be used for drinking and sanitary purposes and, in part, for operational purposes.

The existing permitted contractual potable-water abstraction for ETE1,2 is 280,000 m^3/year, of which up to approximately 140,000 m^3/year is used. According to the New NPP ETE EIA documentation, potable-water abstraction for New NPP ETE is expected to be up to 33,000 m^3/year. Taking into account actual abstraction by ETE1,2, total potable-water abstraction from the combined operation of ETE1,2 units, New NPP ETE, and SMR ETE will therefore not exceed 204,000 m^3/year, or up to 344,000 m^3/year when the existing permitted contractual abstraction for ETE1,2 is taken into account.

Potable-water abstraction for SMR ETE construction will be up to approximately 88,000 m^3/year. During concurrent construction of SMR ETE and New NPP ETE, the contractual abstraction for the Temelín site can be expected to require an increase above the currently permitted

quantity. Potable-water abstraction will decrease progressively during termination of operation and decommissioning as the number of workers decreases.

B.II.3. Other natural resources

3. Other natural resources (for example, raw material resources)

Natural resources: no significant requirements

Operation, construction, and termination of operation of the Project do not require the direct abstraction or extraction of natural resources. Construction-material consumption is stated below.

B.II.4. Energy resources

4. Energy resources (for example, type, source, and consumption)

Energy resources:

nuclear fuel: up to 13.05 t UO_2/year (excluding the first fuel loading)

The stated value is the bounding value for SMR ETE nuclear-fuel consumption. Nuclear fuel will be purchased on the market from reputable suppliers. The fuel will be UO_2-based with a maximum U-235 enrichment of up to 5 % and arranged in fuel assemblies. Fuel-cycle lengths of 18 to 24 months are assumed. The use of MOX fuel is not anticipated, but it is not completely ruled out.

Current nuclear-fuel consumption by ETE1,2 is up to 46 t UO_2/year. According to the New NPP ETE EIA documentation, consumption of up to 78.5 t UO_2/year is assumed for New NPP ETE, so total nuclear-fuel consumption from the combined operation of ETE1,2 units, New NPP ETE, and SMR ETE will not exceed 137.6 t UO_2/year.

No nuclear-fuel consumption is required during construction before commissioning begins or after termination of operation.

electricity: up to 50 MW_e

The stated value is the long-term bounding value for the SMR ETE normal auxiliary load, which is expected to range from approximately 30 to 50 MW_e; the maximum design value for electricity consumption is 70 MW_e. Consumption will be supplied by the electrical generator and the 400 kV line, with backup provided by the standby power supply from the Kočín substation. This value also includes the electric boiler house for steam production, although it will not operate continuously.

The auxiliary load of ETE1,2 is approximately 140 MW_e. According to the New NPP ETE EIA documentation, approximately 220 MW_e is assumed for New NPP ETE, so the total auxiliary load from the combined operation of ETE1,2 units, New NPP ETE, and SMR ETE will not exceed 410 MW_e.

Electricity during construction will be supplied by a line from the Křtěnov substation with an anticipated input of up to 16 MW_e. This value also includes the electric boiler house for steam production. Electricity consumption during termination of operation has not been specified in detail but will constitute a normal demand.

natural gas: no requirements

No natural-gas supply is required for SMR ETE because an electric auxiliary boiler house is designed to produce steam.

The existing ETE1,2 units are connected to a natural-gas supply for operation of the auxiliary gas-fired boiler house. The gas burners in the boilers are ignited regularly for operational purposes. The auxiliary gas-fired boiler house for ETE1,2 is connected to the natural-gas source by a DN 500 medium-pressure gas pipeline operating at 4 bar and terminating at the Zvěrkovice pressure-regulation station. Natural-gas consumption is not anticipated for New NPP ETE.

No natural-gas consumption is required during SMR ETE construction or termination of operation. Steam for the SMR ETE construction and termination-of-operation phases is also expected to be produced in electric boilers.

Consumables: consumption not specified (normal)

Operating consumables include chemicals, lubricants, motor fuels, fuels, and industrial gases.

During SMR ETE operation, consumption of chemicals, industrial gases, and petroleum products in the technological systems and for emergency power-source operation will be of the same order as in output-equivalent technology at one of the existing ETE1,2 units. Industrial gases are used in technological systems, during maintenance, and in power plant laboratories. Nitrogen, hydrogen, and oxygen are used most extensively, in quantities of thousands of m^3/year. Carbon dioxide, argon, helium, and acetylene, for example, are used in smaller quantities. SMR ETE consumption of lubricants is expected to be tens of metric tons per year, while consumption of petroleum products in the form of diesel fuel is expected to be hundreds of metric tons per year. Anticipated consumption of individual chemicals is approximately tens, or exceptionally hundreds, of metric tons/year per SMR ETE unit. The following chemicals are currently considered for use at SMR ETE: hydrazine 30 % (N_2H_4), potassium tetraborate ($K_2B_4O_7$), nitric acid 10 % (HNO_3), sodium nitrite 40 % ($NaNO_2$), ammonium hydroxide 35 % (NH_4OH), hydrogen peroxide 30 % (H_2O_2), sodium molybdate 35 % (Na_2MoO_4), potassium hydroxide 45 % (KOH), and zinc acetate 0.9 % ($Zn(CH_3COO)_2$). Storage of the following chemicals is considered for water-treatment purposes: scale inhibitor, corrosion inhibitor, biodispersant, sodium hypochlorite 14 % (NaClO), and sodium bromide 40 % (NaBr).

Total operating-material consumption from the combined operation of ETE1,2 units, New NPP ETE, and SMR ETE may amount to thousands of metric tons/year for chemicals and high hundreds of metric tons/year for petroleum products.

Anticipated consumption of the principal construction materials is as follows: up to 1,100,000 t of concrete, both precast and cast in place; up to 50,000 t of concrete reinforcement; and up to 350,000 t of steel for steel structures, of which approximately 150,000 t will be used for the temporary erection hall. The stated balance of civil and structural materials does not include the mass of the SMR technical and technological equipment itself, namely the structural modules, which will be supplied by the selected contractor.

No significant additional requirements for operating, civil, or structural materials arise during termination of operation.

B.II.5. Biodiversity

5. Biodiversity

Biodiversity: no requirements

The siting, operation, and termination of operation of the Project do not require any (infrastructure) inputs relating to biodiversity.

Baseline conditions in the affected territory with respect to biodiversity are described in Chapter C.II.7. Biodiversity (page 278 of this Documentation); impacts on biodiversity, including the extent of affected habitats, are assessed in Chapter D.I.7. Impacts on biodiversity (page 397 of this Documentation).

B.II.6. Requirements for transport and other infrastructure

6. Requirements for transport and other infrastructure (for example, need for associated structures)

Transport: road transport, operation: up to 185 vehicles/24 h, of which approximately 35 are heavy vehicles

The stated value represents the average daily inbound traffic volume (number of arrivals) associated with SMR ETE operational requirements. The intensity of outbound origin traffic, expressed as the number of departures, will be identical. This volume includes transportation of permanent operations and maintenance personnel (passenger cars and buses) and transportation associated with operational requirements (mainly trucks). Transportation will take place mainly on Road II/105, which runs alongside the Temelín site, using a section of Road II/138 from which the entrance to the SMR ETE site will be provided. In the directional distribution of traffic on Road II/105, the direction from the south (Hluboká nad Vltavou and České Budějovice) will slightly predominate over the direction from the north (Týn nad Vltavou). The distribution of SMR ETE operational traffic volumes on the affected road network is shown in the following figure and table.

Fig. B.64: Diagram of the affected road network, road numbers, traffic census profile numbers, and SMR ETE operational traffic flow diagram

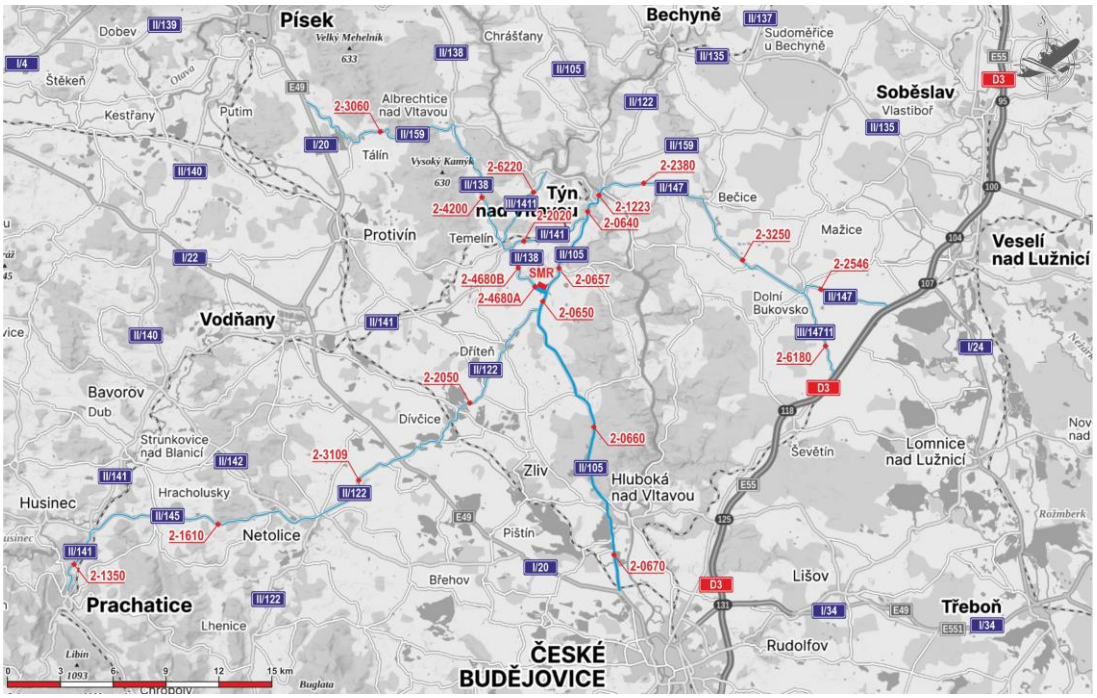


Table B.14: SMR ETE operational traffic volumes

Road	Profile	Annual average daily traffic volumes [vehicles/24 h]			
		OV	LNV	TV	SV
II/105	2-1223	115	13	13	142
	2-0640	115	13	13	142
	2-0657	115	13	13	142
	2-0650	172	20	20	213
	2-0660	172	20	20	213
	2-0670	172	20	20	213
II/122	2-2050	0	0	0	0
	2-3109	0	0	0	0
II/138	2-4200	12	1	1	15
	2-4680A	288	34	34	355
	2-4680B	12	1	1	15
II/141	2-2020	0	0	0	0
	2-1350	0	0	0	0
II/145	2-1610	0	0	0	0
II/147	2-2380	23	3	3	28
	2-3250	23	3	3	28
	2-2546	23	3	3	28
II/159	2-3060	12	1	1	15
III/1411	2-6220	0	0	0	0
III/14711	2-6180	0	0	0	0

Note: Given their location and traffic importance, and the correspondingly higher baseline traffic volumes, roads in the broader area of interest (D3, D4, I/3, I/19, I/20, I/23, I/24, I/29, and I/34) will be affected only marginally by traffic generated by SMR ETE. They are therefore not presented here. The data are available in the detailed transport study DP19 SMR ETE Transport Study (for the reference, see Chapter D.V.3. Documents and sources used, page 489 of this Documentation).

According to the New NPP ETE EIA documentation, the inbound operational traffic volume for New NPP ETE will be approximately 630 vehicles/24 h, of which approximately 130 will be heavy vehicles, with the same number of departures. The SMR ETE operational traffic volume in combination with New NPP ETE operational traffic is shown in the following table.

Table B.15: SMR ETE + New NPP ETE operational traffic volumes

Road	Profile	Annual average daily traffic volumes [vehicles/24 h]			
		OV	LNV	TV	SV
II/105	2-1223	485	34	34	554
	2-0640	485	34	34	554
	2-0657	485	34	34	554
	2-0650	726	52	52	831
	2-0660	726	52	52	831
	2-0670	726	52	52	831
II/122	2-2050	0	0	0	0
	2-3109	0	0	0	0
II/138	2-4200	52	3	3	59
	2-4680A [1]	1212	87	87	1385
	2-4680B	52	3	3	59
II/141	2-2020	0	0	0	0
	2-1350	0	0	0	0
II/145	2-1610	0	0	0	0
II/147	2-2380	97	7	7	110
	2-3250	97	7	7	110
	2-2546	97	7	7	110
II/159	2-3060	52	3	3	59
III/1411	2-6220	0	0	0	0
III/14711	2-6180	0	0	0	0

Note: Traffic volumes generated by ETE1,2 (an inbound volume of approximately 630 vehicles/24 h, of which approximately 130 are heavy vehicles, with the same number of departures) are already included in the existing traffic volumes on the road network. They therefore do not represent an additional transportation requirement and are not presented separately here. They are taken into account in Chapter C.II.10. Transport and other infrastructure (page 300 of this Documentation) as part of the background traffic volumes on the road network.

road transport, construction: up to 450 vehicles/24 h, of which approximately 150 are heavy vehicles

The stated value represents the average daily inbound traffic volume (number of arrivals) associated with SMR ETE construction requirements. The intensity of outbound origin traffic, expressed as the number of departures, will be identical. This volume includes transportation of construction workers (passenger cars and buses) and construction and structural materials (mainly trucks). Transportation will take place mainly

[1] For profile 2-4680A, the conservative assumption is applied that access to New NPP ETE will use the same route through this profile as access to SMR ETE. In reality, however, access to New NPP ETE will use the existing road north of the ETE site through Křtěnov. This assumption is also retained in the following tables.

on Road II/105, which runs alongside the Temelín site, using a section of Road II/138 from which access will be provided to the SMR ETE construction area (main construction site) and the respective construction-facility areas. In the directional distribution of traffic on Road II/105, the direction from the north (especially the transportation of workers from accommodations in Týn nad Vltavou and materials from the D3 motorway) will predominate over the direction from the south (České Budějovice). The distribution of SMR ETE construction traffic volumes on the affected road network is shown in the following figure and table.

Fig. B.65: Diagram of the affected road network, road numbers, traffic census profile numbers, and total SMR ETE construction traffic flow diagram

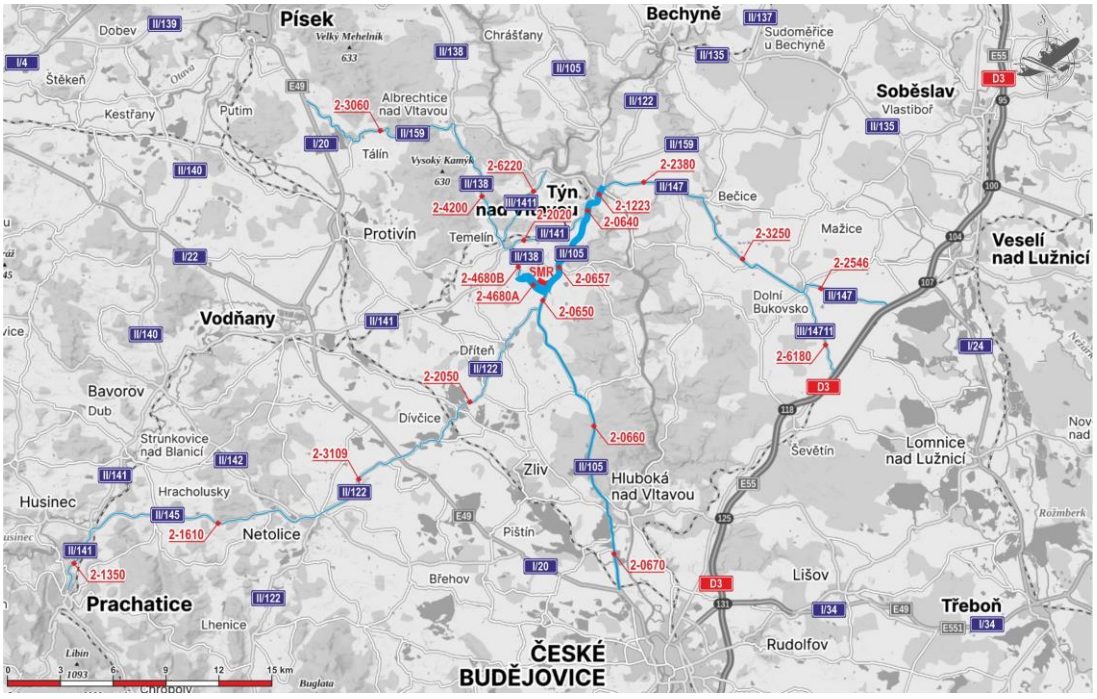


Table B.16: SMR ETE construction traffic volumes

Road	Profile	Annual average daily traffic volumes [vehicles/24 h]											
		Material transport				Personnel transport				Material + personnel transport			
		OV	LNV	TV	SV	OV	LNV	TV	SV	OV	LNV	TV	SV
II/105	2-1223	0	0	124	124	429	0	36	465	429	0	161	589
	2-0640	0	0	124	124	429	0	36	465	429	0	161	589
	2-0657	0	0	124	124	429	0	36	465	429	0	161	589
	2-0650	0	0	66	66	129	0	5	134	129	0	71	200
	2-0660	0	0	58	58	129	0	5	134	129	0	63	192
	2-0670	0	0	58	58	129	0	5	134	129	0	63	192
II/122	2-2050	0	0	8	8	0	0	0	0	0	0	8	8
	2-3109	0	0	8	8	0	0	0	0	0	0	8	8
II/138	2-4200	0	0	59	59	43	0	2	44	43	0	60	103
	2-4680A	0	0	190	190	557	0	42	599	557	0	232	789
	2-4680B	0	0	67	67	43	0	2	44	43	0	68	111
II/141	2-2020	0	0	0	0	0	0	0	0	0	0	0	0
	2-1350	0	0	8	8	0	0	0	0	0	0	8	8
II/145	2-1610	0	0	8	8	0	0	0	0	0	0	8	8
II/147	2-2380	0	0	123	123	0	0	0	0	0	0	123	123
	2-3250	0	0	123	123	0	0	0	0	0	0	123	123
	2-2546	0	0	110	110	0	0	0	0	0	0	110	110
II/159	2-3060	0	0	59	59	43	0	2	44	43	0	60	103
III/1411	2-6220	0	0	8	8	0	0	0	0	0	0	8	8
III/14711	2-6180	0	0	12	12	0	0	0	0	0	0	12	12

Note: Given their location and traffic importance (and the correspondingly higher baseline traffic volumes), roads in the broader area of interest (D3, D4, I/3, I/19, I/20, I/23, I/24, I/29, and I/34) will be affected only marginally by traffic generated by SMR ETE construction. They are therefore not presented here. The data are available in the detailed transport study DP19 SMR ETE Transport Study (for the reference, see Chapter D.V.3. Source documents and sources, page 489 of this Documentation).

During construction of SMR ETE, Road II/138 will be closed to public traffic in the section between Roads II/105 and II/141 (i.e., in the area of the SMR ETE construction site and related construction facilities). Existing traffic will be diverted along Roads II/141 and II/105. The closed section of Road II/138 will remain accessible only to traffic associated with SMR ETE construction, access to the Temelínec landfill and sludge pond site, and integrated rescue system vehicles. For construction purposes, Road II/138 will be widened between Road II/105 and the ETE service road. The ETE service road will also be modified and widened by constructing truck passing bays on both sides of the road. In addition, access roads will be constructed from Road II/138 or II/105 to the SMR ETE main construction site and the individual construction-facility areas

(G, H, I, and J), and a temporary road connection between construction-facility areas H and I will be built by means of a bridge over Dvorčický Stream. The corridor for these road modifications is shown in the general layout in Chapter B.I.3. Project location (page 68 of this Documentation).

Construction of SMR ETE will be coordinated with construction of New NPP ETE so that the main SMR ETE and New NPP ETE construction activities do not coincide. Construction of SMR ETE, which precedes construction of New NPP ETE (see Chapter B.I.6.4.2. Schedule for construction, operation, and decommissioning of other facilities at the site, page 190 of this Documentation), will therefore take place concurrently with the initial/preparatory phase of New NPP ETE construction, for which heavy-truck traffic requirements will be approximately half those of the main New NPP ETE construction phase (which the New NPP ETE EIA documentation assumes to have an inbound traffic volume of approximately 890 vehicles/24 h, of which approximately 490 are heavy vehicles, with the same number of departures). The combined impact of SMR ETE construction traffic and New NPP ETE construction traffic (initial/preparatory phase) will therefore not result in the total heavy construction traffic volume previously assessed in the EIA process for New NPP ETE being exceeded.

The SMR ETE construction traffic volume in combination with New NPP ETE construction traffic (initial/preparatory phase) is shown in the following table.

Table B.17: SMR ETE construction traffic volumes + initial phase of New NPP ETE construction

Road	Profile	Annual average daily traffic volumes [vehicles/24 h]											
		Material transport				Personnel transport				Material + personnel transport			
		OV	LNV	TV	SV	OV	LNV	TV	SV	OV	LNV	TV	SV
II/105	2-1223	0	0	307	307	1135	0	90	1224	1135	0	397	1531
	2-0640	0	0	307	307	1135	0	90	1224	1135	0	397	1531
	2-0657	0	0	307	307	1135	0	90	1224	1135	0	397	1531
	2-0650	0	0	162	162	341	0	13	354	341	0	175	516
	2-0660	0	0	143	143	341	0	13	354	341	0	156	497
	2-0670	0	0	143	143	341	0	13	354	341	0	156	497
II/122	2-2050	0	0	19	19	0	0	0	0	0	0	19	19
	2-3109	0	0	19	19	0	0	0	0	0	0	19	19
II/138	2-4200	0	0	145	145	113	0	4	117	113	0	149	262
	2-4680A	0	0	469	469	1475	0	103	1579	1475	0	572	2048
	2-4680B	0	0	165	165	113	0	4	117	113	0	169	282
II/141	2-2020	0	0	0	0	0	0	0	0	0	0	0	0
	2-1350	0	0	19	19	0	0	0	0	0	0	19	19
II/145	2-1610	0	0	19	19	0	0	0	0	0	0	19	19
II/147	2-2380	0	0	303	303	0	0	0	0	0	0	303	303
	2-3250	0	0	303	303	0	0	0	0	0	0	303	303
	2-2546	0	0	271	271	0	0	0	0	0	0	271	271
II/159	2-3060	0	0	145	145	113	0	4	117	113	0	149	262
III/1411	2-6220	0	0	20	20	0	0	0	0	0	0	20	20
III/14711	2-6180	0	0	29	29	0	0	0	0	0	0	29	29

rail transport: of low significance

The operating period does not impose significant demands on the use of rail transport. The existing volume of rail traffic generated by activities at the Temelín site is negligible and does not exceed a few trainsets per month; this situation will therefore be maintained while operations are concurrent.

During the construction period, the volume of inbound rail traffic can be expected to be several trainsets per day. The construction organization principles will seek to maximize the use of rail routes for transporting components and materials, while the final option will be subject to a technical and economic analysis that will take into account, among other things, the locations of construction-material and process-module suppliers. From this perspective, the above road traffic volumes are considered conservatively, i.e., without taking rail transport into account, although rail transport may assume part of the transportation work.

Termination of operation will not require additional rail-transport capacity compared with the period of operation or construction.

special transport: of low significance

Transportation of oversize and heavy components during construction will not be significant in terms of traffic volume (a few shipments over the construction period). Water, road, or rail transport, or a combined route, is assumed. Existing infrastructure will be used; in terms of spatial and weight requirements, this transportation may require local modifications to existing infrastructure (already being prepared for the transportation of oversize and heavy components for the New NPP ETE project) or temporary restrictions on its use. The same applies to transportation of modular assemblies, involving approximately hundreds of shipments over the construction period, which may exceed the basic weight and dimensional limits for transport combinations but, apart from organizational measures, will not require modifications to transportation infrastructure.

Other infrastructure: network: modification required

The Project will use the connection to the electricity system of the Czech Republic, both for power evacuation to the transmission system and for backup supply of auxiliary power from the distribution system. A connection to the electricity system is available in the affected territory at the Kočín substation site. The transmission capacity of the Czech Republic's transmission system is guaranteed by the transmission system operator (ČEPS, a.s.); it is not part of the SMR ETE Project.

other infrastructure: no requirements

The Project does not place significant demands on other public infrastructure. Connections to the necessary infrastructure networks are available in the Project area.

B.III.
DATA ON OUTPUTS

III. Data on outputs (particularly for construction and operation)

B.III.1. Air, water, soil, and subsoil

1. Pollution of air, water, soil, and subsoil (for example, an overview of pollution sources, and the types and quantities of pollutants emitted, and methods and efficiency of pollutant capture)

Air: air emissions: of low significance

The SMR ETE Project is not a combustion source and will therefore not be a significant source of air emissions. Pollutant sources associated with operation of the process equipment will be backup (emergency) process equipment (diesel generator stations), which will not, however, be in continuous operation. The following diesel generator station configuration is conservatively assumed for SMR ETE:

- 2 × 4 MW_e diesel generator (2 × 8 MW_t) - High Voltage Essential,
- 2 × 1.5 MW_e diesel generator (2 × 3 MW_t) - Low Voltage Alternate,
- 2 × 0.4 MW_e diesel generator (2 × 2 MW_t) - Low Voltage Essential.

Pollutant emissions will be generated during regular testing; in view of the operating time, the quantity of pollutants will be insignificant. The emission characteristics of the diesel generators are presented in the following table.

Table B.18: Diesel generator emission characteristics

	4 MW_e DG	1.5 MW_e DG	0.4 MW_e DG
Thermal power [MW_t]	8	3	2
Fuel	diesel fuel	diesel fuel	diesel fuel
Operating hours [h/year]	48	48	48
CO emissions [g/s]	3.9	1.5	0.4
NOx emissions [g/s]	0.74	0.28	0.07
SPM emissions [g/s]	0.039	0.015	0.004
Benzene emissions [g/s]	0.003	0.001	0.0006
BaP emissions [mg/s]	0.009	0.003	0.002

Automobile transport will be another emission source. Traffic is a source of pollutant emissions from fuel combustion, brake and tire wear, and the resuspension of particulate matter from road surfaces. In view of the traffic volume generated by SMR ETE operation (approximately two hundred vehicles per day), the quantity of pollutants emitted by traffic sources associated with SMR ETE operation (public roads, service roads, and parking lots) will be of little significance compared with the background condition without implementation of SMR ETE; among other things, it will depend on future trends in vehicle-fleet-specific emission factors. In connection with the decrease in motor-vehicle emission factors, lower unit emissions of most pollutants than at present are expected during the SMR ETE operating period.

Similar assumptions also apply to concurrently operating process sources and road traffic associated with operation of the existing ETE1,2 units and planned New NPP ETE. Even under the combined impact during concurrent operation of ETE1,2 + New NPP ETE + SMR ETE, air pollutant emissions will not reach significant levels.

During the SMR ETE construction period, emissions may be expected both from construction activities at the construction site itself and from the resulting road traffic. The most significant impact may be expected from particulate matter emissions, both during work on exposed ground (earthwork or excavation work) and especially during concrete placement, when a significant portion of the transportation of materials for producing concrete and prefabricated modules will take place (including on-site transportation between individual areas). Emissions and the nature of other pollutants are associated with the use of machinery and the related consumption of fuel. Emissions will be limited by available minimization measures and will be limited in time to the construction period. During construction, emissions will vary depending on the schedule of the individual construction activities. During termination of operation, sources associated with operation will cease to have an effect; emissions caused by dismantling or demolition work will not exceed the quantity of emissions during the construction period. An electric auxiliary boiler plant, which will not be a local source of air emissions, is expected to operate during SMR ETE construction.

During termination of operation, sources associated with operation will cease to have an effect; emissions caused by dismantling or demolition work will not exceed the quantity of emissions during the construction period.

More detailed information is provided in the air dispersion study (Annex 5.3 to this Documentation).

waste heat: up to 900 MW_t
evaporation: up to 1,200 m^3/h (0.333 m^3/s)

The stated values represent the bounding values for the SMR ETE technologies considered. Low-grade waste heat will be released to the atmosphere through forced-draft wet cooling towers (the use of natural-draft towers is not anticipated but is not excluded).

The waste heat dissipated from the currently operating ETE1,2 units may reach up to 4,014 MW_t (at an electrical output of 1,100 MW_e per unit), and according to the VÚV TGM balances, total evaporation from the four cooling towers may reach 3,788 m^3/h (1.052 m^3/s). The New NPP ETE EIA documentation does not specify waste heat or evaporation values for the New NPP ETE project. For dissipated waste heat, the anticipated New NPP ETE output (2 × 1,700 MW_e) will be approximately 55 % greater than that of ETE1,2 (2 × 1,100 MW_e in the future condition), and the quantity of dissipated waste heat may therefore also be expected to be 55 % greater, i.e., 6,203 MW_t. According to the VÚV TGM balances, evaporation from New NPP ETE (2 × 1,700 MW_e) together with ETE1,2 (2 × 1,100 MW_e) is up to 11,000 m^3/h (3.06 m^3/s). The total values from the combined operation of ETE1,2 units + New NPP ETE + SMR ETE will therefore not exceed 11,117 MW_t of heat dissipated to the atmosphere and evaporation of 12,200 m^3/h (3.39 m^3/s).

No significant waste heat will be generated during construction or decommissioning.

Water: see Chapter B.III.2. Wastewater

Wastewater and stormwater outputs are specified below in Chapter B.III.2. Wastewater (page 202 of this Documentation).

Soil and subsoil: without outputs

The Project produces no direct outputs to soil or subsoil.

B.III.2. Wastewater

2. Wastewater (for example, an overview of wastewater sources, wastewater quantities and discharge locations, pollutants discharged, treatment facilities, and their efficiency)

Wastewater:

process wastewater: up to 3,564,000 m³/year

The stated value represents the estimated quantity of process wastewater from SMR ETE. Process wastewater will consist mainly of blowdown from the circulating cooling (tertiary) circuit or service-water blowdown, as well as wastewater from water treatment and inspection tanks. In qualitative terms, the composition of process wastewater will approximately correspond to that of process wastewater from the existing ETE1,2 units and will be determined primarily by the quantity of pollutants abstracted with the raw water and their concentration as a result of evaporation. Pollutant input into the wastewater as a result of SMR ETE operation (water treatment, adjustment of chemical regimes, etc.) will be minimal.

Process wastewater discharge from ETE1,2 is currently limited to 10,800,000 m³/year; actual discharge has long ranged from approximately 8,000,000 to 9,000,000 m³/year. According to the New NPP ETE EIA documentation, the anticipated quantity of process wastewater from the New NPP ETE project is 15,123,000 m³/year; total process wastewater discharge from the combined operation of ETE1,2 units + New NPP ETE + SMR ETE will therefore not exceed 29,487,000 m³/year.

Process wastewater will be discharged through the existing ETE1,2 wastewater pipelines to the receiving water (the Vltava River at the Kořensko profile).

The quantity of process wastewater from construction has not been specified. Water abstracted for construction needs becomes incorporated into structures, evaporates, or is reused for construction purposes. Potentially contaminated water (from testing of process equipment, flushing, etc.) will be collected in sumps with no outlet and, depending on the results of physicochemical analyses, will either be discharged to the receiving water body or transported for disposal. Process wastewater discharges will be gradually reduced during decommissioning.

sewage waste water: up to 20,000 m³/year

The stated value represents the quantity of sanitary wastewater from SMR ETE (up to 400 workers). In qualitative terms, the composition of sanitary wastewater will correspond to that of sanitary wastewater from the existing ETE1,2 units.

The existing discharge of treated sanitary wastewater from ETE is approximately 100,000 m³/year. According to the New NPP ETE EIA documentation, sanitary wastewater discharge from the New NPP ETE project is expected to be approximately 33,000 m³/year; total sanitary wastewater discharge from the combined operation of ETE1,2 units + New NPP ETE + SMR ETE will therefore not exceed 153,000 m³/year.

Treated sanitary wastewater will be discharged together with process wastewater through the existing ETE1,2 wastewater pipelines to the receiving water (the Vltava River at the Kořensko profile).

The quantity of sanitary wastewater during construction is expected to be approximately 39,200 m³/year; the receiving water for treated sanitary wastewater from construction will be the Vltava River. Sanitary wastewater discharges will be gradually reduced during decommissioning.

stormwater: up to 175,000 m³/year

The stated value represents a conservative upper estimate of stormwater runoff from the SMR ETE site based on its area.

Existing stormwater discharge from the ETE1,2 site is approximately 266,000 m³/year. According to the New NPP ETE EIA documentation, the quantity of stormwater discharged from the New NPP ETE project is expected to be approximately 155,000 m³/year; the total quantity of stormwater discharged from the combined operation of ETE1,2 units + New NPP ETE + SMR ETE will therefore not exceed 596,000 m³/year.

Because the geological conditions are unsuitable for infiltration, stormwater discharge flows will be limited by retention basins and safety basins. It is assumed that the SMR ETE area (29.7 ha) will be drained by the storm sewer in two ways. The inner fenced part (approximately 18.3 ha) will be drained in a controlled manner through a retention basin (volume approximately 3,200 m³) at the northeastern tip of the SMR ETE area into the existing stormwater pipeline from ETE1,2 to the Strouha Stream. The outer part of the SMR ETE area, covering approximately 11.2 ha, will be drained by the storm sewer to Dvorčice Pond and Dvorčický Stream, to which stormwater from the SMR ETE area currently drains naturally. Some collected stormwater may also be conveyed via appropriate retention facilities to Karlovec Pond.

Stormwater discharge from the SMR ETE construction area will be approximately the same as during the operating phase. The quantity and receiving water for stormwater from the construction-facility areas during SMR ETE construction will differ among the individual construction-facility areas. For all construction-facility areas, it is assumed that stormwater falling on the paved portions of these areas will always be pretreated using an oil separator immediately at the pollution source. For area C, stormwater discharge of 24,000 m³/year and connection to the existing ETE1,2 storm sewer are assumed. For area H, stormwater discharge of 57,000 m³/year by natural drainage toward Dvorčice Pond and Dvorčický Stream is assumed. For area G, stormwater discharge of 32,000 m³/year is assumed; stormwater will be conveyed to a retention basin located in area G, from which an equalized flow will subsequently drain to the terminal ETE1,2 sewer collector. For area I, stormwater discharge of 24,000 m³/year is assumed; the surface drainage of area I will be graded toward the south, where stormwater will flow mainly into Dvorčický Stream and potentially southeastward into Dvorčice Pond. Some collected stormwater may also be conveyed via appropriate retention facilities to Karlovec Pond. For area J, stormwater discharge of 72,000 m³/year is assumed; the surface drainage of area J will be graded toward the west, where stormwater will be connected to the ditch along Road II/138, which continues to Dubenecký Stream.

During termination of operation, the quantity of stormwater discharged from the SMR ETE area will decrease as the site is released.

B.III.3. Waste

3. Waste (for example, an overview of waste sources, waste classification and quantities, and waste-management methods)

Non-radioactive waste[1]:

other waste, including municipal waste:	up to 660 t/year
hazardous waste:	up to 75 t/year
sludge from raw-water treatment:	up to 750 t/year

The stated values represent the anticipated quantities of non-radioactive waste associated with SMR ETE operation. In both qualitative and quantitative terms (taking into account the ratio of output to facility size), the quantity and composition of the non-radioactive waste generated will correspond to the waste composition of the existing operating ETE1,2 units. These will include common types of waste arising from the cleaning, maintenance, repair, operation, and replacement of nonradioactive equipment, construction waste from repairs, and other waste. Waste will be managed similarly to waste generated in connection with operation of ETE1,2, in accordance with Act No. 541/2020 Coll., on Waste, as amended, and the management documents of ČEZ, a. s. (collection, secure storage, and transfer to professionally authorized companies for further management). Sludge from raw-water treatment will be processed and subsequently managed in accordance with applicable legislation.

At present, ETE1,2 produce an average of approximately 1,200 metric tons of non-radioactive waste per year (including approximately 130 metric tons of hazardous waste) and 3,000 metric tons of sludge from raw-water treatment; production is, however, highly variable depending on current activities and the quality of the raw water abstracted. According to the New NPP ETE EIA documentation, average production of 752 metric tons of non-radioactive waste per year (including 112 metric tons of hazardous waste) is assumed for the New NPP ETE project; the quantity of sludge from raw-water treatment will be proportional to the quantity of raw water. Total non-radioactive waste production from the combined operation of ETE1,2 units + New NPP ETE + SMR ETE will therefore not exceed 2,370 t/year of other waste, including municipal waste, 317 t/year of hazardous waste, and 8,850 t/year of sludge from raw-water treatment.

During construction, the waste will consist mainly of construction waste and municipal waste. The final stage of construction, when the construction site facilities will be dismantled, will be particularly significant. The quantity of waste generated during the construction period will be up to approximately 100,000 metric tons over the construction period (including up to 1,000 metric tons of hazardous waste); the waste will consist mainly of construction waste and municipal waste. Priority will be given to reusing and recycling waste using the recycling line located in area H, or the waste will be transferred to professionally authorized companies for further management. Commissioning of SMR ETE will be followed by the construction-facility removal phase. The total quantity of waste from this phase is estimated at 56,000 metric tons, including up to 200 metric tons of hazardous waste. The majority of the total waste from demolition of the construction facilities will consist mainly of concrete waste, mixtures or separate fractions of concrete, or bricks containing reinforcing steel, originating primarily from demolition of foundation structures and paved concrete areas. Steel and iron from dismantling the steel structures of buildings and other auxiliary steel structures will constitute a significant share of the waste. Another significant waste component by volume will be waste from removal of asphalt road surfaces and aggregate base layers.

During termination of SMR ETE operation, the waste generated will initially be of the same nature as during normal operation; subsequently, construction waste from dismantling and demolition work will be added in particular. The quantity of waste from termination of operation is not specified in greater detail; it will be managed in accordance with the Waste Act.

B.III.4. Other

4. Other emissions and residues (for example, noise and vibration, radiation, odor, and other outputs: an overview of sources, emission quantities, and methods of limiting them)

Noise:

stationary sources:	forced-draft fan cooling tower[2]:	L_{pA} = 75 dB
	turbine-generator building:	L_{pA} = 60 dB
	transformer:	L_{pA} = 87 dB
	other individual buildings:	L_{wA} = up to 80 dB

The stated values represent the anticipated sound pressure at a distance of 1 m from the outer surface of the source (L_{pA}) or the sound power (L_{wA}) of the dominant SMR ETE sources. These sources will operate continuously and therefore identically during the daytime and nighttime. All sources will be provided with noise-control measures so that the public-health limits under Government Decree No. 272/2011 Coll., on Protection of Health against the Adverse Effects of Noise and Vibration, as amended, are met in the nearest, or potentially most affected, protected outdoor space (Kočín). Another source of noise during SMR ETE operation will be on-site traffic. Passenger-vehicle movements will be naturally distributed among the existing or future parking areas. Bus transportation will use the existing public-transport stand and stop area. Freight traffic entering the SMR ETE site will use dedicated on-site roads. Similar assumptions apply to existing sources at the site. The stated acoustic parameters may also be redistributed among the individual groups of noise sources, or individual noise sources, so that compliance with the limit under the above Government Decree is always demonstrably ensured.

Noise measurements for ETE1,2 and the Kočín substation (see Chapter C.II.3. Noise and other physical and biological characteristics, page 231 of this Documentation) show that the public-health limits are reliably met in the nearest, or potentially most affected, protected outdoor space (Kočín). As with SMR ETE, all sources for the New NPP ETE project will be provided with noise-control measures so that the public-health limits are met under the combined impact of all sources (i.e., ETE1,2 + New NPP ETE + SMR ETE).

Operation of ETE1,2 also includes special operational states, such as testing or functional actuation of steam-generator safety valves, steam dump stations to the atmosphere, pressure-reducing-station safety valves, and diesel generator stations. Similar operational states may also be assumed for SMR ETE and New NPP ETE. This equipment does not operate during normal operation; it operates during periodic testing and, very exceptionally, during abnormal operation. Its operation is also assumed under accident conditions (which, however, have not occurred during the operating life of ETE1,2). In view of the distance to developed areas and the very short duration of the tests, measurements performed

[1] Information on radioactive waste is provided below (in accordance with the structure of Annex 4 to the Environmental Impact Assessment Act) in Chapter B.III.4. Other, specifically its Ionizing Radiation section.

[2] This applies to both the main cooling towers (MCWS system) and the TVD system cooling towers (ESWS).

during testing of equipment at the existing power plant indicate that no significant disturbance or health risks to residents of the nearest municipalities are expected. Similar conclusions will also apply to special operational states at SMR ETE or New NPP ETE.

The SMR ETE preparation and construction period will be significant in terms of the acoustic impacts of emissions. During these phases, the main activity assumed is operation of construction machinery in the SMR ETE construction-site area and construction-facility areas, and movement of machinery and materials between the areas. The most significant impact may be expected during construction of the construction facilities, when extensive deployment of machinery is anticipated, involving dozens of machines operating concurrently (dozers, excavators, loaders, compaction equipment, etc.) in areas oriented toward the nearest residential development. On-site transportation of soil during bulk earthworks will also be a significant noise source, with many dozens of trucks expected to be deployed concurrently. The SMR ETE construction period will be characterized by activities associated with construction of the main generating unit, the fan cooling-tower block, and other structures (concrete work, including operation of concrete pumps, powered hammers, operation of cranes or mobile cranes, and on-site transportation of materials by truck, etc.). The construction-machinery noise emissions considered are as follows:

machinery used during construction:	dozer:	$L_{wA} \leq 111$ dB
	excavator:	$L_{wA} \leq 107$ dB
	roller:	$L_{wA} \leq 110$ dB
	loader:	$L_{wA} \leq 109$ dB
	powered hammers:	$L_{wA} \leq 109$ dB
	mobile crane:	$L_{wA} \leq 95$ dB
	truck mixer:	$L_{wA} \leq 115$ dB
	concrete pump:	$L_{wA} \leq 107$ dB
	tower crane:	$L_{wA} \leq 95$ dB
	heavy-duty crane:	$L_{wA} \leq 102$ dB
	crushing line:	$L_{wA} \leq 109$ dB
	concrete batching plant:	$L_{wA} \leq 111$ dB

Noise sources during termination of operation will not exceed those during operation or construction.

More detailed information is provided in the acoustic study (Annex 5.2 to this Documentation).

transport on public roads: up to $L_{Aeq,7.5m}$ = 53/51 dB (day/night)

The stated value represents the noise-emission characteristic of SMR ETE origin-destination road traffic in the profile with the highest traffic load (at the main entrance to the SMR ETE site, Road II/138, profile 2-4680A), at the volume specified above in Chapter B.II.6. Requirements for transport and other infrastructure (page 197 of this Documentation). In view of its low frequency, noise from rail traffic may be disregarded.

Existing ETE1,2 origin-destination traffic together with future New NPP ETE traffic in the profile with the highest load will have a traffic-noise emission value of up to $L_{Aeq,7.5m}$ = 59/58 dB (day/night). During concurrent operation of ETE1,2 + New NPP ETE + SMR ETE, traffic-noise emissions will therefore not exceed $L_{Aeq,7.5m}$ = 60/59 dB (day/night).

During construction work for the Project, increased noise levels can be expected in the vicinity of transport routes. Sources of traffic noise during termination of operation will not exceed those during operation or construction.

More detailed information is provided in the acoustic study (Annex 5.2 to this Documentation).

Vibrations: insignificant

The SMR ETE Project will not be a source of significant vibrations propagating to the surrounding area. The turbine-generator building (turbine) is the principal vibration source; suitable mounting minimizes the transfer of vibrations from the turbine to the turbine-pedestal subsoil and limits them to the immediate vicinity. The effects of vehicles traveling on public roads may also be a potential source of vibration. However, these are common traffic sources whose effects are damped in the subsoil in the immediate vicinity of the roads. Similar conclusions also apply to the existing facilities at the Temelín site and the New NPP ETE project.

With regard to vibrations during SMR ETE preparation and construction, only conventional construction machinery and vehicles are considered, and their impacts will be limited to their immediate vicinity. No blasting operations using explosives are assumed during construction. During termination of operation, only the sources specified above for the operation or construction period are considered, and they will therefore have no significant impact on the surrounding area.

Ionizing radiation:	radioactive airborne discharges:	noble gases (excluding Ar-41):	up to 4.26E+13 Bq/year
		tritium:	up to 1.00E+12 Bq/year
		C-14:	up to 4.38E+10 Bq/year
		iodine:	up to 2.74E+08 Bq/year
		aerosols:	up to 2.64E+08 Bq/year
		Ar-41:	up to 2.40E+12 Bq/year

The stated values represent the bounding annual activities of SMR ETE airborne discharges during operational states (normal and abnormal operation) for the individual radionuclide groups. The values are based on the authorized estimates provided by the RR SMR technology supplier. Based on operating experience with PWR-type reactors, actual discharges may realistically be expected to be lower than the values assumed in the design.

The primary source of radioactive gases is the nuclear fuel itself, in which the fission chain reaction also produces radioactive isotopes of gases. Limited quantities of these pass through microleaks in the fuel cladding into the primary-circuit coolant, which is in continuous contact with the cladding. Radioactive gases are carried by the primary circuit coolant into other power plant systems connected to the primary circuit. This is also reflected in the isotopic composition of the discharges, in which noble gases and radiologically significant radioiodines predominate among the fission products; among the activation products, the radioisotopes of carbon and argon are of greatest radiological significance. The discharges will be released to the atmosphere in a controlled manner after high-efficiency filtration and radiological monitoring.

Actual airborne discharges from the existing ETE1,2 units have been within the following ranges in recent years:

noble gases:	up to 1.21E+13 Bq/year
tritium:	up to 3.70E+12 Bq/year
C-14:	up to 1.25E+12 Bq/year
iodine:	up to 2.47E+08 Bq/year
aerosols:	up to 3.62E+08 Bq/year
Ar-41:	up to 1.81E+12 Bq/year

The stated values are a bounding selection (maxima) of measured radionuclide discharge-activity values from ETE1,2 for 2004 through 2025. The other nuclear facilities at the site do not emit gaseous discharges. The discharges are released to the atmosphere in a controlled manner through ventilation stacks after high-efficiency filtration and radiological monitoring.

According to the New NPP ETE EIA documentation, the anticipated bounding airborne discharges from the New NPP ETE project are as follows:

noble gases:	3.55E+15 Bq/year
tritium:	2.59E+13 Bq/year
C-14:	5.40E+11 Bq/year
iodine:	3.85E+10 Bq/year
aerosols:	3.48E+09 Bq/year
Ar-41:	2.52E+12 Bq/year

No radioactive airborne discharges from SMR ETE will be produced during construction. During termination of operation and decommissioning, discharges will decrease progressively and significantly (by up to several orders of magnitude) compared with the operating period. The isotopic composition of gaseous discharges during termination of operation and decommissioning will differ from that during the operating phase (with a substantially lower proportion of noble gases and iodine).

radioactive discharges to the watercourse: tritium: up to 5.00E+12 Bq/year
corrosion, activation, and fission products: up to 2.89E+09 Bq/year

The stated values represent the bounding annual activities of SMR ETE liquid discharges (discharges to the watercourse) during operational states (normal and abnormal operation) for the individual radionuclide groups. The values are based on the authorized estimates provided by the RR SMR technology supplier and, for tritium, were conservatively increased based on comparison with the long-term operation of ETE1,2 and Dukovany Units 1–4. Based on operating experience with PWR-type reactors, actual discharges in the corrosion, activation, and fission-product category may be expected to be lower than the values assumed in the design.

Tritium, which is generated in the primary circuit and cannot be captured effectively by treatment systems, dominates the isotopic composition of liquid discharges. The lower relative tritium discharge values compared with ETE1,2 are due primarily to the boron-free operating regime of the RR SMR. After radiological monitoring, the discharges will be released in a controlled manner to the receiving water (the Vltava River), in accordance with the authorized limits established by a decision of SÚJB, through the existing terminal wastewater collector (together with process wastewater and sanitary wastewater).

Actual liquid discharges to the watercourse from the existing ETE1,2 units have been within the following ranges in recent years:

tritium:	up to 6.38E+13 Bq/year
corrosion, activation, and fission products:	up to 6.42E+08 Bq/year

The stated values are a bounding selection (maxima) of measured liquid-discharge activity values from ETE1,2 for 2006 through 2025. Other nuclear facilities at the site do not emit liquid discharges.

According to the New NPP ETE EIA documentation, the estimated liquid discharges to the watercourse from the New NPP ETE project are as follows:

tritium:	1.2E+14 Bq/year
corrosion, activation, and fission products:	1.9E+10 Bq/year

No liquid radioactive discharges from SMR ETE will be produced during construction. During termination of operation and decommissioning of SMR ETE, discharges will decrease progressively and significantly (by up to several orders of magnitude) compared with the operating period.

ionizing radiation field: insignificant

An ionizing-radiation field means electromagnetic (gamma) radiation or neutron flux directly from process equipment (without the contribution from discharges). It is not significant even in the immediate vicinity of the buildings of the existing nuclear facilities at ETE1,2 or in the case of the SMR ETE and New NPP ETE projects.

The use of radiation sources (sealed sources) forming part of industrial radiography equipment (e.g., for weld inspection) cannot be ruled out during construction; such use will have no significant impact on the surroundings. No additional ionizing-radiation sources will arise during termination of operation or decommissioning.

radioactive waste: up to 27.5 m^3/year

The stated value represents the bounding quantity of RAO produced during SMR ETE operation after conditioning (i.e., RAO intended for disposal). The value is based on unit production of 55 m^3/GW_e/year, conservatively assumed for RAO from SMRs in the updated Concept of Radioactive Waste and Spent Nuclear Fuel Management in the Czech Republic (update for 2025 through 2035, with an outlook beyond 2050). Radioactive-waste sources include, in particular, liquid-radioactive-waste treatment systems (concentrates, spent ion exchangers, and sludge), filters from active ventilation systems, used measuring probes and surveillance-specimen capsules, as well as contaminated unusable components, protective equipment or clothing, segregated materials from the controlled area, etc. The RAO treatment and conditioning technology (in particular the solidification matrix) and the packaging systems for RAO storage and disposal will be selected depending on the RAO acceptance criteria for operating repositories in the Czech Republic (currently the Dukovany repository), the requirements of the Concept of Radioactive Waste and Spent Nuclear Fuel Management in the Czech Republic, and the best available technologies. RAO storage at the SMR site is a standard part of the SMR ETE reference design.

According to the New NPP ETE EIA documentation, conditioned radioactive-waste production from the existing ETE1,2 units and the planned New NPP ETE units will range from 50 to 70 m^3/GW_e/year (long-term RAO production from ETE1,2 is approximately 50 m^3/GW_e/year). This

RAO is and will be disposed of in accordance with the Concept of Radioactive Waste and Spent Nuclear Fuel Management (currently at the Dukovany repository). SÚRAO information on radioactive-waste management is provided in Annex 6.3 to this Documentation.

No radioactive waste will be produced during SMR ETE construction. During termination of operation and decommissioning, radioactive waste will include, in particular, segregated contaminated materials (contaminated process systems or building structures) from dismantling and demolition, and materials used for decontamination.

spent nuclear fuel: up to 13.05 t UO_2/year

The quantity of spent nuclear fuel produced corresponds to the quantity of fresh fuel in the fuel loading. According to the supplier of the RR SMR reference design, the stated value represents the bounding value of spent nuclear fuel production for SMR ETE.

Spent nuclear fuel production for the existing ETE1,2 units is up to 46 t UO_2/year. According to the New NPP ETE EIA documentation, spent nuclear fuel production of up to 78.5 t UO_2/year is assumed for the New NPP ETE project; total spent nuclear fuel production from the combined operation of ETE1,2 units + New NPP ETE + SMR ETE will therefore not exceed 137.6 t UO_2/year.

Spent nuclear fuel will not be produced in the period of construction. After operation has ended and the fuel has been removed from the reactor and pools, no further spent nuclear fuel will be produced.

Non-ionizing radiation: insignificant

The Project will not be a significant source of non-ionizing radiation. The electric and magnetic fields around the individual facilities (electrical lines, transformers, electrical generators, and other equipment) will meet the requirements of Government Decree No. 291/2015 Coll., on Protection of Health against Non-Ionizing Radiation. Employee limits will be met within the power plant site, and limits for members of the general public in a non-occupational environment will be met in publicly accessible outdoor areas (applicable only to electrical lines).

Similar information also applies to the existing facilities at the Temelín site and to the New NPP ETE project.

Similarly, non-ionizing radiation will not be significant during either construction or decommissioning.

Odor: without outputs

The Project is not a source of odor.

Light pollution: of low significance

The Project is not a source of light pollution. Project lighting will be designed in accordance with Ministry of the Environment Methodological Guideline Ref. No. MZP/2023/710/2146 and standard ČSN 36 0459, Limiting the Adverse Effects of Outdoor Lighting, so as to eliminate light pollution in the surrounding area. In view of the physical-protection requirements for the site, however, lighting cannot be eliminated completely.

Other physical or biological factors: without outputs

The Project is not a source of other significant outputs.

B.III.5. Additional data

5. Supplementary information (for example, significant earthwork and landscape interventions)

Earthwork: bulk earthworks:
- topsoil and subsoil stripping: up to 300,000 m³
- excavation: up to 1,390,000 m³
- embankment: up to 1,381,000 m³

The Project respects the terrain character of the affected territory and does not require extensive permanent interventions in the landscape. Within its own areas, the Project has a predominantly balanced earthwork cut-and-fill balance, except for area J, which will receive some of the excavated soil from other areas.

Before construction begins, topsoil and the subsoil layer will be stripped from the construction areas, including the construction-facility areas, to the layer thickness determined by the soil survey. The topsoil and subsoil will be stockpiled in area H during construction.

Excavation work in all affected areas, excluding topsoil and subsoil stripping, will amount to up to 1,390,000 m³, including up to 615,000 m³ in the SMR ETE area (main construction site). Of this quantity, up to 542,000 m³ will be used for embankments and backfilling in the SMR ETE area (main construction site); the surplus of approximately 73,000 m³, together with surplus excavated soil from the other areas, will be used to level construction-facility area J (634,000 m³), and the remainder, approximately 128,000 m³, will be placed in the soil stockpile in area H, which will also serve as a soil stockpile for final grading and subsequent reclamation of the construction-facility areas after SMR ETE construction is completed.

PART C
(INFORMATION ON THE STATE OF THE ENVIRONMENT IN THE AFFECTED TERRITORY)

PART C INFORMATION ON THE STATE OF THE ENVIRONMENT IN THE AFFECTED TERRITORY

C.I.
OVERVIEW OF THE MOST IMPORTANT ENVIRONMENTAL CHARACTERISTICS OF THE AFFECTED TERRITORY

1. Overview of the most important environmental characteristics of the affected territory (e.g., landscape structure and character, its geomorphology and hydrology, defining elements of flora and fauna, parts of the area and species protected under the Nature and Landscape Conservation Act, significant landscape features, the territorial system of ecological stability, specially protected areas, nature parks, sites of Community importance, special protection areas, and specially protected species; mineral deposits; as well as areas of historical, cultural, or archaeological importance, densely populated areas, areas burdened beyond their carrying capacity, legacy environmental burdens, and extreme conditions in the affected territory)

The Project is located in the South Bohemian Region, České Budějovice District, in the Municipality of Temelín (Křtěnov, Kočín, Temelínec, and Březí u Týna nad Vltavou cadastral areas) and the Municipality of Dříteň (Chvalešovice cadastral area). The Project site is located immediately adjacent to the existing Temelín power plant industrial site.

Table C.1: List of environmental characteristics of the affected territory

	Areas for siting and construction of the Project	Broader affected territory
Population and public health		
residential areas	no	yes
densely populated areas	no	no
Air and climate		
areas where limits are exceeded	no	no
Noise and other physical and biological characteristics		
protected outdoor spaces, protected outdoor spaces of buildings	no	yes
radionuclide discharges to the environment	no	yes
Surface water and groundwater		
protected area of natural water accumulation	no	no
protection zone for a surface-water source	no	yes
protection zone for a groundwater source	no	no
floodplain	no	no
Land		
agricultural land fund	yes	yes
land designated for the fulfillment of forest functions	yes	yes
landscape features in the agricultural landscape	no	yes
Geological environment and natural resources		
active mining areas	no	yes
protected mineral-deposit areas	no	yes
undermined areas, historical mine workings	no	no
landslide areas and other geodynamic phenomena	no	no
legacy environmental burdens	no	no
Fauna, flora and ecosystems		
national park	no	no
protected landscape area	no	no
small-scale specially protected areas	no	yes
Natura 2000 sites (sites of Community importance and special protection areas)	no	yes
supraregional territorial system of ecological stability	no	yes
regional territorial system of ecological stability	no	yes
local territorial system of ecological stability	yes	yes
habitat of specially protected large-mammal species, core areas	no	no
habitat of specially protected large-mammal species, migration corridors	yes	yes

occurrence of specially protected plant or animal species	yes	yes
registered significant landscape feature	no	no
statutory significant landscape feature	yes	yes
memorial tree	no	yes
Landscape		
nature park	no	yes
areas completely transformed by humans (anthropogenic areas)	yes	yes
areas with a balanced relationship between natural elements and humans	yes	yes
areas dominated by natural elements	no	no
Tangible assets and cultural heritage		
third-party real property	no	yes
architectural and historical monuments	no	yes
archaeological sites	no	yes
Transport and other infrastructure		
roads	yes	yes
railways	no	yes
other technical and transportation infrastructure	yes	yes

For more detailed information, see the relevant chapters of Part C.II. CHARACTERISTICS OF THE CURRENT STATE OF ENVIRONMENTAL COMPONENTS IN THE AFFECTED TERRITORY (page 208 of this Documentation and the following pages).

C.II.
CHARACTERISTICS OF THE CURRENT STATE OF THE ENVIRONMENT IN THE AFFECTED TERRITORY

2. Characteristics of the current state of the environment or landscape in the affected territory and a description of its components or characteristics that may be affected by the Project,
particularly air (e.g., air-quality status), water (e.g., hydromorphological conditions in the area and changes in them, water quantity and quality, etc.), soil (e.g., the proportion of undeveloped areas, the proportion and condition of agricultural land and forest land, the status of erosion risk and soil degradation, land take, erosion, compaction, and sealing), natural
resources, biodiversity (e.g., the status and diversity of fauna, flora, communities, and ecosystems), climate (e.g., impacts associated with climate change, vulnerability of the area to manifestations of climate change), population and public health, property, and cultural heritage, including architectural and archaeological aspects

C.II.1. Population and public health

C.II.1.1. Location of municipal development

The Project is sited in an area immediately adjacent to the southern edge of the existing industrial site of the Temelín Nuclear Power Plant (ETE1,2). The area directly affected by Project siting (the SMR ETE siting area (main construction site), temporary construction-facility areas, and the power-evacuation and backup-supply corridors) does not extend into residential development areas. The nearest residential buildings or areas designated by spatial plans for residential buildings are located at the following distances from the Project siting area (SMR ETE area):

- municipality of Temelín (Kočín local district): approximately 1.1 km south of the Project siting area,
- municipality of Temelín: approximately 2.5 km northwest of the Project siting area.

The other municipalities are generally more than 3 km from the Project siting area. An overview of municipalities within 10 km of SMR ETE (the broader area of interest, comprising 21 municipalities) and towns within 25 km of SMR ETE is provided in the following table.

Table C.2: Municipalities near the Temelín site

Distance from SMR ETE	Municipality	District	Population (as of January 1, 2024)	Distance by road	
				in km	in minutes
up to 5 km	Dříteň	České Budějovice	1,699	6.6	7
	Temelín	České Budějovice	896	4.9	6
	Všemyslice	České Budějovice	1,173	5.9	7
5–7.5 km	Týn nad Vltavou	České Budějovice	7,850	6.3	7
7.5–10 km	Albrechtice nad Vltavou	Písek	1,011	12.2	13
	Bečice	České Budějovice	105	12.5	12
	Čičenice	Strakonice	471	15.4	15
	Dívčice	České Budějovice	608	11.7	11
	Dobšice	České Budějovice	119	11.5	11
	Hluboká nad Vltavou	České Budějovice	5,597	17.5	14
	Horní Kněžeklady	České Budějovice	111	10.1	10
	Hosty	České Budějovice	170	12.2	13
	Chrášťany	České Budějovice	734	15.7	16
	Modrá Hůrka	České Budějovice	103	13.9	14
	Mydlovary	České Budějovice	306	16.0	14
	Nákří	České Budějovice	218	9.7	9
	Olešník	České Budějovice	806	12.6	11
	Protivín	Písek	4,799	16.2	17
	Zahájí	České Budějovice	452	14.7	13
	Žďár	Písek	253	20.8	22
	Žimutice	České Budějovice	625	12.9	13
cities within 25 km from SMR ETE	Vodňany	Strakonice	7,483	19.8	20
	Bechyně	Tábor	4,838	18.1	19
	Písek	Písek	30,986	30.6	31
	Veselí nad Lužnicí	Tábor	6,580	31.6	29
	České Budějovice	České Budějovice	97,377	28.5	27

Source: ČSÚ Public Database (2025), mapy.com

C.II.1.2. Demographic data

For assessment of the population's demographic status, the narrower area of interest is defined by a circle with a radius of 5 km from the center of the SMR ETE area. The administrative territories of a total of seven towns and municipalities lie within the area defined in this manner (the territories of Hluboká nad Vltavou and Nákří are only marginally part of the narrower area of interest: only Jeznice, its northernmost part, is relevant within the administrative territory of the Municipality of Hluboká nad Vltavou, while Nákří has no direct territorial connection, primarily because of the terrain configuration). All municipalities in the narrower area of interest defined in this manner are located in České Budějovice District and account for approximately one tenth of its population. The largest towns in the narrower area of interest are Hluboká nad Vltavou and Týn nad Vltavou. The population density is approximately 120 residents per km^2, and approximately 67 % of the population lives in towns.

C.II.1.2.1. Population of the narrower area of interest

The population of the narrower area of interest is presented in the following table.

Table C.3: Population in the narrower area of interest

Municipality	Total	Men	Women
Temelín	896	481	415
Dříteň	1,699	858	841
Týn nad Vltavou	7,850	3,844	4,006
Nákří	218	112	106
Olešník	806	407	399
Všemyslice	1,173	629	544
Hluboká nad Vltavou	5,597	2,728	2,869
Total for the narrower area of interest	18,239	9,059	9,180
České Budějovice District	201,926	98,717	103,209
South Bohemian Region	654,505	322,338	332,167
Czech Republic	10,900,555	5,342,610	5,557,945

Source: ČSÚ, data as of December 31, 2023

The population of České Budějovice District has increased steadily in recent decades.

Table C.4: Population trend in České Budějovice District (1869–2021)

České Budějovice District								
Year	Population	± (%)	Year	Population	± (%)	Year	Population	± (%)
1869	116,772	-	1921	161,538	+0.6 %	1980	165,003	+8.9 %
1880	128,343	+9.9 %	1930	159,231	-1.4 %	1991	173,765	+5.3 %
1890	133,452	+4.0 %	1950	134,792	-15.3 %	2001	178,506	+2.7 %
1900	147,745	+10.7 %	1961	144,624	+7.3 %	2011	186,462	+4.5 %
1910	160,505	+8.6 %	1970	151,558	+4.8 %	2021	196,897	+5.6 %

Source: ČSÚ

According to the ČSÚ demographic projection for the regions and areas of the Czech Republic through 2081, which may also be used to predict population trends in the municipalities of the narrower area of interest, the anticipated change in the total population of the Czech Republic is not significant, but the population's age structure will change substantially. Over the years, the sizes of the individual age groups (and their relative proportions) will change substantially, both in terms of the three basic age groups and at the more detailed level of five-year age groups, with the population aging markedly. Assuming zero internal and international migration, the population of all regions and areas would decrease by 13 to 23 % over the projection horizon.

According to the 2024 ČSÚ projection, which is based on the South Bohemian Region having 654,505 residents as of January 1, 2024, its population decrease should be among the highest of the regions in the Czech Republic, with a natural loss of 2,800 residents per year after 2060. Migration is not expected to be capable of offsetting this natural decrease, only mitigating it. By 2081, the population is expected to decrease by approximately 20 %. The average age of the population in 2080 will be 50.6 years; residents aged 65+ will account for 34.2 %, and residents aged 15–64 will account for 53.9 %.

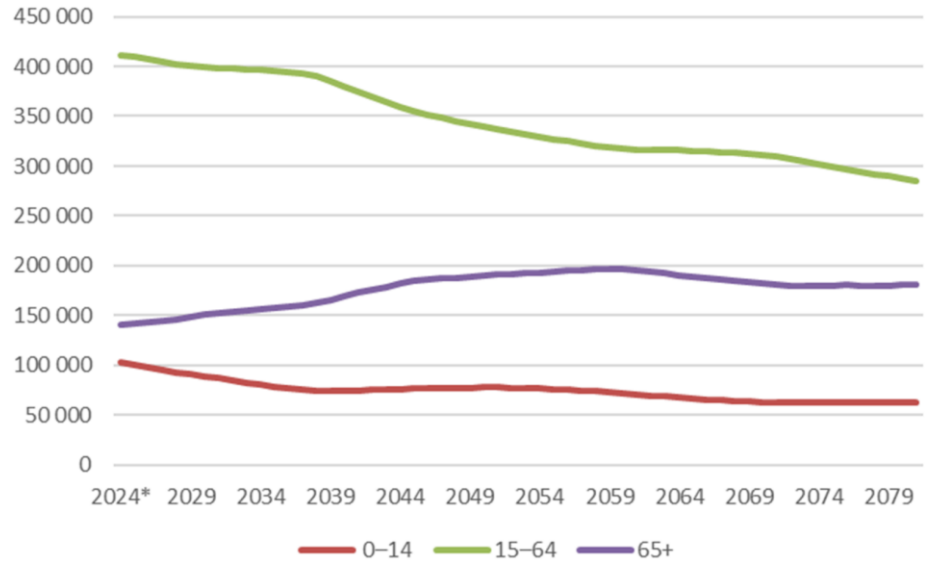
Table C.5: Indicators of the age structure and population change in the South Bohemian Region, projection assumptions

Parameter		2024	2030	2040	2050	2060	2070	2080
Population								
Population, including age group	total	654,505	638,504	624,256	607,352	585,455	556,106	530,374
	0–14	102,765	88,919	74,513	77,785	71,889	63,355	62,753
	15–64	410,715	398,947	380,199	339,468	317,326	310,923	287,187
	65+	141,025	150,638	169,545	190,099	196,240	181,828	180,434
Proportion of population by age (%)	0–14	15.7	13.9	11.9	12.8	12.3	11.4	11.8
	15–64	62.8	62.5	60.9	55.9	54.2	55.9	54.1
	65+	21.5	23.6	27.2	31.3	33.5	32.7	34.0
Average age	total	43.3	45.2	47.2	48.4	49.6	50.4	50.6
	men	42.0	43.8	45.8	47.1	48.5	49.4	49.8
	women	44.6	46.6	48.6	49.7	50.8	51.4	51.3
Old-age index [1]		137	169	228	244	273	287	288
Dependency ratio [2]		74.3	75.1	78.5	93.2	101.5	94.2	99.4
Population change								
Live births		4,923	4,852	5,188	4,959	4,124	4,139	4,032
Deaths		7,017	7,456	8,229	8,178	8,366	8,586	7,669
Natural change		-2,094	-2,604	-3,041	-3,219	-4,242	-4,447	-3,637
Net migration		369	1,564	1,390	1,413	1,512	1,512	1,519
Total change		-1,725	-1,040	-1,650	-1,806	-2,730	-2,934	-2,118
Crude birth rate (‰)		7.5	7.6	8.3	8.2	7.1	7.5	7.6
Crude death rate (‰)		10.7	11.7	13.2	13.5	14.3	15.5	14.5
Crude rate of natural change (‰)		-3.2	-4.1	-4.9	-5.3	-7.3	-8.0	-6.9
Crude net migration rate (‰)		0.6	2.5	2.2	2.3	2.6	2.7	2.9
Crude rate of total change (‰)		-2.6	-1.6	-2.6	-3.0	-4.7	-5.3	-4.0
Projection assumptions								
Total fertility rate		1.39	1.54	1.54	1.54	1.54	1.54	1.54
Average age of mothers at childbirth		30.3	30.5	30.8	31.1	31.1	31.1	31.1
Life expectancy at birth	men	77.4	78.6	80.5	82.3	83.9	85.5	86.9
	women	83.0	84.1	85.7	87.1	88.4	89.6	90.7

Source: ČSÚ, abridged to show individual decades.

[1] Ratio of the population aged 65+ to 100 members of the population aged 0–14.
[2] Ratio of the population aged 0–19 and 65+ to 100 members of the population aged 20–64.

Fig. C.1: Anticipated population trend in the South Bohemian Region by principal age group



Based on population change resulting (only) from natural change, the old-age index will increase sharply. Since 2024, ČSÚ projections have assumed that the number of seniors will exceed the number of children in all regions of the Czech Republic, and this predominance will become increasingly pronounced, reaching 200 seniors per 100 children as early as the 2030s. Over the projection horizon, the old-age index could range from 245 to 354 seniors per 100 children, with the lowest value in the Ústí nad Labem Region and the highest in the Capital City of Prague (without taking migration into account). The economic dependency ratio, which compares the economically inactive and active parts of the population (here, those aged 20–64), is favorable for the time being because the largest generation, born in the mid-1970s, is currently of working age. According to the projection, the economically inactive component will eventually exceed the active component. This situation is expected to begin in the second half of the 2040s (or possibly the early 2050s). The excess of the economically inactive population will then be greatest in the second half of the 2050s, after which it will decline toward the projection horizon.

This trend is caused by the long-term increase in life expectancy throughout Europe and the resulting increase in the population's average age. In the Czech Republic, however, this phenomenon is substantially amplified by the two peaks in the population pyramid. One dates from the years after World War II and, in particular, the other from the normalization period in the 1970s (the so-called Husák's children).

The population structure of the Czech Republic, the South Bohemian Region, and the narrower area of interest shows three fundamental age groups whose continued progression over time will have a significant impact on the health care system. These are very large population cohorts now aged 40 to 50 and, in particular, 30 to 40. Not only will these groups age progressively, but they will also multiply the demand for health and social services. In parallel with the population-aging process, the current small population group aged 10 to 25 will move into economically productive age, weakening the currently large economically active group of people during this period. This phenomenon, in which diseases among older seniors will increase substantially while the number of working people decreases, will last approximately 10–25 years and will be critical to ensuring adequate health care and social-system budgets.

C.II.1.2.2. Additional demographic information

Additional demographic information is provided for the broader area of interest, i.e., the area within a 10 km radius comprising 21 municipalities, because the narrower area of interest is too small for statistical purposes.

C.II.1.2.2.1. Population educational attainment

The educational attainment of the population in the broader area of interest (the area within a 10 km radius comprising 21 municipalities) is below the average for the Czech Republic and the surrounding towns.

In 2021, the proportion of residents aged 15 and over with a university education (in accordance with demographic conventions, the number is relative to this age category even though some of these residents are still studying and improving their educational attainment) was 13.9 % in the town of Týn nad Vltavou and 14.1 % in the other 20 municipalities combined; the average for the Czech Republic was 17.6 %, however, and for the five towns within 25 km it was as high as 20.4 %. These are, however, residents, so they may be, and in many cases are, employed in the territories of other municipalities and towns. The more highly educated population therefore typically concentrates in large cities (in this case České Budějovice), where it also finds corresponding employment. Although ETE employees have higher educational attainment on average (54 % of ETE employees had a university education in February 2025), many live in larger cities and commute to work.

A similar result would be obtained by adding together residents aged 15 and over who have a university education or an upper secondary education with the matura examination, i.e., residents who attained at least the matura level in the education process. At the time of the 2021 census, this proportion was 46.9 % in the town of Týn nad Vltavou and 45.2 % in the other 20 municipalities, compared with 50.0 % throughout the Czech Republic and 55.5 % in the five towns analyzed. People who attained at least the matura level of education predominate among ETE employees. The proportions of residents aged 15 and over with an upper secondary education without the matura examination were above one third, compared with only 31 % in the Czech Republic and 26.9 % in the five towns.

C.II.1.2.2.2. Economic activity of the population

In terms of employment by branch of economic activity in the 2021 census, both the town of Týn nad Vltavou and the other 20 municipalities in the broader area of interest showed clearly higher employment in industry and construction. A total of 48 % (Týn nad Vltavou) and 38 % (the other municipalities) of employed residents worked in these sectors, respectively, several percentage points more than in the five towns and the Czech Republic average. Higher industrial employment is characteristic of rural areas, while electricity generation and certain other related industries are also classified under industry and construction.

At the end of 2024, the Labor Office of the Czech Republic registered 167 job seekers in Týn nad Vltavou, representing an unemployment rate of 3.1 %. The other 20 municipalities had 382 job seekers and an unemployment rate of 2.8 %. Unemployment in this region is lower than in the five towns studied and the Czech Republic average; the existence of ETE1,2 undoubtedly contributes to this, as does the location within the hinterland of České Budějovice, a regional capital with a substantial supply of vacancies.

The presence of the Temelín power plant already has a substantial impact on the labor market because, with approximately 1,500 employees, it is a key employer throughout the region and is also linked to numerous supplier companies. It therefore acts as a stabilizing element for the entire local economy and labor market. The location of such a large employer in a relatively specialized industry affects the employment structure by sector and industry. The energy generation and distribution field falls within industry, and the presence of ETE1,2 therefore increases industrial employment in the region. Importantly, these are progressive parts of industry, rather than obsolete and declining industries. Supplier companies and their workers then operate in related industries. Regardless of the presence and expansion of the power plant in the region, however, the tertiarization of the economy (an increasing share of services) will continue, especially in the regional capital of České Budějovice and its immediate hinterland.

Operation of ETE1,2 also has a positive impact on the relatively low unemployment rate, which will be stabilized at low levels even further by construction of SMR ETE and New NPP ETE. Nuclear power plant operation is more or less unaffected by the economic cycle, i.e., layoffs during economic crises and employee recruitment during periods of economic growth. Low unemployment, however, does not and will not apply to all specific groups of job seekers. Employment in this type of operation requires, on average, higher qualifications and good health, which limits employment opportunities for people with low educational attainment (typically those with only a basic education) or people with disabilities.

The presence of ETE1,2 also affects commuting flows in the broader region because the Municipality of Temelín itself does not have enough workers. Without ETE1,2, a significant proportion of economically active people would commute to work in České Budějovice (or other larger cities) because the region forms the regional capital's hinterland. The power plant, however, makes Temelín one of the principal destinations for commuting from municipalities in the region, not only from municipalities with small populations but also from larger towns; the two largest, consistently stable flows have long been from Týn nad Vltavou and České Budějovice. Schools in the region are already linked to operation of ETE1,2 through cooperative arrangements. This interrelationship has strengthened over the long term.

C.II.1.2.2.3. Structure of business entities

The presence of ETE1,2 in the region naturally also affects local business conditions. Between 2013 and 2024, the broader area of interest had fewer business entities per 1,000 residents aged 15 to 64 than the Czech Republic average. This is predictable, however, because the area is rural in character, and this indicator is generally lower in rural areas (the national average is also strongly affected by the Capital City of Prague). The number of business entities per 1,000 residents in the 20 municipalities analyzed in the broader area of interest is also lower than in the large towns within 25 km because those are urban-type settlements with substantially larger populations. Compared with the town of Týn nad Vltavou, however, the 20 municipalities have more business entities per 1,000 residents. This may be because many municipalities contain entities that work with ETE1,2. In addition, some municipalities lie within the hinterlands of large cities such as České Budějovice, resulting in a higher value for this indicator. It may be stated that, without ETE1,2, the number of business entities per 1,000 residents aged 15 to 64 in the municipalities surrounding ETE1,2 would be lower than it is now.

In addition to ETE1,2, another 35 business entities with more than 50 employees were identified in the municipalities of the broader area of interest. For most of them, their economic activity is not directly related to operation of ETE1,2. The largest entity is RICHMONT - CZ, a.s., based in Týn nad Vltavou, which specializes in manufacturing machine tools. Other major employers in Týn nad Vltavou are Mikrona holding s.r.o. (manufacture of weapons and ammunition) and the town of Týn nad Vltavou itself, which is included in the list because of employees engaged in general public-administration activities. Major employers are also located in Bečice (EXTRUDO Bečice s.r.o., manufacture of bakery and confectionery products), Hluboká nad Vltavou (NET CZ s.r.o., manufacture of cordage, rope, and netting), and Protivín (OM Protivín a.s., manufacture of general-purpose machinery and equipment). Betonpres a.s., which manufactures concrete products, is based directly in Temelín.

Another 48 employers with more than 25 employees operate within the broader area of interest. In many cases, these are educational entities, agricultural cooperatives, municipalities, cultural facilities, or food-service establishments. The principal employers in the broader area of interest are therefore enterprises in the tertiary and secondary sectors. On the other hand, the primary sector remains important because the region may be characterized as the rural hinterland of the regional capital. At the same time, the number of agricultural businesses reflects the area of agricultural and forest land in the municipalities. Public-administration business entities are represented in the larger municipalities, which follows from the very nature and function of municipalities as administrative units. The vast majority of businesses are concentrated in the largest towns in the area, where demand potential is greatest, i.e., Týn nad Vltavou, Hluboká nad Vltavou, and Protivín. For most of them, their economic activity is also not directly related to operation of ETE1,2.

C.II.1.2.2.4. Tourism

Tourism is an important economic sector that affects employment, the balance of payments, and the economic and social development of regions, contributes to gross domestic product, and affects local-government budget revenues. For the above reasons, tourism is also important to the current and future development of the Temelín site.

The area of interest surrounding the Temelín site currently has average potential for tourism and recreational activities. A total of 11 certified tourist areas operate in South Bohemia. Each area has a different profile, making the range of offerings at the regional level highly diverse. Many tourist attractions are local in character, however, and their potential is not fully utilized. In terms of visitor numbers, tourist areas associated with Šumava, Toulava, and Czech Canada are the most popular.

The České Budějovice tourist area contains more than 40 tourist destinations, 12 information centers, and almost 70 popular food-service establishments. Domestic tourism is growing here; recreational, leisure, and active-vacation destinations are particularly popular with visitors. The activities of greatest interest to visitors are visits to historical monuments, time in nature, hiking, and cycling.

The most popular tourist destinations are the South Bohemian Zoo Hluboká nad Vltavou, Hluboká nad Vltavou State Chateau, South Bohemian Museum in České Budějovice, Budweiser Budvar, Temelín Nuclear Power Plant Information Centre, Protivín Crocodile Zoo, Ohrada Museum, Black Tower and the historic center of České Budějovice, Bechyně Chateau, Týn nad Vltavou Revolving Auditorium, Týn nad Vltavou Municipal Museum, Jindřichův Hradec Observatory and Planetarium, České Budějovice Water Tower, and Týn nad Vltavou Municipal Gallery.

The natural wealth is represented by small-scale protected areas, a varied landscape, and a high degree of forest cover. At the same time, the area has a predominantly rural landscape without prominent historical or religious monuments, except in Hluboká nad Vltavou, Týn nad Vltavou, Protivín, and Albrechtice nad Vltavou (Church of Saints Peter and Paul). The Vltava River, which is navigable in the České Budějovice-Hluboká nad Vltavou-Týn nad Vltavou-Orlík Reservoir sections, is another important landmark in the area. The Vltava River and the Hněvkovice hydraulic structure also supply raw water for heat removal through the cooling towers of the operating ETE1,2 units.

The Temelín Nuclear Power Plant (ETE1,2) is itself a tourist attraction. The virtual tour of the power plant's most highly secured areas (known as ReakTour) is one of the main attractions when visiting the Temelín Nuclear Power Plant Information Centre. Using special glasses, visitors enter the most interesting and highly secured parts of the power plant, such as the nuclear reactor, a cooling tower, or the unit control room. ETE1,2 also offer remote online tours (known as Virtually at the Power Plant).

Visitor numbers in the individual areas are related not only to the attractiveness of their natural, cultural, and historical assets, but also to the accompanying infrastructure. Infrastructure is an important factor in tourism potential because it provides a means of achieving the purpose of tourism participation and creates conditions for using the natural, cultural, and historical assets on offer. Tourism could not be developed in the region without infrastructure. The character of the local landscape also makes the area suitable for cycling and hiking; dozens of cycling routes and bicycle paths therefore pass through it, many of which were built with the assistance of ČEZ, a. s. Hiking trails are concentrated primarily in the central area around the Municipality of Temelín and farther northwest toward the Písecké hory Nature Park.

C.II.1.3. Health status of the population

C.II.1.3.1. Overview of investigations conducted

The health status of the population in the area has long been monitored under the Program for Monitoring and Assessing the Environmental Impact of the Temelín Nuclear Power Plant (ČEZ, a. s., INVESTprojekt, s.r.o., 1999). This program defines a set of activities for monitoring and assessing environmental components and environmental-status indicators beyond the power plant operator's statutory obligations.

The Faculty of Medicine of Masaryk University in Brno is responsible for monitoring the health status of the population. The program documents the health status of the population during the power plant's pre-operational period; current data for the preceding period are then collected and assessed at regular annual intervals both for residents living near the Temelín power plant (the exposed area) and for residents living in other, more distant regions with similar natural and socioeconomic conditions (the control areas). A public health study was prepared to assess the health status of the population (Aleš Peřina, MSc, PhD: Public Health Study at the Temelín Site. Institute of Public Health, Faculty of Medicine, Masaryk University, June 2025), which summarizes the results of earlier work and describes current trends in the health status of the population.

C.II.1.3.2. Methodological information

C.II.1.3.2.1. Focus of the investigation

Methodologically, health-status monitoring is based on a descriptive epidemiological study in which the characteristics monitored are analyzed at the population level in a selected area and during a selected period.

The theoretical bases are:

- theoretical knowledge of the effects of ionizing radiation from radionuclides released to the environment through nuclear-facility airborne and liquid discharges,
- the results of previous studies of the health status of the population living near nuclear facilities in the Czech Republic and abroad.

The objective is to identify current trends in the health status of the population in exposed and control areas defined in relation to the Temelín Nuclear Power Plant. Three types of characteristics are assessed in the selected areas (see below):

Sociodemographic characteristics: These are used to assess the population background, which substantially affects the values of basic and special health indicators. The sociodemographic analysis focuses primarily on assessing aspects of population aging because the population's age structure is a fundamental parameter determining trends in population health-status indicators.

Basic health characteristics: Together, these express the overall level of population health in the population groups studied and provide a basis for assessing special health indicators. Overall mortality, i.e., without distinction by cause, is reported, as are mortality from circulatory-system diseases and mortality from malignant neoplasms.

Special health characteristics: Unlike the mortality described above, the occurrence of newly diagnosed cases of malignant neoplasms (incidence of malignant neoplasms) is an important measure of health status of the population in relation to an ionizing-radiation source under normal operation. Although population morbidity may also be described using numerous other criteria, such as the incidence of obesity, metabolic diseases, etc., the long-term effects of ionizing radiation are associated most strongly with their potential consequences for the development of malignant neoplasms. For this reason, the incidence of all malignant neoplasms is monitored in the exposed and control areas defined in relation to the Temelín Nuclear Power Plant, except for non-melanoma skin cancers, the detection of which is unreliable and which are therefore routinely excluded from epidemiological overviews of population health status. The special health characteristics also include certain other selected indicators of reproductive-cycle disorders, namely the incidence of abortions and the birth rate of children with low birth weight (less than 2,500 grams).

The health-characteristic assessment is based on the program for monitoring the health status of the population in the area of interest (conducted since 1992 using J. Kotulán's methodology) and analyzes data divided into the decades of construction and the subsequent twenty years of operation. The current assessment covers the complete period through 2020 and supplements it with the latest available data from 2019–2022 for the key indicators of mortality, reproductive disorders, and incidence of malignant neoplasms. The resulting data therefore reflect the population's actual health status against the background of long-term operation of the existing units.

C.II.1.3.2.2. Areas monitored

Following the Health Status of the Population Monitoring Program, the division into two exposed areas, the closer area (E1) and the more distant area (E2), and two control areas, specifically the České Budějovice control area (KB) and Písek control area (KP), is retained. This territorial definition is used to detect any impacts of the Temelín Nuclear Power Plant on health status; findings from the exposed areas are compared with corresponding data from control sets of municipalities selected to have, as far as possible, similar social, economic, and rural backgrounds.

Closer exposed area E1: It consists of a group of municipalities with a direct line of sight to the Temelín Nuclear Power Plant and comprises five administrative municipalities. In 2021, they had 11,314 residents.

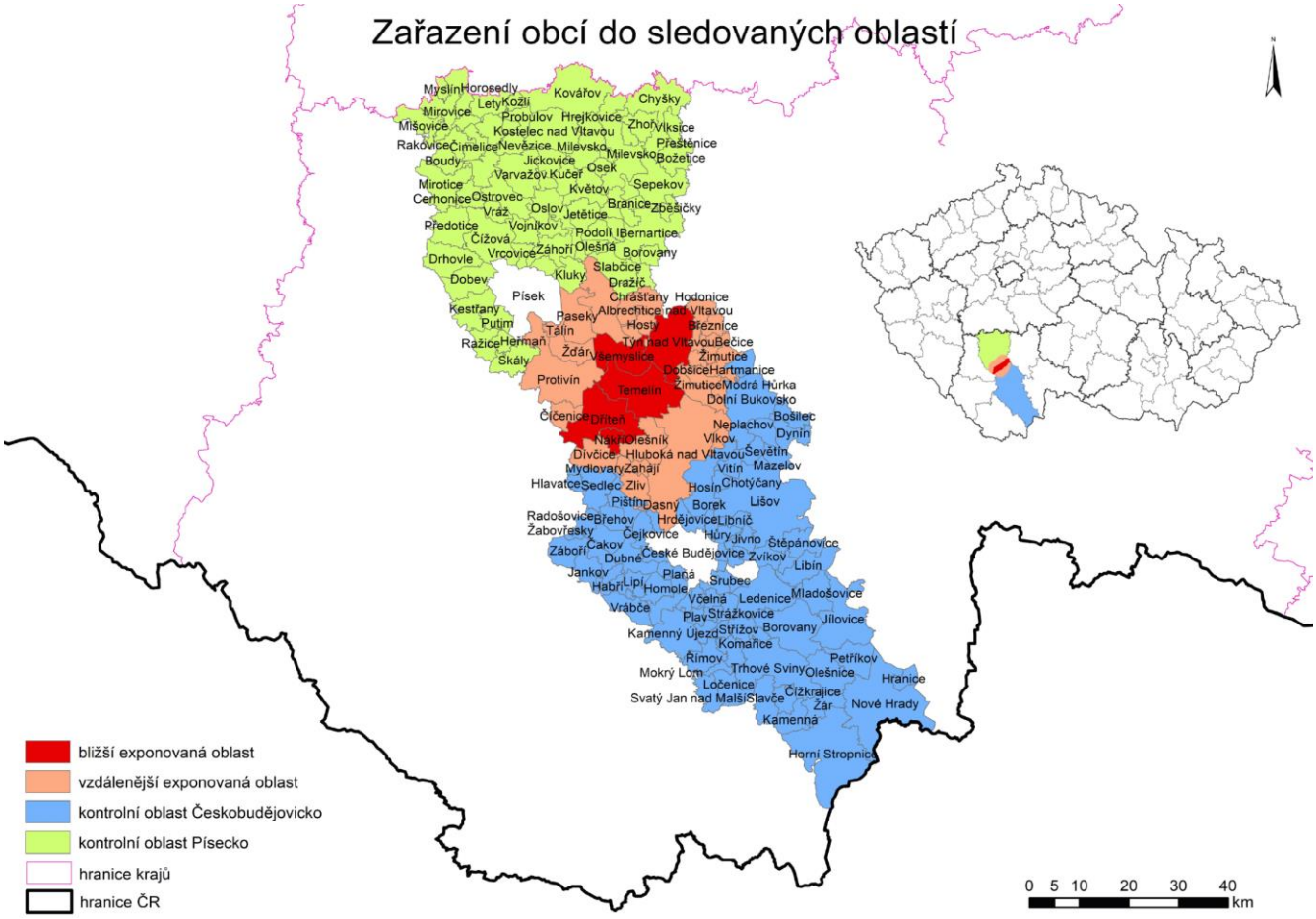
More distant exposed area E2: It forms a band adjoining the perimeter of the above closer exposed area (E1) and extending to the boundary of the established emergency planning zone, i.e., to a distance of approximately 13 km. It comprises 24 administrative municipalities. The municipalities in the exposed area that belong to České Budějovice District largely overlap the administrative district of the Týn nad Vltavou municipality with extended powers (ORP); the other municipalities in the exposed area belong to Písek District and, to a small extent, the Tábor and Strakonice ORP administrative districts. In 2021, they had 19,822 residents.

České Budějovice control area (KB): The set of remaining municipalities in České Budějovice District (i.e., those not included in the exposed areas), excluding the City of České Budějovice. It comprises 87 administrative municipalities. In terms of the administrative division into ORP administrative districts, it comprises most of the České Budějovice ORP administrative district and the entire administrative territory of the Trhové Sviny ORP. In 2021, they had 76,858 residents.

Písek control area (KP): It comprises the remaining municipalities in Písek District (i.e., municipalities not included in the exposed areas), excluding the City of Písek. This area comprises 70 administrative municipalities. In terms of the further administrative division, it comprises the majority of the Písek ORP administrative territory and the entire Milevsko ORP administrative territory. A significant part of the Písek control area has a high radon risk, estimated to affect more than 10 % of residential buildings in the area. In 2021, they had 34,419 residents.

A total of 142,413 residents live in the exposed and control areas monitored. The definition of the areas is shown in the following figure.

Fig. C.2: Assignment of municipalities to the monitored areas and their definition in relation to the Czech Republic



	Assignment of municipalities to the monitored areas
	closer exposed area
	more distant exposed area
	České Budějovice control area
	Písek control area
	regional boundaries
	The Czech Republic's border

C.II.1.3.3. Health-status investigation results

C.II.1.3.3.1. Sociodemographic characteristics

Sociodemographic characteristics are used to assess the population background, which substantially affects the values of basic and special health and psychological indicators. These factors (age, education, and income) affect the population's psychological and physical health regardless of the power plant's existence and act in epidemiological studies as confounding factors (confounders), which must be distinguished from any effects of ETE operation. The population's health status is shaped by the etiological triad, in which economic, political, and cultural relationships at the place of residence jointly contribute to living conditions. Two exposed areas, the closer area (E1) and the more distant area (E2), and two control areas, České Budějovice (KB) and Písek (KP), are defined for the detection of any impacts. The control sets are selected to have a similar

sociodemographic character of the rural population (excluding the regional and district capitals), making it possible to determine whether deviations are caused by operation of the source or by other lifestyle factors. The assessment is based on the Population and Housing Census (SLDB); the current analyses use 2021 data in conjunction with the long-term monitoring conducted continuously since 1992. The assessment covers demographic characteristics (population, age structure, migration flows, and life expectancy); social characteristics (educational attainment, economic activity, unemployment, and income); and settlement and housing characteristics (numbers of houses and dwellings, proportion of single-family houses, occupancy, and age of the housing stock).

In the most recent periods, the general population-aging trends have continued in the exposed areas (mainly exposed area E1) and the Písek control area. The population's age structure is subsequently reflected in reproductive capacity, marital status, educational-attainment structure, and economic activity.

Trends involving a population influx, a greater representation of younger age groups, and increasing population educational attainment are continuing in the more distant exposed area E2 and the České Budějovice control area (KB). Part of the population influx into the Písek control area (KP), especially in the most recent period, is also attributable to international migration, primarily in connection with the war in Ukraine. Foreign nationals account for 5 to 9 % of the population in the exposed and control areas, approximately 60 % of whom are Ukrainian nationals. Overall, people arriving in connection with the war in Ukraine therefore account for approximately 4.5 % of the population in the exposed and control areas.

Current sociodemographic trends in both the exposed and control areas may be expected to be reflected increasingly in the health indicators monitored and, to some extent, to act as confounding factors (confounders), which are one cause of uncertainty in epidemiological studies.

C.II.1.3.3.2. Health characteristics

C.II.1.3.3.2.1. Health-characteristic indicators

The population's health status is examined mainly using negative-health indicators, i.e., morbidity and mortality indicators. This is a relatively common way of expressing population health status, including in comparable foreign studies. Morbidity and mortality indicators are also routinely reported in national statistics.

In view of the potential impacts of SMR ETE (ionizing radiation and psychological stress) and the availability of health data, the selected health-status characteristics are mortality, the occurrence (incidence) of malignant neoplasms, and impairment of reproductive function (childbearing).

The following mortality indicators are assessed for 1992–2022:

- Mortality (all age groups):
  - overall mortality (all deaths without distinction by cause),
  - mortality from circulatory-system diseases (cardiovascular diseases),
  - mortality from malignant neoplasms.
- Premature-mortality indicator (for the population aged 1–65):
  - years of potential life lost (YPLL), the age-standardized average number of years by which decedents fell short of reaching 65 years of age.

The incidence of malignant neoplasms is assessed for 1992–2021. The set of all newly diagnosed malignant neoplasms is monitored, except for non-melanoma skin cancers (C00 through C97, excluding C44 [1]), together with a selection of eight specific diagnoses under the 10th revision of the International Classification of Diseases (ICD-10):

- Incidence of malignant neoplasms:
  - malignant neoplasms of the stomach (C16),
  - malignant neoplasms of the colon and rectum (C18 through C21),
  - malignant neoplasms of the pancreas (C25),
  - malignant neoplasms of the trachea, bronchus, and lung (C33 through C34),
  - malignant neoplasms of the female breast (C50),
  - malignant neoplasms of the prostate (C61),
  - malignant neoplasms of the urinary tract (C64 through C68),
  - malignant neoplasms of lymphoid, hematopoietic, and related tissue (C81 through C96).

All mortality and malignant-neoplasm incidence indicators are calculated separately for men and women and are age standardized. The results are expressed using internationally applied indicators: for mortality, the Standardized Mortality Rate; and for neoplasm incidence, the Standardized Incidence Rate. National data (Czech Republic), always from the same period, are used as the reference basis for comparison.

Certain malignant neoplasms in children and young adults up to 24 years of age are also monitored. The selected malignant neoplasms are those whose incidence was the subject of epidemiological studies in connection with nuclear-facility operation in Sellafield, England, from the 1960s through the 1980s. These are the following:

[1] Under ICD-10 (International Statistical Classification of Diseases), C44 denotes other malignant neoplasm of skin.

- Incidence of childhood leukemia and non-Hodgkin lymphoma:
  - non-Hodgkin lymphomas (C82 through C85),
  - leukemias (C91 through C95).

Two indicators are assessed as characteristics of impairment of the reproductive process for 1992–2022:

- Characteristics of impairment of the reproductive process:
  - incidence of abortions,
  - birth rate of children with low birth weight (below 2,500 g).

These reproductive-health indicators are not age standardized.

Trends are assessed within closed ten-year periods (1992–2000, 2001–2010, and 2011–2020) and updated using the latest available data. The underlying data for all the characteristics specified are obtained from the databases of the Czech Statistical Office and the Institute of Health Information and Statistics of the Czech Republic (National Cancer Registry and National Register of Abortions).

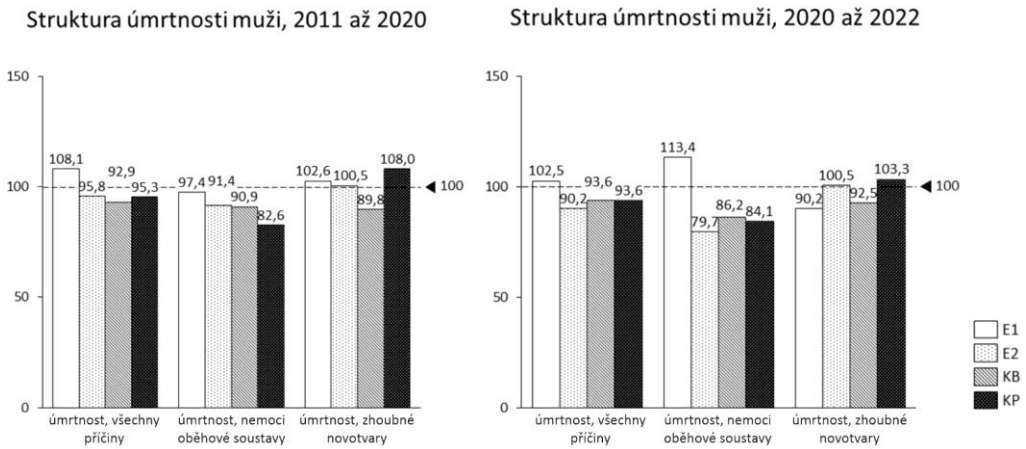
C.II.1.3.3.2.2. Mortality

The results of the overall population-mortality investigation in the ETE area of interest show no long-term, significant deviations from the situation characteristic of most of the Czech Republic. In exposed areas E1 and E2, age-standardized mortality rates are lower than in the Czech Republic in most cases. Short-term trends from the latest period, 2020 through 2022, could indicate a certain increase in mortality from circulatory-system diseases among men and from malignant neoplasms among women, in both cases in the closer exposed area E1; the trends did not, however, reach statistical significance. Mortality data for 2019 through 2022 are also distorted by changes caused by the course of the COVID-19 pandemic and by the larger influx of foreign nationals, especially as a result of the war in Ukraine.

Available literature reviews indicate that the strongest determinants affecting population mortality are sociodemographic and socioeconomic living conditions. It is therefore unsurprising that the standardized population-mortality rates in the Temelín Nuclear Power Plant area of interest do not differ significantly from the national average. Overall trends in population mortality and its causes continue to correspond to the trends applicable to the Czech Republic.

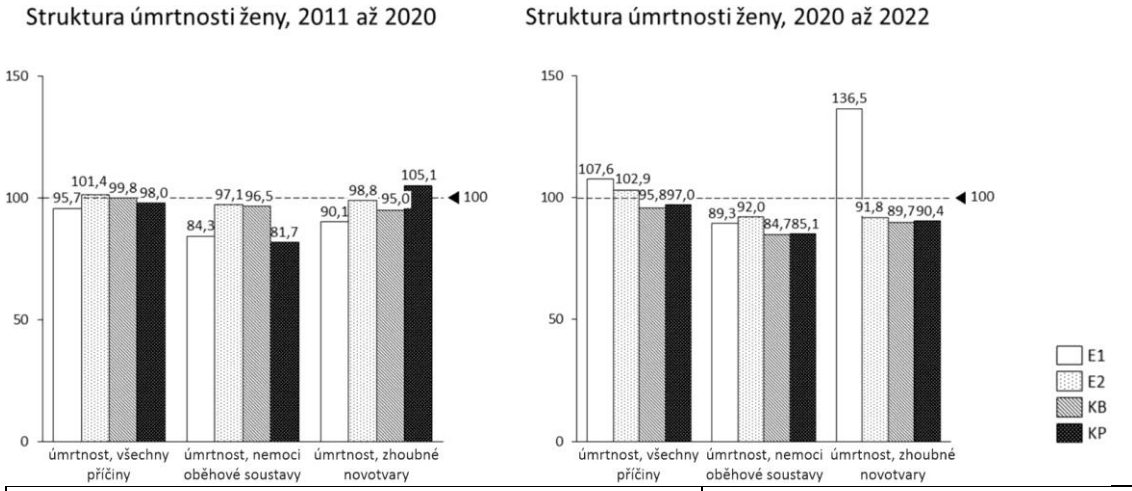
The age distribution is logically reflected in the mortality structure. Long-term trends in the Czech Republic show that people over 65 years of age account for more than 80 % of deaths and that circulatory-system diseases predominate among causes of death, followed by malignant neoplasms. At the onset of the COVID-19 pandemic, COVID-19 became a frequent cause of death and, in 2021, was even the leading cause of death for one year. The spread of COVID-19 throughout the Czech Republic worsened mortality conditions in the country, increasing mortality by an average of 20 %, the largest increase in the history of the Czech state since 1919.

Fig. C.3: Mortality trends and changes among men



Struktura úmrtnosti muži, 2011 až 2020	Mortality structure among men, 2011 through 2020
Struktura úmrtnosti muži, 2020 až 2022	Mortality structure among men, 2020 through 2022
úmrtnost, všechny příčiny	mortality, all causes
úmrtnost, nemoci oběhové soustavy	mortality, circulatory-system diseases
úmrtnost, zhoubné novotvary	mortality, malignant neoplasms

Fig. C.4: Mortality trends and changes among women



Struktura úmrtnosti ženy, 2011 až 2020	Mortality structure among men, 2011 through 2020
Struktura úmrtnosti ženy, 2020 až 2022	Mortality structure among men, 2020 through 2022
úmrtnost, všechny příčiny	mortality, all causes
úmrtnost, nemoci oběhové soustavy	mortality, circulatory-system diseases
úmrtnost, zhoubné novotvary	mortality, malignant neoplasms

Years of Potential Life Lost (YPLL) is an internationally recommended and comparable indicator of premature mortality. It is determined as the number of years by which decedents fell short of reaching the age considered the standard life span, i.e., the age at which death may be assessed as biologically expected. This means that the younger the age at death, the greater the loss of years reflected in the indicator. The standardized life-expectancy indicator provides another perspective on mortality. A downward trend was apparent in all areas over the years through 2020. The downward trend was halted by the course of the COVID-19 pandemic. Similarly, regular Czech Statistical Office analyses of life expectancy show that, compared with the Czech Republic (reference data), life expectancy among men is lower in an area approximately corresponding to exposed area E1 and in part of the Písek control area. Among women, life expectancy is lower only in one part of the České Budějovice control area. The greatest limitation of this assessment method is that life expectancy provides no information about quality of life. In recent years, longer life expectancy has become increasingly associated with a decreasing number of years lived in good health. Advances in medicine do not increase mortality, but rather the prevalence (population occurrence) of chronic diseases. Over the past 20 years, the number of years lived in less than full health in the Czech Republic has increased by approximately 10 years, more among women, with an increasing trend.

Table C.6: Life expectancy at birth by selected ORP administrative district in relation to ETE, 2018–2022

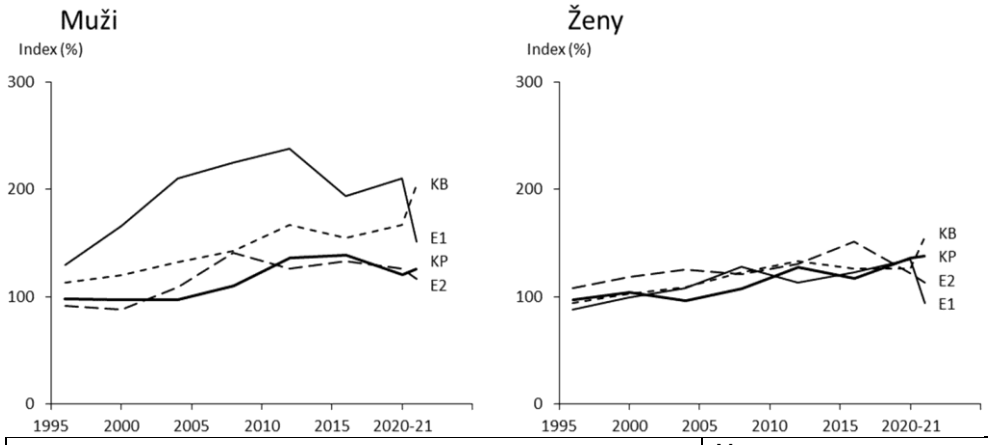
ORP administrative district	Related area	Men		Women	
		life expectancy	relative to the Czech Republic	life expectancy	relative to the Czech Republic
Týn nad Vltavou	E1	76.0	lower	82.2	higher
České Budějovice	E2, KB	76.8	higher	81.9	equivalent
Trhové Sviny	KB	74.7	lower	80.6	lower
Milevsko Area	KP	76.5	higher	82.1	higher
Písek	KP	76.0	lower	82.0	equivalent
Reference indicators					
Czech Republic, 2018		76.1		81.9	
Czech Republic, 2022		76.2		82.0	

C.II.1.3.3.2.3. Incidence of malignant neoplasms

The incidence of malignant neoplasms in the Czech Republic has shown a long-term increasing trend exceeding five cases per 1,000 residents per year, although the rate of increase slowed slightly after 2010. Whereas men are affected most frequently above 70 years of age, disease onset is earlier among women because gynecological cancers occur earlier. Almost half of all diagnoses in the Czech Republic are neoplasms of the colon and rectum, respiratory tract, female breast, and male prostate; overall epidemiological trends around the Temelín Nuclear Power Plant mirror these national values.

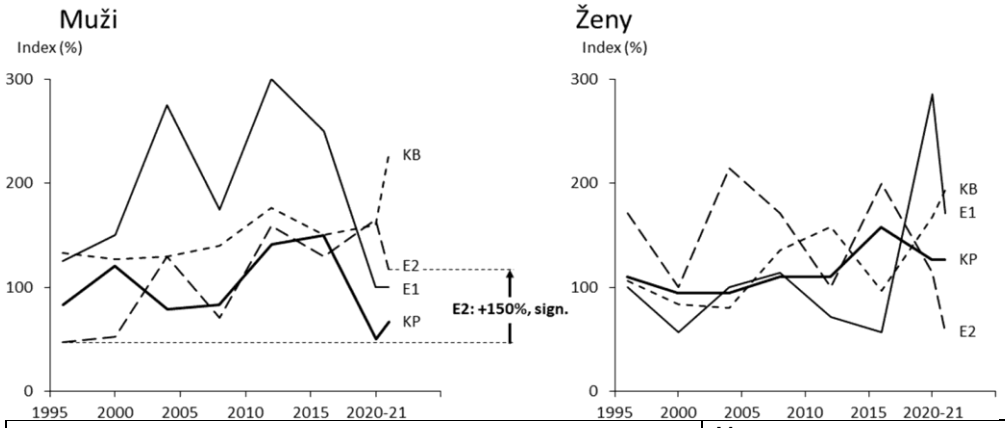
Trends in the incidence of malignant neoplasms are shown in the following figures.

Fig. C.5: Relative change in the incidence of all malignant neoplasms (C00 through C97, excluding C44)



	Men
	Women
	Index (%)

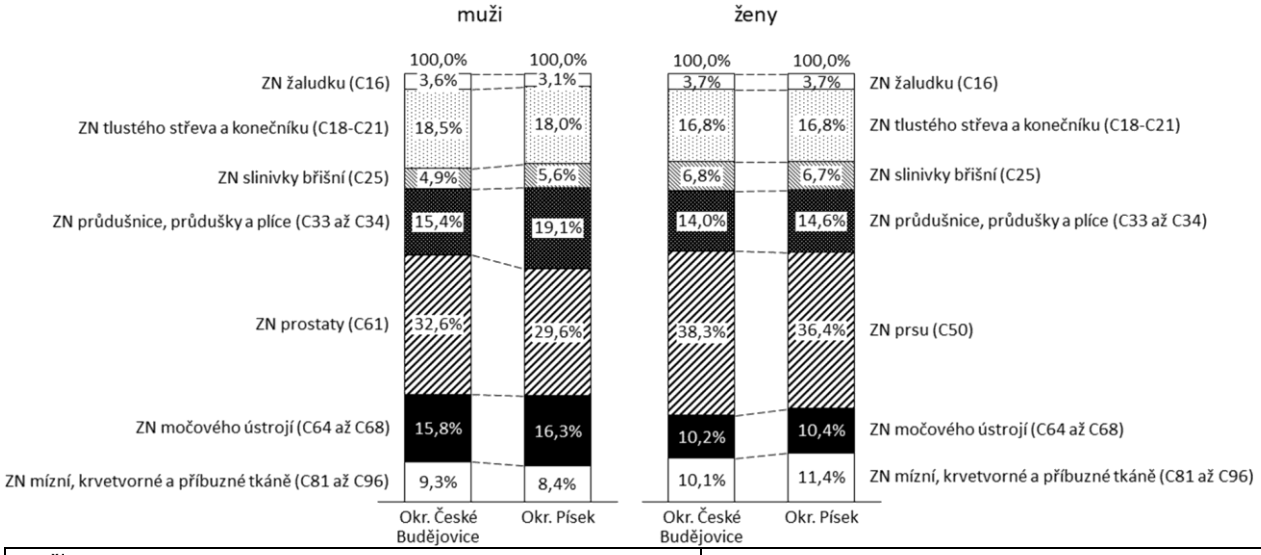
Fig. C.6: Relative change in the incidence of malignant neoplasms of lymphoid, hematopoietic, and related tissue (C81 through C96)



	Men
	Women
	Index (%)

The increase in reported cases of breast, prostate, and colorectal cancer primarily reflects the success of active screening programs, while lung cancer is decreasing among men but increasing steeply among women. Although the effect of ionizing radiation has been demonstrated most strongly for neoplasms of lymphoid and hematopoietic tissue (leukemias and lymphomas), an effect of ETE operation on the increased incidence of these diseases in the more distant area E2 was not confirmed because there are alternative explanations for these deviations that are independent of the power plant. In České Budějovice and Písek Districts, cancer incidence follows national trends, with slight local deviations such as a higher proportion of lung cancer among men in the Písek area or a specific incidence of pancreatic cancer among women there.

Fig. C.7: Structure of malignant neoplasms in České Budějovice and Písek Districts



muži	men
ženy	women
ZN žaludku (C16)	MN of the stomach (C16)
ZN tlustého střeva a konečníku /C18-C21)	MN of the colon and rectum (C18–C21)
ZN slinivky břišní (C25)	MN of the pancreas (C25)
ZN průdušnice, průdušky a plíce (C33 až C34)	MN of the trachea, bronchus, and lung (C33 through C34)
ZN prostaty (C61)	MN of the prostate (C61)
ZN prsu (C50)	MN of the breast (C50)
ZN močového ústrojí (C64 až C68)	MN of the urinary tract (C64 through C68)
ZN mízní, krvetvorné a příbuzné tkáně (C81 až C96)	MN of lymphoid, hematopoietic, and related tissue (C81 through C96)
Okr. České Budějovice	Dist. České Budějovice
Okr. Písek	Dist. Písek

Long-term epidemiological trends in the exposed and control areas of the Temelín Nuclear Power Plant correspond to national trends. The overall incidence of all malignant neoplasms in these areas is the same as or lower than that throughout the Czech Republic and shows a slight downward trend. In recent periods, Standardized Incidence Rate values have been comparable among the exposed and control areas.

During the past ten years, statistically significant positive deviations were recorded only for selected diagnoses and locations. Specifically, these are malignant neoplasms of the colon, rectum, and pancreas in the Písek control area and neoplasms of lymphoid and hematopoietic tissue among men in exposed area E2. The other indicators monitored are either below the national average or do not differ from it statistically.

The most rapid fluctuations in incidence among the areas monitored occurred in 2020 and 2021. This phenomenon overlaps with the COVID-19 pandemic, which brought fundamental changes in the organization of medical care that may also have been reflected in the reported incidence of malignant neoplasms. In most cases, however, the disease structure in the exposed and control areas maintains trends corresponding to the average for the Czech Republic.

Malignant neoplasms are diseases that develop as a result of long-term exposure, often lasting for decades. This study, which is based on anonymized data from national registries, generally cannot take into account every possible exposure factor, such as genetic effects; lifestyle factors, including smoking and alcohol consumption; other occupational risks outside the Temelín Nuclear Power Plant; numerous socioeconomic effects; and other unmeasurable factors. There is even epidemiological evidence that, for example, night-shift work is considered a possible risk factor for the development of certain types of malignant neoplasms. Uncertainty in estimates comparing the incidence of malignant neoplasms between the exposed and control areas may result from their historical definition, which continues to be followed to preserve data continuity; the orientation of the exposed and control areas relative to the cardinal directions; and the non-negligible burden on the Písek control area resulting from the presence of radon in the geological bedrock.

C.II.1.3.3.2.4. Incidence of childhood leukemia and non-Hodgkin lymphoma

Information on increased numbers of leukemia and certain other malignant neoplasms of the lymphatic system (non-Hodgkin lymphomas) among children, especially those aged 0 to 4, and in some rare cases among young people up to 25 years of age, near nuclear facilities attracted particular interest in the professional literature and among the public in the past.

The numbers of cases that occurred in the Temelín Nuclear Power Plant area of interest, i.e., leukemias (C91 through C95) and non-Hodgkin lymphomas (C82 through C85) among children and young adults up to 24 years of age, are presented in the following tables. The results serve only as a record of case numbers and are not subject to further statistical assessment because the number of cases cannot be assessed statistically. It may, however, be logically assumed that the 12 cases of leukemia and four additional cases of non-Hodgkin lymphoma in the České Budějovice control area (KB) from 2001 to the present may be associated with the influx of young people into the České Budějovice control area after 2000. Since ETE1,2 were commissioned in 2000, no new case of leukemia among children or young adults and one case of non--Hodgkin lymphoma in this population category have been recorded in exposed areas E1 and E2.

Table C.7: Incidence of leukemia among children and young adults in the ETE area of interest

Area	1992–2000	2001–2010	2011–2021
E1	1	0	0
E2	0	0	0
KB	0	6	6
KP	0	1	2

Table C.8: Incidence of non-Hodgkin lymphoma among children and young adults in the ETE area of interest

Area	1992–2000	2001–2010	2011–2021
E1	1	0	0
E2	0	1	0
KB	2	2	2
KP	2	1	0

C.II.1.3.3.2.5. Characteristics of impairment of the reproductive process

As with the other health indicators, reproductive-health indicators are not strictly specific to operation of the existing Temelín Nuclear Power Plant. A woman's reproductive capacity depends on numerous health and psychosocial variables (overall health status, diet, maternal age at conception, etc.) and on the standard of medical care.

The number of abortions in the exposed and control areas defined in relation to the Temelín Nuclear Power Plant site shows a similar trend in closer exposed area E1 and both control areas: until approximately 2020, the number of abortions increased gradually; in accordance with the national trend, it began to decrease after 2020. The reasons for the decrease in abortions after 2020 are the subject of numerous studies; sociodemographic effects, or emerging changes in sexual behavior and family planning, are assumed in particular. Unlike in exposed area E1 and the control areas, the number of abortions in exposed area E2 did not begin to decrease after 2020. The causes of this phenomenon have not been fully clarified.

The number of newborns with low birth weight in the area of interest in relation to the Temelín Nuclear Power Plant increased through 2020 and subsequently decreased in both the exposed and control areas. The decrease could also correspond to the trend in the number of abortions because abortion and low birth weight are both manifestations of a medically high-risk pregnancy.

Table C.9: Spontaneous-abortion index in the exposed and control areas

Area	1992–2000	2001–2010	2011–2021	2021–2022
E1	107.3	113.6	123.3	109.2
E2	103.8	117.6	123.8	137.9 *
KB	92.4	113.4	124.3	105.3
KP	91.4	234.3 *	289.4	114.9

* ... statistical significance at the 5 % significance level

Table C.10: Index of births of children with low birth weight

Area	1992–2000	2001–2010	2011–2021	2021–2022
E1	52.9	78.0	76.4	60.5
E2	56.1	77.7	88.3	63.9
KB	59.7	77.3	82.6	56.2
KP	74.2	79.3	76.9	64.8

Impairment of human reproduction has been studied in the past in relation to certain events associated with nuclear-facility accidents around the world, particularly the 2011 Fukushima nuclear power plant accident and the earlier 1986 Chornobyl nuclear power plant accident. Nuclear power plant accidents are often associated with elevated background radiation and therefore provide opportunities to study direct impacts on population health status under natural conditions. It is noteworthy that, in these situations, the elevated abortion rate among the population affected by the accidents was more strongly associated with people's fears than with demonstrable radiobiological effects, i.e., health care facilities recorded more maternal requests for abortion because of fears of genetically determined consequences.

Trends in reproductive-health indicators may also be associated with changes in the population's sociodemographic structure. Large-scale immigration from abroad in 2022, mainly in connection with the outbreak of the war in Ukraine, also brought changes in the provision and use of medical care. Available Czech Statistical Office data document that the most frequent reasons for hospitalization of foreign women are conditions associated with pregnancy, childbirth, and the postpartum period, including care associated with abortions. There is also some international evidence that large numbers of women were raped in connection with the war in Ukraine and subsequently left their country and sought assistance in countries that accepted war refugees. Nevertheless, trends in the abortion rate are affected by other measured and unmeasured risk factors, such as increasing maternal age at conception and numerous biologically and sociodemographically determined characteristics.

International analyses of reproductive-health registry data conducted to date and available meta-analyses have not demonstrated a convincing relationship between low-dose ionizing-radiation exposure and the abortion rate or children's birth weight. Evidence of adverse trends in human reproductive health cannot be identified unequivocally in either the exposed or control areas in relation to the Temelín Nuclear Power Plant site.

C.II.1.3.3.3. Overall assessment and conclusions of the health-status investigation

The following conclusions arise from the results of the population health-status investigation:

- Overall, mortality-indicator trends in the exposed areas do not differ substantially from the comparable indicators applicable throughout the Czech Republic. A long-term decrease can be observed in the Years of Potential Life Lost (YPLL) indicator, which is developing in accordance with the national trend. The mortality indicators are affected in part by the consequences of the COVID-19 pandemic.
- Overall trends in the incidence of malignant neoplasms among men and women in the exposed areas are stable and remain at the level of the trends in the control areas. Changes in trends correspond to the national scale, while data from the exposed areas, which have smaller populations, are more sensitive to short-term fluctuations. At the detailed level, an increasing incidence of malignant neoplasms of lymphoid, hematopoietic, and related tissue among men in the more distant exposed area E2 can be observed, but a direct effect of the Temelín Nuclear Power Plant cannot be confirmed on the basis of the available findings because all important risk factors cannot be controlled.
- The incidence of childhood leukemia is sporadic; in recent years, new cases have occurred in only one control area, and no clusters of new cases have developed.
- The incidence of spontaneous abortions and the birth rate of children with low birth weight are stable over time. Reproductive-health indicators may also be affected by the arrival of migrants.

As the stated data show, no new or unexpected changes in population health status that could be causally associated with operation of ETE1,2 have been identified. Irregularities persist in the basic and special population health-status indicators, and they cannot be fully explained on the basis of the available data. It may, however, be assumed that the health status of the population in the Temelín Nuclear Power Plant area of interest is affected by numerous factors, the strongest of which are probably sociodemographic. Mortality data for 2019 through 2022 are also distorted by changes caused by the course of the COVID-19 pandemic and by the larger influx of foreign nationals, especially as a result of the war in Ukraine.

Sociodemographic changes in the region caused by construction of the nuclear power plant between 1990 and 2000, together with the effects of large and small birth cohorts, are reflected in the current intensity and structure of mortality. Over the long term, circulatory-system diseases are the predominant cause of mortality in the exposed and control areas in relation to the Temelín Nuclear Power Plant; mortality trends over time are stable. For the incidence of malignant neoplasms, it continues to be confirmed that the most frequent types, such as malignant neoplasms of the colon and rectum, female breast, and prostate, have increased gradually from the 1990s to the present, but in most cases no more rapid increase in malignant neoplasms has been demonstrated in the exposed areas than among the population of the control areas. The exception is malignant neoplasms of lymphoid, hematopoietic, and related tissue in the more distant exposed area E2, where an increase was recorded during the past decade and in the latest available data. An elevated incidence of malignant neoplasms of the pancreas among women was observed in the Písek control area during the most recent period.

Overall trends in population mortality and its causes continue to correspond to the trends applicable to the Czech Republic. A hypothesis may be derived from the available data that the statistically non-significant increase in mortality in the closer exposed area E1 could be caused by the natural aging of the local population, whose base was formed in part by the workforce that migrated to the region 30 years ago during ETE construction in the 1990s and is now, quite naturally, increasing age-related mortality. This hypothesis cannot, however, be confirmed on the basis of routine data.

The overview of the incidence of childhood leukemia and non-Hodgkin lymphoma shows several sporadic cases, especially in recent years, mainly in the České Budějovice control area rather than the exposed areas.

Reproductive-health indicators follow current general trends, except for the continuing increase in abortions in the more distant exposed area E2, while a decrease has occurred elsewhere in the Czech Republic. It may be hypothesized that deviations in reproductive-health indicators are affected by sociodemographic characteristics, especially by the influx of foreign nationals and care for them as a result of the ongoing war in Ukraine. Similarly, other population health-status data may also be distorted by the accuracy of disease diagnosis and reporting to databases and registries and by the course of the COVID-19 pandemic, which resulted in changes in the organization of medical care and the timely diagnosis and treatment of chronic diseases.

C.II.1.4. Psychological status of the population

The safety of nuclear power plant operation is an area monitored worldwide and by society as a whole. In addition to key technical safety aspects, psychological aspects of the safe operation of these facilities are playing an increasingly important role in assessments of the social acceptability of operating existing and planned nuclear power plants. These assessments seek to identify and evaluate what the public feels, experiences, and thinks about these facilities, including both the population living near nuclear power plants and the general public as a whole. They determine whether residents are afraid of anything (and, if so, of what), whether their psychological state is generally more stable or, conversely, whether they experience and feel the consequences of acute or chronic stress and anxiety, and whether they are generally satisfied or dissatisfied with life, which includes, among other things, operation of nuclear facilities.

An analysis of the population's psychological status was prepared to assess the impact of long-term SMR operation at the Temelín site on the psychological status of residents living nearby (P. Sadílek: Study of the Psychological Status of the Population at the Temelín Site, 2025, INRES Agency, Jacobs Clean Energy s.r.o. June 2025). The fundamental objective of the research conducted was to determine whether psychological instability occurs more frequently among residents near the Temelín Nuclear Power Plant than elsewhere, whether they are affected by feelings of anxiety more than other groups in the Czech population, and whether they live with stress and fear of a possible accident at the nearby nuclear power plant. The research techniques selected were adapted to this objective so that the findings would be objective and express the actual current situation in the area monitored. The following indicators were investigated:

- N - neuroticism. Neuroticism manifests itself in greater emotional instability, increased anxiety proneness, and, in some cases, irritability.
- L - lie score, the "lie scale". This expresses the tendency to present oneself in a better light than the reality warrants. This item is also relevant to assessing the truthfulness of the respondent’s answers.
- DE - depressive symptoms. This is one of the key areas assessed. This includes items such as indecision, dissatisfaction, pessimism, social isolation, and fatigability. The aim is to determine whether depressive symptoms occur to a greater extent in the sample under study.
- LOC - locus of control. It reflects the level of belief in one’s own abilities, self-confidence, and belief in one’s personal responsibility.
- LS - life satisfaction. This characterizes the overall level of satisfaction with one's own life and the way it is experienced.
- F - experienced fear and anxiety. This identifies the level of frustration and any feelings of fear or anxiety concerning the surrounding world or oneself.
- SE - self-efficacy. This expresses the level of confidence in one's own abilities, particularly the ability to assert oneself in the contemporary world and cope under its conditions.

A special methodology was developed for the research, comprising a set of 24 statements compiled into an interviewer questionnaire, to which respondents indicated their positions using a seven-point scale ranging from "applies completely" to "does not apply at all". The methodology was developed using existing foreign experience as well as the researchers' own experience as psychologists working on this research project. Before the field investigation itself was conducted, this methodology was verified in a pilot investigation. This eliminated the risks of potential methodological and procedural shortcomings. The methodology used was identical to the instruments applied during the field investigations in 2000 and 2002. In addition, in 2004, 2011, 2018, and 2025, respondents were asked whether they had experienced any serious event in their personal lives during the preceding two years that caused great dissatisfaction with life. This could have affected the results of the research.

The interviewer questionnaire was prepared so that it did not reveal that the research was in any way related to the Temelín Nuclear Power Plant. The research was presented as part of activities aimed at identifying various aspects of the health status of the population of the Czech Republic with the objective of improving it. The reason for this approach was to eliminate the conscious projection of any negative attitudes toward ETE into the requested responses and to avoid the resulting biases.

The sample was constructed on the basis of the following parameters:

- a total sample size of 1,101 people,
- a sample size of 550 people in exposed area E1, who live in the immediate vicinity of the Temelín Nuclear Power Plant; exposed area E1 is defined in the same manner as exposed area E1 for the assessment of the population's health status (see Chapter C.II.1.3. Health status of the population, page 213 of this Documentation),
- a sample size of 551 people in the control group, who live in the East Bohemian region and are not exposed to any suspected specific psychosocial stressors,
- the sex and age structure of the sample for both groups was derived from the structure of the base population in the exposed area,
- the age range was 15 and over, and respondents' highest educational attainment was taken into account (basic-vocational qualification, secondary education without the matura examination-secondary education with the matura examination, and bachelor's-university studies),
- the respondent's employment and net income were not parameters used to construct the sample (they were only recorded).

The South Bohemian sample (exposed area E1) included respondents from Dříteň, Nákří, Temelín, Týn nad Vltavou, and Všemyslice. The East Bohemian region included respondents from Hradec Králové, Chrudim, Náchod, Rychnov nad Kněžnou, Pardubice, Svitavy, and Ústí nad Orlicí. The sample was intentionally dispersed to eliminate the effect of random suspected psychosocial stressors.

Data were collected through structured interviews between interviewers and respondents using a fully standardized interviewer questionnaire prepared on the basis of the methodology described above. The research was conducted by INRES Agency interviewers; a total of 112 interviewers participated so that each interviewer conducted no more than ten structured interviews.

During the field investigation, the interviewers approached a total of 1,382 randomly selected members of the public and asked them to participate in an interview concerning the population's psychological well-being. A total of 281 respondents (i.e., 20.3 % of all those approached) declined the interview. In the exposed group, women were more likely than men to consent to participate in the research. Women aged 20 to 34 and over 65 were the most willing to participate in the research, while the least willingness was recorded among both men and women in the youngest age group, 15–19. Similarly, women were more likely than men to consent to participate in the research in the control group. Men aged 20–34 were the most willing to participate in the research, and men aged 15–19 were the least willing. Among women, those aged 15–19 were most likely to decline to participate in the research, while those aged 50–64 were the most willing. The most frequent reasons for declining to participate in the research were lack of time (48.7 %), the subject itself (23.7 %), and a lack of interest, unwillingness, or distrust of research in general (17.1 %).

The comprehensive analysis shows that statistically significant differences in psychological characteristics were identified between the exposed-area sample and the control-area sample.

For *neuroticism (N)*, manifested as greater emotional instability, increased anxiety proneness, or irritability, an increased incidence was recorded in the control sample in the East Bohemian region. In terms of practical significance, this difference has a small effect size. This means that neuroticism occurs significantly less frequently around the Temelín Nuclear Power Plant than in the control sample. This supports the conclusion that the existence of the Temelín Nuclear Power Plant does not cause increased neuroticism among residents living nearby.

For *depressive symptoms (DE)*, manifested as indecision, dissatisfaction, pessimism, social isolation, and fatigability, depressive states occurred significantly more frequently in the control sample, i.e., the dispersed population of the East Bohemian region. In this case, the practical significance indicates no effect. This means that depressive states occur significantly less frequently among residents living near the Temelín Nuclear Power Plant than in the control sample. This supports the conclusion that the existence of the Temelín Nuclear Power Plant does not cause an increased incidence of depressive states among residents living nearby.

For *locus of control (LOC)*, which expresses the level of confidence in one's own abilities, self-confidence, and belief in one's own responsibility, significantly poorer results were recorded in the control sample. In terms of practical significance, this difference has a small effect size. This means that the population living near the Temelín Nuclear Power Plant has greater confidence in its own abilities, greater self-confidence, and stronger belief in its own responsibility than the control sample. This supports the conclusion that the existence of the Temelín Nuclear Power Plant does not cause reduced self-confidence among residents living nearby in the form of reduced confidence in their own abilities and does not reduce their belief that they control their own lives.

For the assessment of *response truthfulness (L, the lie score)*, which reflects the tendency to present oneself in a better light than the reality warrants, significantly better results were recorded among residents living near the Temelín Nuclear Power Plant. Their responses appear more truthful than those of the dispersed population of the East Bohemian region. In this case, the practical significance indicates a small effect size.

No statistically significant differences were identified between the population living near the Temelín Nuclear Power Plant and the dispersed population of the East Bohemian region in *life satisfaction (LS)*, *level of frustration (F)*, or *self-efficacy (SE)*.

Table C.11: Comparison of the samples by reported causes of dissatisfaction with life

Cause of dissatisfaction with life	Proportion of responses (%)	
	Exposed area	Control area
Health problems	12.6	27.4
Problems at school or work	9.7	16.8
Family, emotional, relationship, and child-rearing problems	16.5	12.4
Financial problems	17.5	18.6
Job loss	0.0	0.9
General dissatisfaction with the state of society	6.8	9.7
Housing problems	1.0	0.9
Problems with oneself	18.4	20.4
Other (little free time, commuting, interpersonal relationships, weather, and fear of the future)	26.2	10.6

Note: The sum of the relative frequencies in each column exceeds 100 % because some respondents reported more than one cause of dissatisfaction with life.

A comparison of the Temelín and control samples in terms of reported causes of dissatisfaction with life indicates that the control sample reports health problems and problems at school (work) more frequently, while the Temelín sample reports family, emotional, relationship, and child-rearing problems and other problems more frequently (see the table). The differences in these factors were identified as the greatest. These are also factors that may be of key importance to a sense of life satisfaction. The number of respondents who reported a cause of dissatisfaction with life is higher in the control sample, and respondents in this sample reported a slightly higher average number of causes of dissatisfaction with life. As with the measurements in previous years, the greatest differences were recorded for the "health problems" item, which was reported significantly more frequently in the control sample. The causes of potential life dissatisfaction were identified by means of an open-ended question eliciting respondents' spontaneous responses. The existence of the Temelín Nuclear Power Plant was not stated as one of these causes in the Temelín

sample in any case. If residents of the exposed area are dissatisfied with anything, it concerns ordinary factors associated with the daily lives of most of the population.

The comprehensive analysis shows that the proximity of the Temelín Nuclear Power Plant does not adversely affect the population living in its immediate vicinity, does not cause neuroses, depression, or frustration, and has no effect on the level of self-confidence or sense of life satisfaction. The Temelín Nuclear Power Plant was not cited by residents of exposed area E1 even among the spontaneously reported causes of life dissatisfaction.

The psychological characteristics of the population living near ETE1,2 have been monitored since they were commissioned in 2000 and compared with the psychological characteristics of the dispersed population of the East Bohemian region. Between 2000 and 2025, six studies of the psychological characteristics of the population living near ETE1,2 were conducted and compared with the psychological characteristics of the dispersed population of the East Bohemian region. The Temelín Nuclear Power Plant and factors associated with it were not found to have an adverse effect on the psychological status of the population living nearby.

At present, too, the results of the investigation conducted in 2025 confirm the trend identified in previous years. The Temelín sample did not demonstrate a statistically significantly higher level of neuroticism, a higher level of depressive states, or a lower level of satisfaction with respondents' own lives and the manner in which they experience them. Nor was a greater tendency to present oneself in a better light identified. On the contrary, compared with the control sample, the population of exposed area E1 expresses greater confidence in its own abilities, self-confidence, and belief in its own responsibility, and also exhibits lower levels of neurotic and depressive states. It may be stated that the conclusion formulated in 2000, 2002, 2004, 2011, and 2018 remains valid: the population living in the immediate vicinity of the Temelín Nuclear Power Plant has accepted its existence and does not perceive it as a threat. Fundamentally, it acts on the basis of a well-calculated risk, the level of which it understands as acceptable and tolerable in relation to the reality of life. As a result of successfully managed trial operation and subsequent routine operation, this attitude became established and was not affected by reports of problems with nuclear power plant operation elsewhere in the world. The stated findings, and particularly the trend identified, indicate a relatively stable and favorable trend in the psychological characteristics of the population near the Temelín Nuclear Power Plant. This trend undoubtedly depends on the power plant's trouble-free operation and on the safety of nuclear power as a whole.

C.II.1.5. Public opinion

Public opinion provides supplementary information for describing population characteristics. The ČEZ Group has long commissioned public-opinion surveys and assessments focusing on public attitudes toward nuclear power and its future development. For this purpose, regular public-opinion surveys are conducted in a standardized format, providing both current public-opinion results and trends in public views. The surveys cover both the population's general attitudes toward nuclear power and operating power plants and specific issues concerning development, completion of new nuclear units, deployment of small modular reactors (SMRs), and disposal of spent fuel.

The surveys conducted cover either all of the Czech Republic or focus specifically on the affected regions surrounding the power plants. In both cases, they use a representative sample, usually of 500 respondents (regional waves use quota sampling with, for example, 200 respondents within 5 km and 300 respondents 5 to 13 km from the power plant). Data are collected using a combination of computer-assisted personal interviews and online surveys. Long-term opinion surveys are conducted by IBRS in accordance with the international ESOMAR standards; in more recent waves (since 2023), the OpenAI - ChatGPT tool has also been used experimentally to assess some of the open-ended results.

In addition to the long-term surveys conducted by IBRS, this chapter also takes into account the results of a nationally representative survey of attitudes toward nuclear power conducted by Ipsos between March and April 2026 using a sample of 513 respondents. The results of this investigation confirm the long-term trends identified in previous years, particularly strong support for nuclear power, the public's emphasis on the Czech Republic's energy self-sufficiency, and growing awareness of SMR technology.

National trends and nuclear-power statistics:

- The 2023 and 2024 surveys confirm absolute and consistently stable support for the Czech Republic's energy self-sufficiency. A stable total of 95 % to 96 % of the population of the Czech Republic wants the country to remain self-sufficient in electricity generation in the future. The main concern regarding a loss of this independence is an increase in electricity prices (reported by 74 % of respondents in November 2023 and a total of 68 % in May 2024). Perceptions of the direct effect of the war in Ukraine on Czechia's energy self-sufficiency and source preferences have weakened slightly over time: whereas the effect was previously perceived more strongly, the proportion of these respondents decreased by 8 % to 68 % in November 2023 and then to 65 % in May 2024, indicating that the public is beginning to view the situation as a long-term condition. At the same time, concerns about the conflict risks monitored are weakening, although the greatest fear remains possible damage to a Ukrainian nuclear power plant as a result of fighting (66 % in November 2023 and 59 % in May 2024).
- After previously increasing during the energy crisis, general support for the development of nuclear power in the Czech Republic stabilized slightly. From a peak of 72 % in November 2022, it decreased to 70 % in May 2023 and remained at a similar level in November 2023 (69 %) and May 2024 (70 %). Public support for the development of nuclear power in the Czech Republic and the development of renewable energy sources (OZE) is gradually converging, at 70 % for nuclear power and 76 % for OZE. Other fossil-fuel sources have an entirely minimal role in the public's conceptions of development (a few percent).
- At the same time, the trend toward coexistence of the two principal sources is increasing substantially. The proportion of people who support the concurrent development of nuclear power and OZE in the future energy policy increased from 51 % in November 2023 to 54 % in May

2024. An interesting shift has occurred in perceptions of economic benefits. Although price and inexpensive generation remain the main spontaneous arguments in favor of nuclear power, the proportion of respondents who believe that the presence of nuclear power plants in the Czech Republic contributes significantly to maintaining lower electricity prices decreased to 41 % in May 2024. Conversely, perceptions of nuclear power plants as a positive factor for employment in the affected regions are strengthening steadily (48 %). Support for a commitment to end nuclear electricity generation completely in the future, following the example of certain EU countries, remains stable year over year at approximately one fifth (19 % in May 2023 and 21 % in November 2023).

- Awareness of small modular reactors (SMRs) is increasing substantially. Whereas approximately 10 % of the population had heard of this technology in earlier years and awareness increased to 19 % in 2023, the latest national survey conducted by Ipsos in 2026 shows a further increase to 30 % of the population. Respondents familiar with SMRs most frequently support a combination of conventional nuclear units and SMRs. The public considers the sites of existing nuclear power plants and the sites of current or former coal- and gas-fired power plants the most suitable locations for their potential siting. When assessing SMR technology, residents place the greatest emphasis on energy security, the price of the electricity generated, and operational safety.
- The latest national survey conducted by Ipsos in 2026 also confirms a further strengthening of support for nuclear power in the Czech Republic. The development of nuclear power is supported by 85 % of the population, the highest value recorded during long-term public-opinion monitoring. At the same time, 97 % of the population wants the Czech Republic's energy self-sufficiency to be maintained. The public does not perceive nuclear power and renewable energy sources as competing alternatives. A total of 74 % of respondents support the concurrent development of both nuclear power and OZE. The benefits of nuclear power cited most frequently include national energy self-sufficiency, supply stability, and the economic aspects of electricity generation.

Specific focus on the Temelín Nuclear Power Plant region:

- Regional surveys around the Temelín Nuclear Power Plant (ETE), conducted in November 2020 and at the end of November and beginning of December 2024, show specific trends in the views of residents living in the immediate vicinity of the plant. Interest in nuclear-power issues has traditionally been higher around ETE than the national average. Although it was temporarily dampened in 2020 by the COVID-19 pandemic, which substantially overshadowed perceptions of nuclear power at that time, interest in the issue had increased again to 41 % by the end of 2024. Men, people over 40, and residents living in the nearest zone within 5 km of the power plant consistently show greater interest. Temelínky magazine and its associated website provide a stable level of information in the region; one fifth of residents read or visit them at least occasionally, with information about regional events and support for municipalities being the most popular.
- General support for the development of nuclear power directly in the ETE region remains stable at 64 %. This trend reflects the intensive public discussions concerning newly planned projects in the South Bohemian Region. On the issue of future energy policy, however, nuclear power retains a dominant position in the Temelín region, with support from 57 %, while renewable energy sources are preferred by 41 % of local residents. A total of 31 % of people at the site support the coexistence and concurrent development of both sources. The power plant's role as a key economic pillar is perceived more strongly here than at the national level: ETE's role as the principal regional employer and a guarantor of the municipalities' economic stability has strengthened continuously over the years. More than half of the region's residents perceive the ČEZ Group's activities as a clear benefit to municipal development, and the long-term trend of declining perceived benefit has stopped. The proportion of the region's residents who would welcome a complete end to electricity generation at Temelín in the future has long remained at approximately 28 % (at the end of 2024).
- A fundamental shift in awareness of new technologies has occurred in the Temelín region. Awareness of small modular reactors (SMRs) was minimal in 2020, when only one in ten respondents (10 %) knew of them, while 23 % of residents had noticed the government's proposal to support nuclear power in general. By the end of 2024, awareness of the term SMR around Temelín had increased to 30 %, and as many as 80 % of local residents expressed interest in the issue. Respondents in the region express a clear preference for a combination of conventional nuclear units and small modular reactors (complementing one another). When developing these projects, residents around ETE place the greatest emphasis on operational safety. Other key parameters for selecting new technology have long included national security, technical safety, and economic benefit.

Permanent and unchanging aspects of public opinion:

- Across all survey waves (2020–2024), and regardless of whether the survey was national or regional, certain negative arguments and public attitudes remain constant. The principal spontaneous argument against further development of nuclear power is the persistent concern regarding radioactive-waste production, the burden on future generations, and the unresolved issue of long-term spent nuclear fuel disposal (in May 2024, 54 % of respondents nationally cited this as the principal disadvantage). Fear of safety risks and radioactivity remains the principal argument against constructing both surface storage facilities and permanent deep geological repositories (HÚ), although deep geological disposal of spent nuclear fuel appears to the public to be a somewhat more acceptable option than storing spent nuclear fuel in surface storage facilities.
- A consistent trend has long been apparent in the credibility of the individual institutions in the field of nuclear safety and nuclear-power information. The State Office for Nuclear Safety (SÚJB), independent experts in the field, and, at the regional level, municipal mayors and information sources from ETE1,2 consistently retain the highest levels of public trust. Conversely, political representatives, especially at the national level, have consistently commanded the lowest level of public trust on this issue.
- It remains the case that ETE1,2 have consistently better public ratings than Dukovany Units 1–4 in comparisons with other nuclear power plants around the world, although the ratings are converging slightly (82 % for ETE1,2 and 66 % for Dukovany Units 1–4 in May 2024).

C.II.2. Air and climate

C.II.2.1. Air quality

To assess background ambient air quality in the affected territory and determine whether any air quality limit value is exceeded, in accordance with Section 11 (6) of Act No. 201/2012 Coll., on Air Protection, as amended, average concentration values for a 1 km^2 grid square over the preceding five calendar years are used. These values are published annually by the Czech Hydrometeorological Institute. The latest published data for 2020–2024 indicate the following:

Nitrogen dioxide (NO_2): This pollutant is affected by line sources associated with traffic and, to a lesser extent, by stationary sources (e.g., local heating), which have shown a downward trend over the past several years. Average annual concentrations of up to 5.5 µg/m^3, i.e., up to 14 % of the air quality limit value (40 µg/m^3), may be expected in the affected territory. According to measurements at sites of a similar nature, maximum short-term NO_2 concentrations may be expected to be 60–90 µg/m^3, i.e., up to 45 % of the air quality limit value (200 µg/m^3).

Particulate matter (PM_{10}, $PM_{2.5}$): Higher particulate-matter concentrations may be expected in developed areas, principally in connection with operation of seasonal heating sources and, to a lesser extent, road traffic, including associated resuspension of dust particles from the roadway. The impact of secondary aerosols formed by chemical transformation from gaseous pollutants (precursors) may also be considered significant across the area. Because of the duration of the chemical reactions, secondary aerosols characteristically have very long transport paths and little or no spatial relationship between the location where the precursors are emitted and the location where the aerosols ultimately contribute to suspended-particle concentrations. Average annual PM_{10} concentrations of up to approximately 12.5 µg/m^3, i.e., up to 31 % of the air quality limit value (40 µg/m^3), may be expected in the affected territory. According to measurements at the Temelín station, maximum short-term PM_{10} concentrations of up to 135 µg/m^3, i.e., above the air quality limit value (50 µg/m^3), may be expected. The permitted number of exceedances is not, however, reached at the site (according to current data, the limit was exceeded at the Temelín station on only two days per year); the 36th-highest daily concentration (relative to the air quality limit value) may be expected to be up to approximately 22 µg/m^3 in the area, i.e., below the air quality limit value. For particulate matter in the $PM_{2.5}$ fraction, average annual concentrations of up to 9.0 µg/m^3, i.e., up to 45 % of the air quality limit value (20 µg/m^3), may be expected in the affected territory.

Benzene (BZN): The ambient concentrations of this pollutant are associated principally with traffic sources and, to a lesser extent, solid-fuel combustion and industrial production. According to the five-year rolling averages, average annual concentrations of up to 0.6 µg/m^3, i.e., up to 12 % of the air quality limit value (5 µg/m^3), may be expected in the affected territory.

Benzo(a)pyrene (BaP): The residential-heating sector (solid-fuel combustion in household heating appliances) is the predominant contributor to total benzo(a)pyrene emissions. According to the five-year rolling averages, average annual concentrations of up to 0.20 ng/m^3, i.e., up to 20 % of the air quality limit value (1 ng/m^3), may be expected in the affected territory.

The ambient-air pollution burden from the other pollutants monitored (SO_2, As, Pb, Ni, and Cd) is reliably below the limits.

As the stated data show, the affected territory is not classified as an area in which air quality limit values are exceeded. The trends based on comparison with earlier data are generally favorable. This conclusion adequately takes into account both stationary air-pollution sources and actual trends in traffic volumes in the affected territory during the individual years of the assessment period.

A more detailed characterization of air quality in the affected territory is provided in the air dispersion study (Annex 5.3 to this Documentation).

C.II.2.2. Climatic factors

In climatic terms, the Project, or the SMR ETE site, is located in the mildly warm MT7 climatic region (according to Quitt, 2012 update), with a normally long, mild, and moderately dry summer; short transitional periods with a mild spring and moderately warm autumn; and a normally long, moderately warm, dry to moderately dry winter with short-duration snow cover. The basic characteristics of the climatic region are presented in the following table.

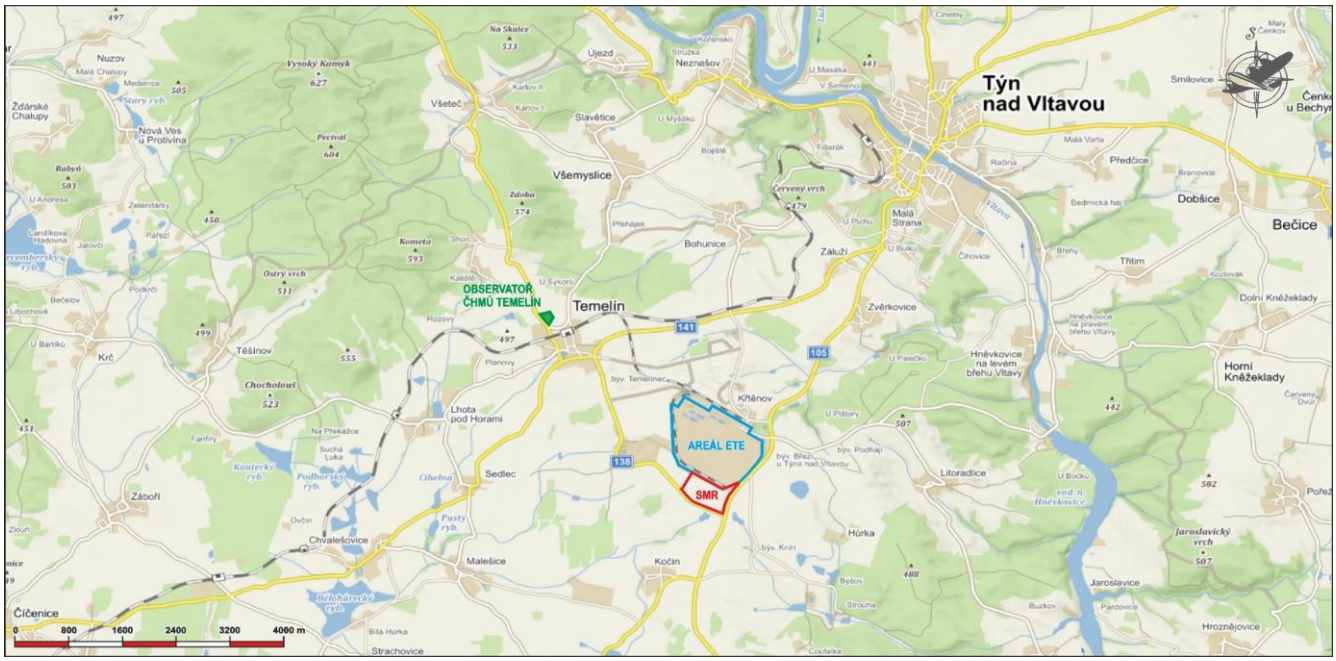
Table C.12: Characteristics of climatic region MT7

	MT7
Summer days	30 to 40
Number of days with an average temperature of 10 °C or higher	140 to 160

Frost days	110 to 130
Ice days	40 to 50
Average temperature in January	-2 °C to -3 °C
Average temperature in April	6 °C to 7 °C
Average temperature in July	16 °C to 17 °C
Average temperature in October	7 °C to 8 °C
Average number of days with precipitation of 1 mm or more	100 to 120
Total precipitation during the growing season	400 mm to 450 mm
Total precipitation during the winter	250 mm to 300 mm
Days with snow cover	60 to 80
Number of overcast days	120 to 150
Number of clear days	40 to 50

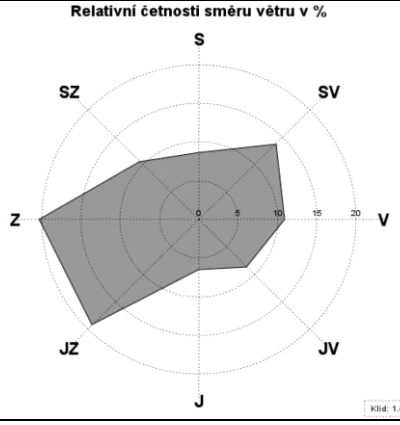
The ČHMÚ Temelín Observatory, which has an extensive measurement program and above-standard instrumentation for monitoring local climatic conditions, is located near the ETE or SMR ETE site. The observatory's location, which is representative for characterization of the local climate, is also selected accordingly.

Fig. C.8: Location of the ČHMÚ Temelín Observatory



Basic climatic data from the ČHMÚ Temelín Observatory are summarized in the following table.

Table C.13: Climate measurement results for 2011–2024, ČHMÚ Temelín station

	2011–2024
Average annual air temperature	9.5 °C
Average annual maximum air temperature	14.0 °C
Absolute annual maximum air temperature	35.8 °C
Average annual minimum air temperature	5.3 °C
Absolute annual minimum air temperature	-21.4 °C
Average annual total precipitation	608.3 mm
Average number of days with precipitation	209.2
Average seasonal total depth of new snow	51 cm
Average seasonal maximum total snow cover	16 cm
Average number of days with snowfall	49
Average number of days with thunderstorms	20.9
Average number of days with fog	82.9
Average number of days with ice accretion, hoarfrost, and rime	36.4
Relative wind-speed frequencies	0 m/s: 1.39 % 0–1 m/s: 15.92 % 2–4 m/s: 59.86 % 5–9 m/s: 21.84 % >9 m/s: 1.00 %
Relative wind-direction frequencies	

Based on long-term monitoring of meteorological parameters at the Temelín site, the Czech Hydrometeorological Institute establishes the range of extreme-condition parameters for the basic meteorological phenomena that may occur at the Temelín site. These parameters are reassessed periodically on the basis of measurement results. The current results, which take into account measurement records through 2024, are presented in the following tables (ČHMÚ, 2025).

Table C.14: Anticipated maximum and minimum air temperatures for the Temelín site

Temperature	Return period	
	100 years	10,000 years
Maximum instantaneous temperature [°C]	42.0	52.0
Maximum 6-hour average [°C]	38.6	46.2
Maximum 24-hour average [°C]	32.0	39.3
Maximum 7-day average [°C]	27.8	34.6
Minimum instantaneous temperature [°C]	-35.6	-47.0
Minimum 6-hour average [°C]	-30.4	-46.4
Minimum 24-hour average [°C]	-23.2	-36.0
Minimum 7-day average [°C]	-20.4	-33.1

Table C.15: Anticipated maximum 1 s, 10 s, and 10 min wind speeds for the Temelín site

Wind velocity	Return period	
	100 years	10,000 years
1 s wind gust [m/s]	48.0	65.0
10 s wind gust [m/s]	38.9	52.7
Ten-minute mean speed [m/s]	26.8	36.3

Table C.16: Anticipated maximum torrential rainfall for the Temelín site

Total precipitation/time	Return period	
	100 years	10,000 years
mm/15 min	39.0	59.0
mm/3 hours	79.0	120.0
mm/6 hours	84.0	140.0
mm/24 hours	115.0	180.0

Table C.17: Recommended snow water equivalent values for the Temelín site

Water-column height	Return period	
	100 years	10,000 years
Snow water equivalent [mm]	109	189

Table C.18: Recommended new-snow-depth values for the Temelín site

New-snow depth	Return period	
	100 years	10,000 years
New-snow depth in 24 hours [cm]	46.5	76.2

Table C.19: Design parameters for a dust and sand storm at the Temelín site

Dust- and sand-storm parameter	Return period	
	100 years	10,000 years
Dust loading [mg·h/m^3]	21.7	160
Duration [h]	3.2	18
Average dust concentration [mg/m^3]	6.77	8.9

Table C.20: Recommended duration of a continuous interval with daily precipitation totals of 2 mm or less for the Temelín site

Duration of continuous dry conditions	Return period	
	100 years	10,000 years
Duration of a continuous interval with daily precipitation totals of 2 mm or less [days]	70	112

Table C.21: Design values for hail loading at the Temelín site

Parameter	Return period	
	100 years	10,000 years
Hailstone diameter [mm]	30	50
Kinetic energy at impact [kJ]	0.0044	0.035

Table C.22: Probability of occurrence of a tornado of a given intensity at the Temelín site

Tornado class	Return period			
	100 years	10,000 years	100,000 years	1,000,000 years
F1	0.002	0.240	2.397	23.975
F2	0.002	0.196	1.960	19.604
F3	0.000	0.000	0.002	0.024
F1 and higher	0.004	0.436	4.360	43.579
F2 and higher	0.002	0.196	1.963	19.628

Table C.23: Design tornado parameters for the Temelín site

Maximum wind speed [m/s]	Translational speed [m/s]	Maximum rotational wind speed [m/s]	Radius of maximum rotational speed [m]	Air-pressure drop [hPa]	Rate of air-pressure drop [hPa/s]
72	14	57	45.7	40.8	13.6

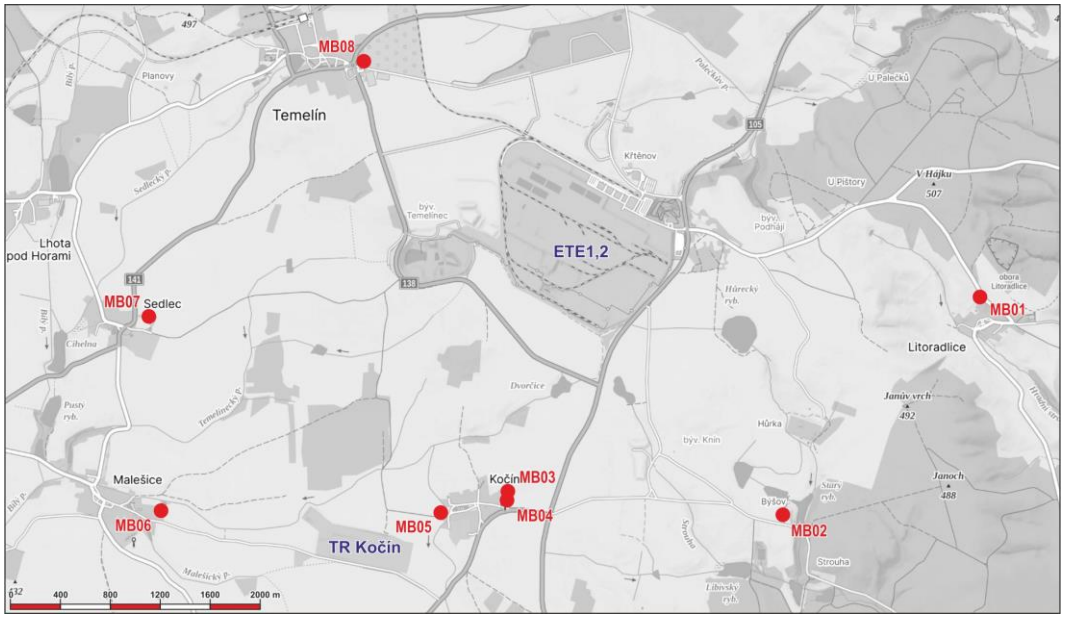
C.II.3. Noise and other physical and biological characteristics

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C.II.3.1. Noise

The SMR ETE Project is located in an area immediately adjacent to the existing operating Temelín power plant (ETE1,2). No spaces or buildings protected from noise are located in this area. The nearest protected outdoor spaces, or protected outdoor spaces of buildings, are located at the adjacent edges of the developed areas of the surrounding municipalities. Reference points for measuring and assessing the noise impacts of stationary sources are selected there. Their locations are shown in the following figure.

Fig. C.9: Locations of reference points for assessing noise from stationary sources



Noise sources at the Project site (in the affected territory) are operation of process equipment and non-public on-site roads at ETE1,2. The Kočín substation (operated by ČEPS, a.s.), which is adjacent to the Municipality of Kočín, is another significant process-related noise source.

Existing noise levels from operation of stationary sources are summarized in the following table (for more detailed information, see the acoustic study, Annex 5.2 to this Documentation).

Table C.24: Noise from operation of stationary sources: existing condition, operation of ETE1,2 (2025)

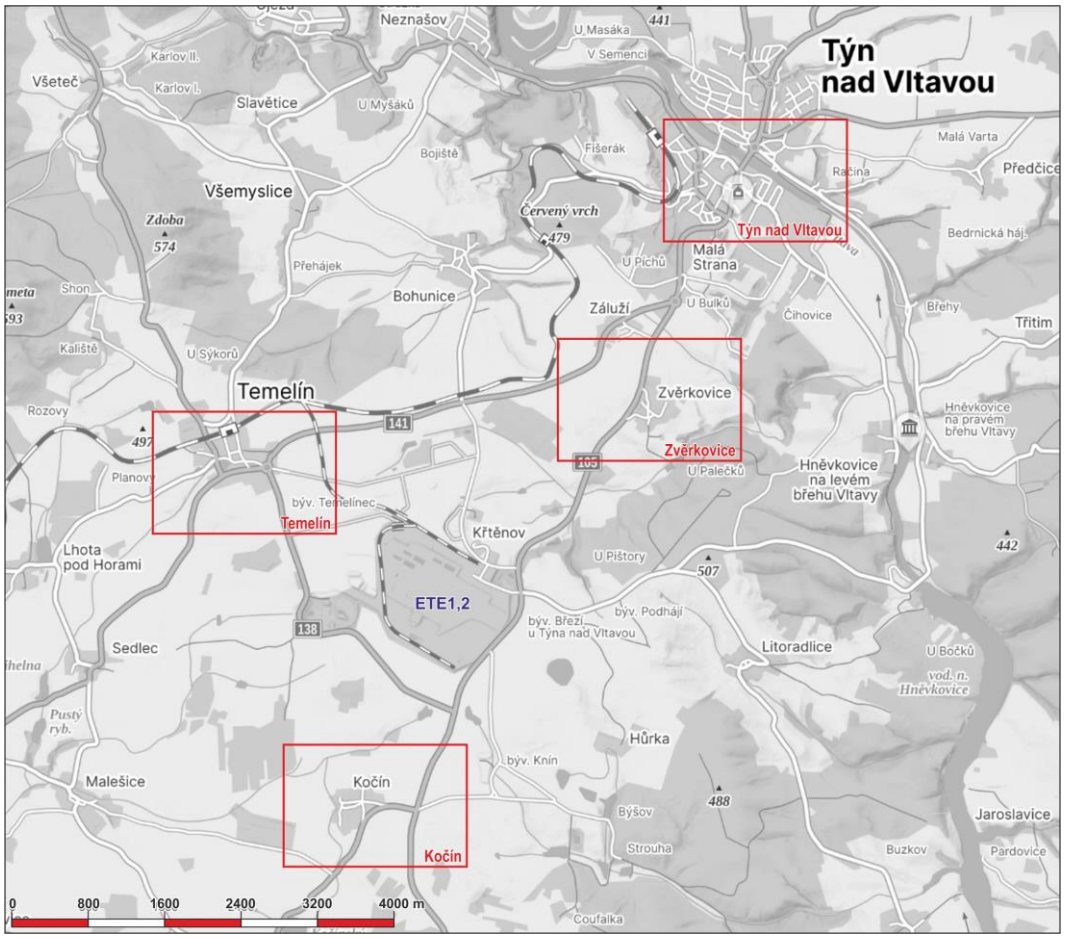
Reference point	Location	Height	Limit	Operation of ETE1,2	
			day/night	day	night
		[m]	$L_{Aeq,T}$ [dB]		
MB01	Edge of Litoradlice	3	50/40	29.7	29.7
		6		30.2	30.2
MB02	Near the former farmstead beyond the former village of Knín	3		31.3	31.3
		6		32.2	32.2
MB03	North-eastern edge of Kočín	3		38.4	38.4
		6		39.0	39.0
MB04	North-eastern edge of Kočín	3		38.8	38.8
		6		38.8	38.8
MB05	South-western edge of Kočín	3		36.1	36.1
		6		37.2	37.2
MB06	Edge of Malešice	3		30.5	30.5
		6		31.2	31.2
MB07	Edge of Sedlec	3		27.0	27.0
		6		27.6	27.6
MB08	Edge of Temelín	3		30.3	30.3
		6		30.6	30.6

The results show that the public-health limit under Government Decree No. 272/2011 Coll., on Protection of Health against the Adverse Effects of Noise and Vibration, as amended ($L_{Aeq,T}$ = 50/40 dB day/night), is met at all reference points, including when the combined effect of the Kočín

substation is taken into account. This condition has remained stable over the long term. Noise from operation of ETE1,2 and other sources is not subjectively perceptible at the measurement locations and merges with the background noise.

In the broader surrounding area, the noise conditions are determined by various activities (transportation, agriculture, production and other activities, background noise from rural development, etc.). Road traffic on the road network is the most significant of these. To describe the noise conditions caused by road traffic passing through the individual municipalities, reference points are selected at the most affected buildings along selected sections of roads that may be significantly affected (i.e., along transportation routes associated with future operation of the SMR ETE or New NPP ETE projects) in Kočín, Temelín, Týn nad Vltavou, and Zvěrkovice. The locations of these points are shown in the following figures.

Fig. C.10: General layout of locations for traffic-noise assessment



Detailed views of the reference points at these locations are shown in the following figures.

Fig. C.11: Locations of reference points for assessing noise from line sources in the Municipality of Kočín



Fig. C.12: Locations of reference points for assessing noise from line sources in the Municipality of Temelín



Fig. C.13: Locations of reference points for assessing noise from line sources in the town of Týn nad Vltavou

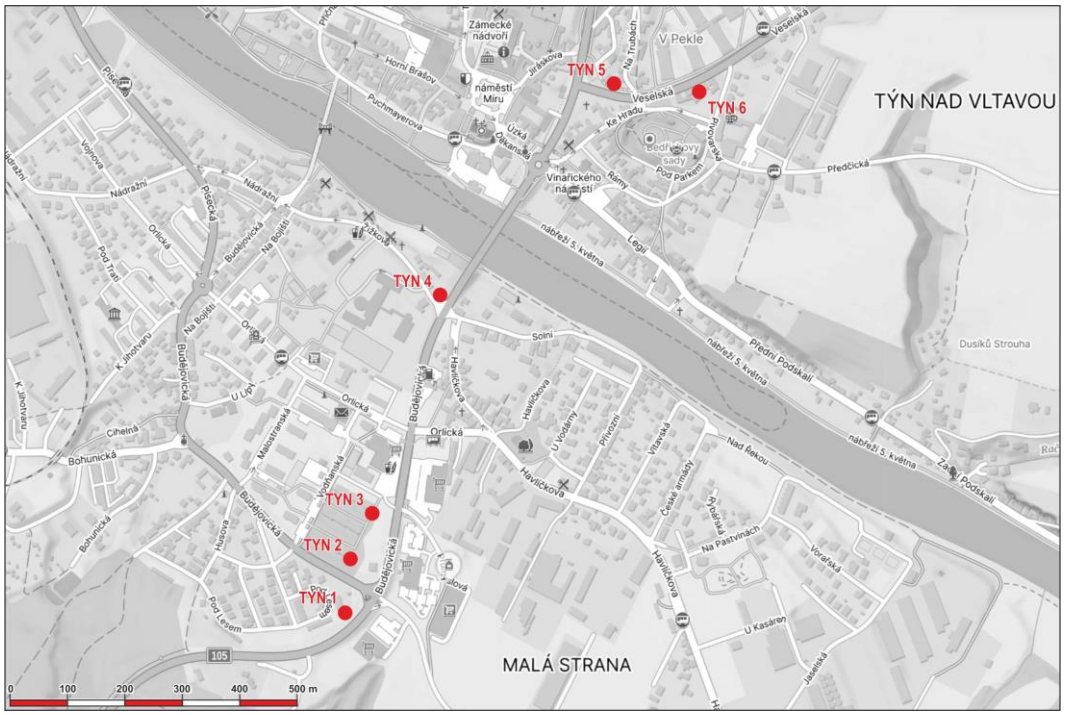


Fig. C.14: Locations of reference points for assessing noise from line sources in the Municipality of Zvěrkovice



The existing (background) equivalent sound pressure levels from traffic on public roads (line sources) in the surrounding municipalities are summarized in the following table (for more detailed information, see the acoustic study, Annex 5.2 to this Documentation).

Table C.25: Noise from traffic on public roads: existing condition

Reference point	Story	Limit	2025	
		day/night	day	night
		$L_{Aeq,T}$ [dB]		
KOC 1	1st	68/58	53.2	45.6
	2nd		53.9	46.3
TEM 1	1st		62.0	54.0
	2nd		62.3	54.4
TEM 2	1st		59.1	51.2
	2nd		62.3	54.5
TEM 3	1st		63.4	55.4
	2nd		64.0	56.0
TEM 4	1st		64.2	56.2
	2nd		64.6	56.5
TEM 5	1st		63.1	55.1
	2nd		64.5	56.5
TEM 6	1st		55.6	47.7
	2nd		56.9	49.1
TEM 7	1st		58.5	50.6
	2nd		59.8	51.9
TYN 1	1st		61.5	53.5
	2nd		63.2	55.1
TYN 2	1st		56.2	48.2
	2nd		57.0	49.0
	3rd		57.8	49.8
	4th		58.5	50.5
	5th		59.2	51.1
	6th		59.8	51.8
TYN 3	1st		58.2	50.1
	2nd		59.2	51.2
	3rd		60.3	52.3
	4th		61.3	53.2
	5th		61.7	53.7
	6th		61.9	53.9
TYN 4	1st		62.2	54.1
	2nd		65.2	57.0
TYN 5	1st		57.7	49.8
	2nd		62.6	54.7
TYN 6	1st		62.7	54.6
	2nd		63.9	55.8
ZVER 1	1st		57.9	50.1
	2nd		58.7	51.0
ZVER 2	1st		61.6	53.9
	2nd		63.0	55.3

The stated data show that the public-health limits for noise from traffic on public roads under Government Decree No. 272/2011 Coll., on Protection of Health against the Adverse Effects of Noise and Vibration, as amended, are met in all affected municipalities and at all reference points.

Operation of the rail siding, on which traffic is currently minimal (no more than a few trainsets per month), is another noise source. Under this assumption, the resulting equivalent sound pressure level from rail traffic is reliably below the limit (the limit is $L_{Aeq,T}$ = 68/58 dB day/night).

Overall, the noise situation in the affected territory can be assessed as commensurate with the character and functional structure of the area. The area's urban layout is satisfactory and provides adequate noise protection without additional measures.

C.II.3.2. Ionizing radiation

C.II.3.2.1. General information on sources of radiation exposure of the population

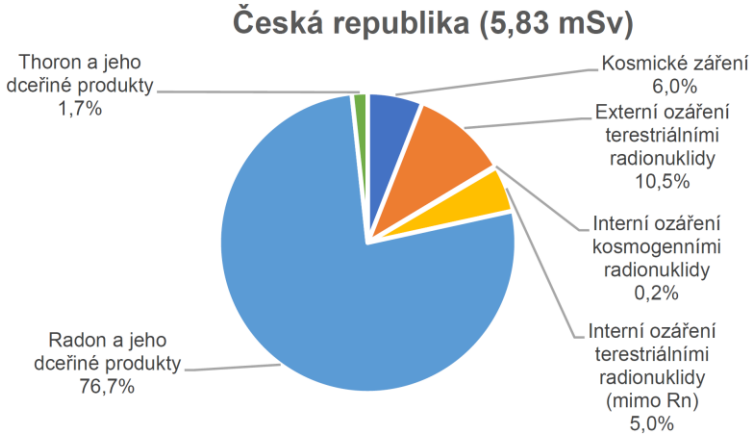
Ionizing radiation is a natural component of the environment. Sources of ionizing radiation that expose the human population to radiation are classified by origin as natural or artificial.

Natural exposure is caused by two sources: cosmic radiation incident on the Earth and naturally occurring radionuclides on the Earth. Cosmic radiation reaches the Earth from space and externally exposes people depending on altitude and location on the Earth. Naturally occurring radionuclides are present in the human environment and are contained in the Earth's crust and core, in water, and in the air. These may be primordial radionuclides with very long half-lives that originated in the early stages of the universe and became part of the Earth when the Solar System formed approximately 4–5 billion years ago (potassium K-40, uranium U-238 and U-235, and thorium Th-232), radionuclides produced by

the action of cosmic radiation on elements on Earth, or radionuclides produced secondarily by the decay of other radioactive elements. External exposure of people is caused primarily by the presence of radionuclides in rocks and soils in the Earth's surface layer and by cosmic radiation. For internal exposure, the predominant contribution results from inhalation of radon progeny in buildings; exposure from naturally occurring radionuclides in the human body, particularly potassium, is also significant.

According to the European Atlas of Natural Radiation (2019), the estimated total radiation burden from natural sources in the Czech Republic averages 5.83 mSv/year, including an estimated effective dose from internal contamination with radon and its progeny of 4.47 mSv/year. The dose distribution is shown in the following figure.

Fig. C.15: Contribution of the weighted annual average effective dose (in %) from various natural radiation sources to the total effective dose for the Czech Republic



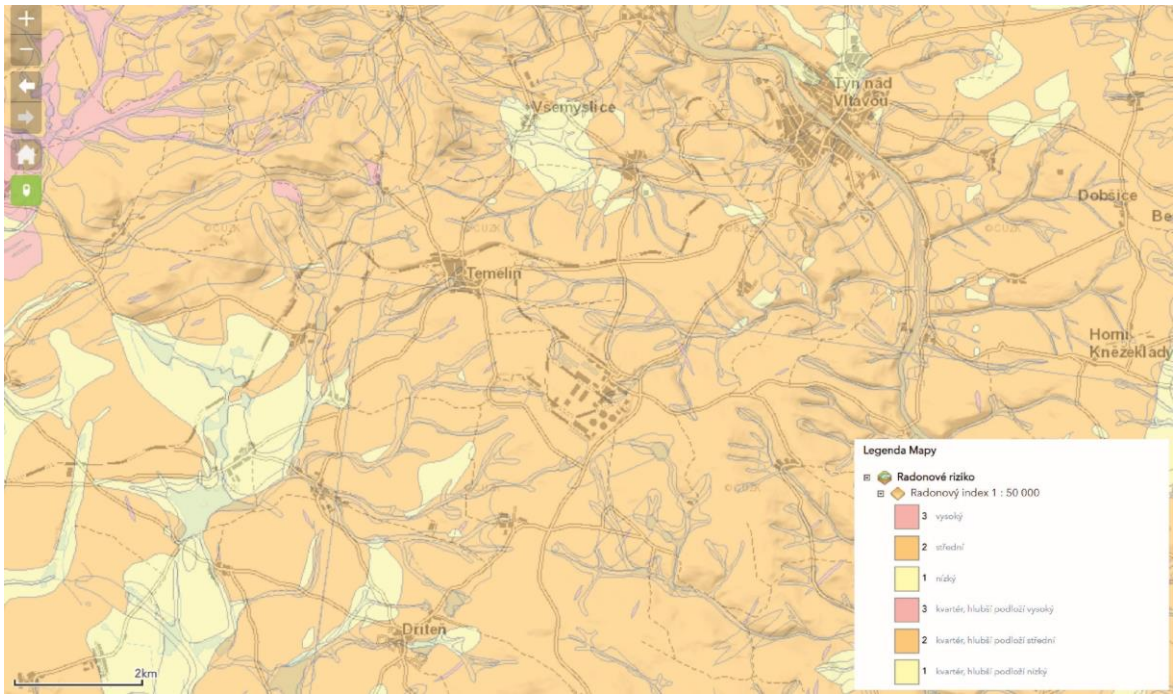
Source: CINELLI, G., DE CORT, M., and TOLLEFSEN, T., editors. European Atlas of Natural Radiation. 2019. ISBN 978-92-76-08258-3. [own adaptation]

Česká republika (5,83 mSv)	Czech Republic (5.83 mSv)
Thoron a jeho dceřiné produkty 1,7%	Thoron and its progeny 1.7 %
Radon a jeho dceřiné produkty 76,7%	Radon and its progeny 76.7 %
Kosmické záření 6,0%	Cosmic radiation 6.0 %
Externí ozáření terestriálními radionuklidy 10,5%	External exposure from terrestrial radionuclides 10.5 %
Interní ozáření kosmogenními radionuklidy 0,2%	Internal exposure from cosmogenic radionuclides 0.2 %
Interní ozáření terestriálními radionuklidy (mimo Rn) 5,0%	Internal exposure from terrestrial radionuclides (excluding Rn) 5.0 %

The Temelín site lies in an area with a medium radon-index value. It follows that the average burden from inhalation of radon (Rn-222), thoron (Rn-220), and their progeny is approximately 4.57 mSv per year. The average annual effective dose per resident from inhalation and ingestion of terrestrial radionuclides (excluding Rn) may be estimated at 0.3 mSv.

The total annual radiation burden from natural sources at the Temelín site may be estimated at 5.93 mSv per year, which also corresponds to the estimated value for the Czech Republic (5.83 mSv) (Cinelli, 2019).

Fig. C.16: Radon risk in geological bedrock



Source: https://mapy.geology.cz/radon/

Legenda Mapy	Map legend
Radonové riziko	Radon risk
Radonový index 1 : 50 000	Radon index 1: 50,000
vysoký	high
střední	medium
nízký	low
kvartér, hlubší podloží vysoký	Quaternary, deeper bedrock high
kvartér, hlubší podloží střední	Quaternary, deeper bedrock medium
kvartér, hlubší podloží nízký	Quaternary, deeper bedrock low

The dose caused by cosmic radiation essentially depends on elevation, so low-lying countries such as the Netherlands, Denmark, and the Baltic countries are affected less than Turkey, Switzerland, or Austria. The average effective dose from cosmic radiation is estimated at 0.34 mSv/year for the EU and 0.38 mSv/year worldwide. For European countries, it ranges from 0.31 mSv/year in Denmark, Estonia, Finland, Ireland, Latvia, the Netherlands, and Sweden to 0.41 mSv/year in Switzerland and 0.42 mSv/year in Turkey. For the Czech Republic, it is estimated at 0.35 mSv/year. The effective dose from external exposure to terrestrial radionuclides is estimated at 0.61 mSv/year (Cinelli, 2019). The average annual effective dose per resident from external exposure to natural background radiation is therefore approximately 1 mSv per year in total (0.96 mSv), corresponding to an ambient dose equivalent rate of approximately 115 nSv/h.

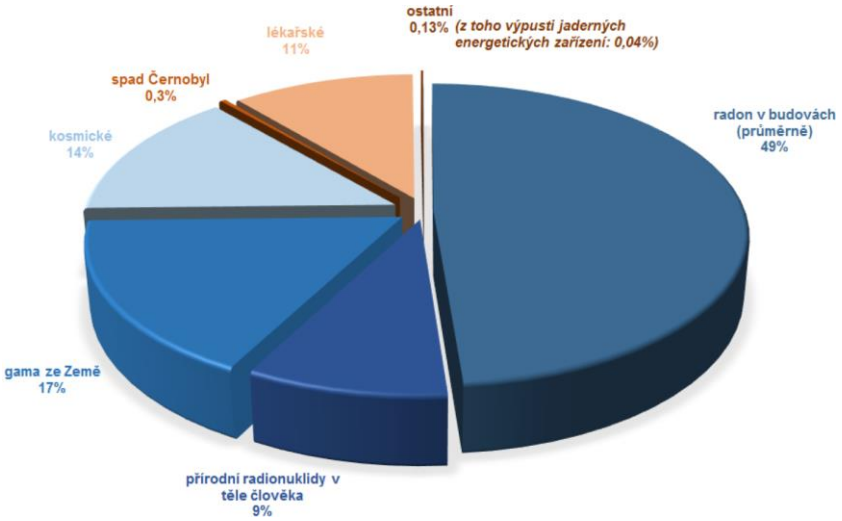
Artificial sources of exposure include, in particular, medical exposure (X-rays, radiopharmaceuticals, etc.). Anthropogenic sources (use of radionuclides in consumer and other goods, food irradiation, sterilization, and radionuclide content in building materials), occupational exposure at work, and global fallout, which includes radionuclides remaining from nuclear-weapons tests and accidents at nuclear power facilities and research reactors, account for a minor share. This also includes exposure from nuclear-facility discharges.

The annual effective dose per person worldwide from medical exposure during the first decade of the 21st century was 0.62 mSv, primarily as a result of diagnostic X-ray examinations. The contribution from diagnostic nuclear-medicine examinations was only 5 % (according to UNEP, Ionizing Radiation. Effects and Sources. 2016. ISBN 978-92-807-3600-7).

The situation in the Czech Republic is described in the 2021 SÚJB publication Assessment of Medical Exposure. The population dose from medical exposure in the Czech Republic was updated for 2019 and, taking into account the current frequencies of the individual examinations, is 1.16 mSv per resident. The average annual effective dose per resident in the Czech Republic from nuclear medicine may be estimated at approximately 0.1 mSv, and the average annual effective dose from medical applications is estimated at approximately 1.3 mSv.

The general distribution of radiation doses for the population (according to SÚRO) is shown in the following figure.

Fig. C.17: Distribution of doses to the population



Source: https://www.suro.cz/cz/prirodnioz

přírodní radionuklidy v těle člověka 9%	naturally occurring radionuclides in the human body 9 %
gama ze země 17%	gamma radiation from the ground 17 %
kosmické 14%	cosmic radiation 14 %
spad Černobyl 0,3%	Chornobyl fallout 0.3 %
lékařské 11%	medical exposure 11 %
ostatní 0,13% (z toho výpustí jaderných energetických záření: 0,04%)	other 0.13 % (of which nuclear power plant discharges: 0.04 %)
radon v budovách (průměrně) 49%	radon in buildings (average) 49 %

Even though these are general/average values intended to provide an overview in the overall context, the figure shows that exposure from natural sources accounts for the decisive share of the population's exposure, representing approximately 89 % of the average exposure of the population. Medical exposure predominates among artificial sources of exposure. Other contributions, including nuclear power plant discharges, are minor.

C.II.3.2.2. Radiation situation in the affected territory

C.II.3.2.2.1. Methodological information

The fundamental information for assessing the radiation burden from an operating nuclear facility is measurement at the source, i.e., measurement of dose rates and monitoring of gaseous and liquid discharges from these facilities. The radiation burden on the population surrounding the nuclear facility caused by the discharges is determined from the measured values using model calculations, and the effective dose is calculated for a representative person. The Atomic Act defines a representative person as a member of the public who represents a model group of individuals receiving the greatest exposure from the given source and through the given pathway.

Additional information for assessing radiation conditions in the affected territory is provided by the results of environmental monitoring at and around the Temelín site conducted by LRKO ETE, the T. G. Masaryk Water Research Institute in Prague, the University of South Bohemia in České Budějovice, the Czech Technical University in Prague, Masaryk University in Brno, and potentially other entities.

Of the nuclear facilities located at the Temelín site, only the operating ETE1,2 units release limited quantities of radioactive substances to the environment, and limited quantities of radioactive substances will also be released during operation of SMR ETE and the future planned New NPP ETE. The spent nuclear fuel storage facility at the site (SVJP ETE) releases no radioactive substances to the environment in the form of discharges.

C.II.3.2.2.2. Discharge conditions

C.II.3.2.2.2.1. Authorized limit

Discharges of radioactive substances from nuclear facilities located at the Temelín site are limited by authorized limits, i.e., annual committed effective doses from external and internal exposure for a representative person. Compliance with the exposure limits established by the Atomic Act and SÚJB Decree No. 422/2016 Coll., on Radiation Protection and Security of a Radionuclide Source, as amended, is demonstrated by compliance with the authorized limits. For the currently operating ETE1,2 units, these limits are set at 10 μSv per calendar year for airborne

discharges and 4 μSv per calendar year for discharges to the watercourse[1]. Authorized limits will also be established for SMR ETE and New NPP ETE before operation begins.

Compliance with the limit is assessed annually by the operator of ETE1,2 and submitted in annual reports to the competent regulatory authorities, which subsequently publish the results in their annual reports. The results are summarized in the following table.

Table C.26: Annual effective doses to a representative person (formerly an individual in the critical population group) from ETE operational discharges

Year	Atmospheric discharges			Discharges to the watercourse		
	Authorized limit	Utilization of the authorized limit		Authorized limit	Utilization of the authorized limit	
	[μSv]	[μSv]	[%]	[μSv]	[μSv]	[%]
2006	40	0.053	0.133	3	0.396	13.200
2007		0.050	0.125		0.302	10.067
2008		0.030	0.075		0.584	19.467
2009		0.0115	0.029		0.6839	22.797
2010		0.01354	0.034		0.5564	18.547
2011		0.02298	0.057		0.8210	27.367
2012		0.02442	0.061		0.6129	20.430
2013		0.01830	0.046		0.3934	13.113
2014		0.02537	0.063		0.8367	27.890
2015		0.02919	0.073		0.9513	31.710
2016		0.01435	0.036		0.6470	21.567
2017		0.02114	0.053		0.7493	24.977
2018		0.01103	0.028		0.6024	20.080
2019		0.01653	0.041		0.5769	19.230
2020		0.01575	0.039		0.3501	11.670
2021		0.01844	0.046		0.4046	13.487
2022		0.02355	0.059		0.5545	18.483
2023	10	0.02139	0.214	4	0.4024	10.060
2024		0.02306	0.231		0.3969	9.923
2025		0.02449	0.245		0.9950	24.875

Source: Results of monitoring discharges and radiation conditions around the Temelín Nuclear Power Plant, 2006–2025.

The data show that, when radionuclides from ETE discharges are released to the environment in the form of airborne discharges and discharges to the watercourse, the authorized limit for the effective dose and committed effective dose to a representative person is reliably met.

C.II.3.2.2.2.2. Discharge monitoring

Discharges are monitored to verify compliance with the established limits. Because radioactive substances will be released to the environment during SMR ETE operation, the SMR ETE construction Project will affect the method used to monitor discharges at the Temelín site.

At the operating ETE1,2 units, gaseous discharges are monitored by observing, measuring, assessing, and recording quantities and parameters in the internal and external ventilation stacks at HVB1 and HVB2 and in the ventilation stack at BAPP.

The following table presents the activities of radionuclides released to the environment in gaseous airborne discharges during 2009–2025. The data are taken from annual reports on radiation monitoring around ETE, which provide an overview of the most important radionuclides using forms in accordance with Recommendation 2004/2/Euratom. C-14 discharges account for the largest share (70 % or more) of the total individual effective dose received by a representative person from airborne discharges; Ar-41 and H-3 also make a more significant contribution. The contributions from the other radionuclides are below 1 %.

Table C.27: Total airborne activity discharges from ETE1,2 in individual years during 2009–2025 for selected radionuclides

Nuclide	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	[Bq/year]									
H-3	1.07E+12	1.25E+12	1.55E+12	1.30E+12	1.40E+12	1.58E+12	1.78E+12	2.10E+12	1.42E+12	1.19E+12
C-14	4.72E+11	4.95E+11	1.25E+12	8.61E+11	7.21E+11	7.30E+11	5.84E+11	5.56E+11	5.59E+11	5.02E+11
Ar-41	1.06E+12	1.10E+12	1.44E+12	1.81E+12	1.51E+12	1.73E+12	1.03E+12	7.61E+11	9.38E+11	9.30E+11
Cr-51	6.18E+05	7.65E+05	1.64E+06	2.23E+05	2.80E+05	2.11E+05	3.76E+05	2.84E+05	2.82E+05	2.43E+05
Mn-54	2.65E+05	1.19E+05	2.61E+05	1.01E+05	5.46E+04	3.16E+04	5.54E+04	3.86E+04	6.72E+04	6.72E+04
Co-58	4.35E+05	1.52E+05	4.15E+05	3.16E+04	2.96E+04	1.83E+04	4.50E+04	2.89E+04	3.64E+04	4.58E+04
Co-60	1.43E+05	1.13E+05	3.60E+05	1.41E+05	1.03E+05	5.93E+04	9.11E+04	5.24E+04	6.28E+05	1.24E+05

[1] Through 2022, the authorized limit was set at 40 μSv per year for airborne discharges by SÚJB Decisions Ref. Nos. 16920/2002, 28718/2007, and SÚJB/RCČB/24102/2017 and at 3 μSv per year for liquid discharges by SÚJB Decisions Ref. Nos. 8096/2005, SÚJB/OROPC/26161/2009, and SÚJB/RCCB/32016/2021. Since 2023, the authorized limit has been set at 10 μSv per year for airborne discharges by SÚJB Decision Ref. No. SÚJB/RCCB/5497/2023 and at 4 μSv per year for discharges to the watercourse by SÚJB Decision Ref. No. SÚJB/RCCB/31153/2022. The new decision also changed the terminology, replacing the original term liquid discharges with discharges to the watercourse.

Kr-85	<DL	<DL	<DL	<DL	<DL	<DL	2.65E+11	<DL	<DL	2.58E+11
Kr-85m	2.31E+10	4.38E+10	2.97E+10	3.41E+10	5.31E+10	4.63E+11	6.06E+11	1.08E+10	3.07E+10	2.61E+10
Kr-87	2.05E+10	3.92E+10	2.49E+10	4.69E+10	5.09E+10	2.38E+11	2.75E+11	4.53E+09	1.58E+10	1.21E+10
Kr-88	2.54E+10	7.32E+10	4.50E+10	6.45E+10	5.90E+10	7.35E+11	9.55E+11	8.37E+09	9.88E+09	8.03E+09
I-131	6.48E+06	5.68E+06	3.96E+07	3.37E+05	2.42E+07	7.70E+07	7.32E+07	2.82E+07	4.67E+07	2.50E+07
I-133	4.24E+05	1.90E+05	2.60E+05	<DL	<DL	9.14E+05	3.03E+06	2.44E+06	1.67E+06	1.28E+06
Te-132	8.29E+04	1.17E+04	1.17E+04	1.78E+04	3.39E+04	3.48E+04	4.25E+04	4.45E+04		
Xe-133	1.23E+12	1.31E+12	3.05E+12	4.45E+10	9.33E+10	4.03E+12	6.94E+12	2.73E+12	1.45E+12	1.08E+12
Xe-135	1.53E+11	3.60E+11	2.01E+11	3.70E+11	5.55E+11	2.58E+12	3.03E+12	5.49E+10	1.54E+11	1.17E+11
Xe-135m	1.95E+10	3.56E+10	2.68E+10	6.31E+10	5.91E+10	7.26E+10	5.35E+10	2.73E+09	3.40E+09	3.09E+09
Xe-138	9.12E+09	1.10E+10	9.78E+09	9.45E+09	<DL	5.48E+09	<DL	<DL	<DL	<DL
Cs-134	4.45E+04	1.20E+05	4.89E+05	5.62E+04	1.56E+04	3.31E+05	1.80E+08	7.26E+05	1.40E+05	3.88E+05
Cs-137	1.23E+05	1.99E+05	4.81E+05	1.13E+05	8.40E+04	3.02E+05	1.80E+08	6.74E+05	2.80E+05	4.49E+05

Nuclide	2019	2020	2021	2022	2023	2024	2025
	[Bq/year]						
H-3	1.11E+12	9.46E+11	9.44E+11	1.15E+12	9.75E+11	6.89E+11	7.24E+11
C-14	5.71E+11	5.08E+11	4.77E+11	4.97E+11	4.98E+11	4.83E+11	5.12E+11
Ar-41	9.77E+11	9.46E+11	8.77E+11	3.78E+10	9.00E+11	7.84E+11	8.58E+11
Cr-51	7.39E+05	1.25E+06	3.31E+05	4.33E+05	6.36E+05	3.62E+05	2.10E+05
Mn-54	1.03E+05	1.64E+05	7.50E+04	5.46E+04	7.15E+04	6.78E+04	2.32E+04
Co-58	9.31E+04	1.55E+05	3.72E+04	6.53E+04	8.79E+04	5.77E+04	2.60E+04
Co-60	1.21E+05	2.17E+05	1.05E+05	9.93E+04	7.00E+04	1.03E+05	3.01E+04
Kr-85	2.83E+11	<DL	<DL	<DL	<DL	<DL	<DL
Kr-85m	3.85E+10	7.83E+10	8.24E+10	3.78E+10	2.43E+10	1.08E+10	2.06E+09
Kr-87	1.68E+10	3.34E+10	3.11E+10	1.74E+10	1.47E+10	7.74E+09	2.93E+09
Kr-88	1.79E+10	5.61E+10	6.11E+10	1.82E+10	8.67E+09	7.37E+09	<DL
I-131	4.54E+07	8.33E+07	1.26E+08	6.18E+07	2.44E+07	9.54E+06	1.74E+07
I-133	<DL	2.21E+05	1.82E+05	1.79E+05	1.95E+05	1.56E+05	<DL
Te-132							
Xe-133	2.39E+12	2.18E+12	2.27E+12	8.97E+11	4.45E+11	7.15E+11	5.02E+09
Xe-135	1.74E+11	2.70E+11	3.28E+11	1.81E+11	8.88E+10	3.73E+10	1.05E+10
Xe-135m	6.23E+09	6.07E+09	3.85E+09	6.58E+09	3.62E+09	2.42E+09	1.90E+09
Xe-138	<DL	<DL	<DL	<DL	<DL	<DL	<DL
Cs-134	3.37E+05	1.54E+05	1.75E+05	7.97E+04	1.18E+05	1.54E+05	3.15E+04
Cs-137	3.40E+05	1.78E+05	2.09E+05	1.30E+05	1.55E+05	2.17E+05	8.98E+04

Notes: <DL ... activity below the detection limit

Liquid discharge monitoring is performed both at the point where the wastewater to be discharged is generated, i.e., in the monitoring tanks, and at the point where the water is discharged into the watercourse, i.e., in the wastewater collection sump (or in the wastewater channel). The following table lists the activities of radionuclides released into the environment in liquid discharges to the watercourse (the Vltava River at the Kořensko profile) from 2009 to 2025. The data are taken from annual reports on radiation monitoring around ETE, which provide an overview of the most important radionuclides using forms in accordance with Recommendation 2004/2/Euratom. H-3 discharges account for by far the largest share (over 99 %) of the total individual effective dose received by the representative person from discharges to the watercourse.

Table C.28: Total activity discharged from ETE1,2 to the watercourse by year from 2009 to 2025 for selected radionuclides

Nuclide	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	[Bq/year]									
H-3	4.07E+13	4.24E+13	5.68E+13	5.54E+13	6.38E+13	5.27E+13	5.11E+13	4.48E+13	3.88E+13	3.358E+13
Cs-137	2.63E+07	2.64E+07	1.81E+07	1.52E+07	2.72E+07	2.58E+07	5.08E+07	1.89E+07	5.68E+07	4.27E+07
Cs-134	1.85E+07	1.36E+07	8.06E+06	6.96E+06	8.31E+06	7.88E+06	5.91E+08	1.39E+07	3.97E+07	4.30E+07
Co-60	9.50E+06	5.11E+06	5.01E+06	6.14E+06	<DL	<DL	<DL	5.30E+05	<DL	<DL
Ag-110m	1.55E+07	1.62E+07	1.04E+07	1.13E+07	7.84E+05	7.82E+05	5.65E+05	5.86E+05	4.85E+05	<DL
Mn-54	1.02E+07	7.60E+06	5.91E+06	5.39E+06	<DL	<DL	<DL	8.07E+05	<DL	<DL
I-131	1.75E+07	4.92E+06	5.63E+06	<DL	<DL	6.16E+06	3.25E+06	1.47E+06	<DL	<DL
Nb-95	1.28E+07	9.59E+06	7.62E+06	1.04E+07	<DL	<DL	<DL	<DL	<DL	<DL
Co-58	8.62E+06	4.80E+06	<DL	3.36E+06	<DL	<DL	<DL	<DL	<DL	<DL
Zr-95	1.66E+07	9.47E+06	6.52E+06	7.41E+06	<DL	<DL	<DL	<DL	<DL	<DL
Sb-124	1.22E+07	5.99E+06	5.29E+06	1.43E+07	8.61E+05	<DL	9.54E+05	6.79E+05	<DL	<DL
Nuclide	2019	2020	2021	2022	2023	2024	2025			
	[Bq/year]									
H-3	4.107E+13	3.27E+13	3.87E+13	4.31E+13	4.55E+13	5.00E+13	4.49E+13			
Cs-137	1.77E+07	3.4E+07	1.73E+07	1.31E+07	4.68E+06	6.46E+06	2.24E+07			
Cs-134	1.26E+06	2.14E+07	1.05E+05	7.69E+06	2.19E+06	2.93E+06	1.00E+07			
Co-60	<DL	<DL	<DL	<DL	<DL	<DL	<DL			
Ag-110m	<DL	<DL	7.316E+05	<DL	<DL	<DL	<DL			
Mn-54	<DL	<DL	<DL	<DL	<DL	<DL	<DL			
I-131	2.88E+06	<DL	<DL	<DL	<DL	<DL	<DL			
Nb-95	<DL	7.77E+05	<DL	<DL	<DL	<DL	<DL			
Co-58	<DL	<DL	<DL	<DL	<DL	<DL	<DL			
Zr-95	<DL	<DL	<DL	<DL	<DL	<DL	<DL			
Sb-124	<DL	<DL	<DL	4.96E+05	<DL	<DL	<DL			

Notes: <DL ... activity below the detection limit

Discharges from ETE1,2 to both the atmosphere and watercourses have remained stable over the long term, with no significant differences either between individual years or within a year, including during refueling outages. The only recorded exception was an event at Temelín NPP Unit 2, when an internal leak was identified in steam generator (SG) No. 4 during unit startup following an outage in June 2015. The leak was caused by a defect in the SG vent system tube, which passes from the primary collector through the secondary side and out of the SG to the vent system. During the event, corrosion-erosion damage to the part of this vent tube passing through the secondary side of the SG allowed radioactive medium to leak from the primary circuit into the secondary circuit and other systems. The leak rate was determined to be 2–3 m^3/h. A significant portion of the activity was captured in the steam generator blowdown system and the turbine condensate cleanup system; some activity from the primary circuit entered the circulating cooling-water circuit of Unit 2 and, from there, seeped into the stormwater sewer piping. Detailed monitoring of the radiation situation identified minor surface contamination (maximum value of 8 Bq/cm^2) on the roof of the main generating unit enclosure, the roof of the Unit 2 turbine hall, and certain other areas. No increased surface contamination was detected outside the power plant site. During the event, the systems monitoring the dose rate in the surrounding environment measured the usual values corresponding to the natural background at the Temelín site. In connection with this event, the investigation levels for tritium activity concentration were exceeded in the stormwater safety retention tank and the Býšov retention reservoir, where the investigation level for the activity concentration of Cs-134 and Cs-137 in sediments in this reservoir was subsequently also reached. Overall, according to the assessment performed, this event resulted in an additional exposure of the representative person of 0.05 µSv. The release of radionuclides to the atmosphere and the watercourse during the event did not exceed the authorized limit under the applicable SÚJB permits. The event was classified as INES Level 1.

In addition to monitoring by the operator, discharges from ETE1,2 are subject to independent monitoring managed by SÚJB. As part of the independent monitoring performed by SÚJB, air samples are collected from the ventilation stacks of ETE1,2. The activity concentrations of noble gases are determined in the samples. During unit outages, independent monitoring is expanded to include evaluation of the activity concentrations of C-14, H-3, and gaseous I-131. As part of the independent monitoring of liquid discharges, the content of gamma-emitting radionuclides is also measured in monthly composite samples from the monitoring tanks (BAPP and laundry wastewater) and in two-week composite wastewater samples collected at the wastewater monitoring station (in the wastewater channel). H-3 activity is also determined in the same samples.

According to the SÚJB annual reports, the results of independent monitoring confirm good agreement with the results of discharge monitoring performed by the operator of ETE1,2.

C.II.3.2.2.3. Ambient radiation conditions

Ambient radiation conditions are determined by monitoring the radiation situation in the vicinity of the Temelín NPP. This is performed by observing, measuring, evaluating, and recording quantities and parameters characterizing ionizing radiation fields and the occurrence of radionuclides in the vicinity of the Temelín NPP. Monitoring is performed by the Temelín NPP Environmental Radiation Monitoring Laboratory (LRKO ETE), located in České Budějovice. Monitoring is performed in accordance with the monitoring program approved by SÚJB, and the power plant provides the measurement results to state regulatory and administrative authorities. At the initiative of the operator of ETE1,2, monitoring has been expanded

in accordance with the Program for Monitoring and Assessing the Environmental Impact of the Temelín Nuclear Power Plant. This monitoring is performed by other entities.

From a radiation protection perspective, the following environmental components are monitored in the vicinity of the Temelín NPP:

- outdoor environment,
- air: aerosols, gaseous components, precipitation, atmospheric fallout,
- surface water, groundwater, drinking water,
- food-chain items: milk, fish, agricultural and other crops,
- sediments,
- soil.

C.II.3.2.2.3.1. Outdoor environment monitoring

The outdoor environment is monitored by measuring the ambient dose equivalent rate of gamma radiation using integral thermoluminescent dosimeters located in the inner part of the emergency planning zone for ETE1,2 (42 measuring locations in total). The measured values are at the natural background level. For example, from 2018 to 2025, the mean values from all measuring locations ranged from 0.100 to 0.127 μSv/h.

The values at the individual measuring locations in 2024 and 2025 are presented in the following table.

Table C.29: Ambient dose equivalent rate of gamma radiation in the Temelín NPP emergency planning zone

Number	Location	Ambient dose equivalent rate							
		Q1 2024	Q2 2024	Q3 2024	Q4 2024	Q1 2025	Q2 2025	Q3 2025	Q4 2025
		[μSv/h]							
1	Bohunice	0.108	0.092	0.111	0.096	0.104	0.095	0.107	0.094
2	Neznašov	0.133	0.127	0.127	0.133	0.130	0.128	0.126	0.129
3	Chrášťany	0.106	0.107	0.098	0.111	0.102	0.107	0.101	0.109
4	Týn nad Vltavou	0.103	0.100	0.099	0.105	0.096	0.099	0.096	0.094
5	Záluží	0.099	0.103	0.101	0.108	0.094	0.105	0.101	0.104
6	Koloděje nad Lužnicí	0.120	0.113	0.109	0.119	0.113	0.115	0.109	0.122
7	Týn nad Vltavou	0.109	0.108	0.112	0.110	0.105	0.108	0.110	0.107
8	Zvěrkovice	0.101	0.094	0.100	0.098	0.098	0.095	0.101	0.093
9	Březnice	0.099	0.100	0.094	0.106	0.094	0.100	0.091	0.097
10	Hněvkovice	0.087	0.095	0.088	0.097	0.084	0.097	0.086	0.092
11	U Palečků	0.096	0.096	0.100	0.100	0.093	0.096	0.098	0.094
12	Dobšice	0.093	0.092	0.090	0.098	0.091	0.096	0.095	0.095
13	Žimutice	0.091	0.087	0.086	0.094	0.088	0.088	0.083	0.086
14	Horní Kněžeklady	0.106	0.100	0.101	0.106	0.101	0.099	0.099	0.097
15	Pořežany	0.104	0.093	0.098	0.104	0.098	0.130	0.095	0.127
16	Modrá Hůrka	0.099	0.089	0.097	0.094	0.096	0.090	0.096	0.088
17	Litoradlice	0.089	0.083	0.086	0.088	0.087	0.084	0.087	0.084
18	Kostelec	0.101	0.098	0.096	0.104	0.096	0.100	0.090	0.095
19	Býšov	0.083	0.087	0.086	0.087	0.079	0.087	0.084	0.085
20	Purkarec	0.109	0.100	0.104	0.107	0.103	0.102	0.103	0.101
21	Poněšice	0.095	0.088	0.092	0.094	0.097	0.088	0.087	0.085
22	Coufalka	0.084	0.089	0.085	0.094	0.080	0.091	0.085	0.092
23	Chlumec	0.118	0.114	0.110	0.122	0.114	0.117	0.109	0.115
24	Nová Ves	0.105	0.109	0.104	0.112	0.099	0.110	0.100	0.104
25	Olešník	0.105	0.112	0.100	0.118	0.100	0.114	0.099	0.111
26	Zliv	0.103	0.111	0.098	0.117	0.099	0.111	0.094	0.110
27	*Kočín*	0.106	0.099	0.106	0.102	0.102	0.100	0.106	0.098
28	Dříteň	0.092	0.107	0.089	0.115	0.088	0.110	0.085	0.107
29	Dívčice	0.087	0.092	0.085	0.095	0.083	0.093	0.083	0.092
30	Malešice	0.096	0.098	0.093	0.104	0.092	0.102	0.092	0.099
31	Záblatí	0.102	0.100	0.103	0.104	0.098	0.101	0.097	0.099
32	Sedlec	0.097	0.083	0.096	0.088	0.093	0.086	0.094	0.083
33	Čičenice	0.112	0.102	0.109	0.107	0.107	0.103	0.105	0.101
34	Lhota Pod Horami	0.104	0.112	0.100	0.115	0.099	0.112	0.095	0.106
35	Těšínov	0.095	0.099	0.093	0.104	0.091	0.100	0.089	0.097
36	Krč	0.161	0.156	0.150	0.165	0.157	0.159	0.157	0.163
37	Protivín	0.164	0.165	0.163	0.169	0.158	0.166	0.161	0.167
38	*Temelín*	0.099	0.097	0.097	0.102	0.093	0.098	0.099	0.097
39	Tálín	0.154	0.148	0.149	0.153	0.149	0.155	0.162	0.161
40	Všemyslice	0.143	0.137	0.135	0.143	0.135	0.134	0.133	0.134
41	Všeteč	0.122	0.117	0.122	0.120	0.118	0.120	0.120	0.115
42	Albrechtice nad Vltavou	0.157	0.142	0.148	0.141	0.142	0.137	0.149	0.146
Average of all locations		0.108	0.106	0.105	0.111	0.103	0.108	0.104	0.106

Source: Results of discharge and radiation monitoring in the vicinity of the Temelín Nuclear Power Plant, 2024 and 2025.

The results show that the measured values in the nearest village of Temelín (the local part of Kočín) and in the municipality of Temelín itself are at or below the average values determined for the entire ETE1,2 emergency planning zone. Based on the mean ambient dose equivalent rates in the area, which are approximately 0.108 μSv/h, the resulting mean annual effective dose from natural background radiation (external exposure to cosmic radiation and terrestrial radionuclides (excluding radon)) per resident is approximately 1 mSv/year, which corresponds well to the assumptions stated above in Chapter C.II.3.2.1. General information on sources of radiation exposure of the population (page 235 of this Documentation).

Monitoring of the radiation situation at the ETE1,2 site is provided by a teledosimetric system (TDS), which is part of the Temelín NPP Workplace Monitoring Program. The TDS consists of 24 measuring stations located near the outer boundary of the ETE1,2 site and continuously monitors the ambient dose equivalent rate of gamma radiation. The ambient dose equivalent rate at these stations is comparable to the natural background values measured in the emergency planning zone described above. Monitoring of the radiation situation at the SMR ETE site will be provided before SMR ETE is put into operation.

The gamma dose equivalent rate in the vicinity of ETE1,2 is also measured as part of the early warning network. The measured values, including those from the Temelín NPP TDS system, are transmitted online to the MonRaS database (the SÚJB database). Measurement results from 2018 to 2025 show that the values have remained stable over the long term and are comparable to the results of measurements performed before 2018.

The outdoor environment is also monitored by measuring the areal gamma activity of uncultivated and cultivated soils at a total of nine locations in the vicinity of the Temelín NPP. Of the artificial radionuclides, only Cs-137 originating from global fallout is detectable; the other artificial radionuclides are below the minimum detectable activities.

C.II.3.2.2.3.2. Air monitoring

Air activity in the vicinity of ETE1,2 is monitored by measuring the activity of gamma radionuclides, Sr-90, and gaseous forms of I-131. Environmental radiation monitoring stations (SRKO) located in Nová Ves, Litoradlice, Zvěrkovice, Bohunice, Sedlec, Týn nad Vltavou, České Budějovice, and at the Temelín NPP site are used for monitoring. The tritium activity concentration in precipitation is measured at the Temelín meteorological station. The activity concentration of atmospheric fallout is measured at the Litoradlice and Zvěrkovice environmental radiation monitoring stations.

The results show that the activities of artificial radionuclides (except tritium) were below the minimum detectable activity from 2018 to 2025. In most precipitation-water samples analyzed from 2018 to 2025, tritium activity did not exceed the minimum detectable activity or was only slightly above it. The maximum tritium activity measured in precipitation water during this period was 6.4 Bq/l. The activity of natural radionuclides such as Be-7, K-40, and Pb-210 was markedly predominant in the samples measured.

C.II.3.2.2.3.3. Water monitoring

Surface water activity is monitored by measuring the activity concentrations of gamma radionuclides and tritium, gross alpha activity concentration, gross beta activity concentration, and Sr-90 activity concentration. The monitoring locations are Vltava-Hladná, Vltava-Solenice, Vltava-Hněvkovice (downstream of the dam), Vltava-Kořensko (upstream and downstream of the dam), the Temelínec municipal waste landfill, Bělohůrecký Pond, the Býšov retention reservoir, and the Býšov stormwater safety retention tanks. The samples are evaluated using laboratory semiconductor spectrometry, liquid scintillation beta spectrometry, and methods complying with ČSN 757611 and ČSN 757612.

With respect to the operation of ETE1,2, surface water monitoring focuses primarily on the radionuclides H-3 (tritium), Cs-137, and Sr-90. Except for tritium, most results from measurements of artificial radionuclide activity are around the minimum detectable activity, and all values are reliably below the permissible pollution levels specified by Government Decree No. 401/2015 Coll., on the indicators and values of permissible surface water and wastewater pollution. For tritium, the main source of surface water activity, the maximum permissible activity is set at 3,500 Bq/l, while the measured values are in the tens of Bq/l. Overall, the trend in artificial radionuclide concentrations in surface water is stable without fluctuations or is gradually decreasing (Cs-137 and Sr-90).

Drinking water activity is monitored by measuring tritium and gamma activity concentrations. The samples measured are collected from wells in Kočín and Temelín and from the public water supply systems in Dříteň and Týn nad Vltavou. The Cs-137 activity concentration in samples collected in 2018-2025 did not exceed the minimum detectable value. The activity in most tritium samples collected during this period was also below the minimum detectable value. The highest tritium activity measured during this period, 4.1 Bq/l, is well below the indicative value of 100 Bq/l specified in Government Decree No. 401/2015 Coll. for the annual average activity of water used for treatment into drinking water. In accordance with SÚJB Decree No. 360/2016 Coll., drinking water samples are also collected twice a year to determine the Sr-90 activity concentration, the level of which did not exceed the minimum detectable value in the samples collected.

Groundwater activity is monitored by measuring the tritium activity concentration in shallow and deep boreholes at and around the ETE1,2 site, in the well in Křtěnov, and in drainage boreholes at the ETE1,2 site, and by measuring the gamma activity concentration in shallow and deep boreholes at and around the ETE1,2 site. The most significant radionuclides monitored in groundwater are tritium and Cs-137. In summary, for the period 2018-2025, the activity concentration of cesium Cs-137 in groundwater was below the limit of quantification at all measuring locations (both within and outside the Temelín NPP site). Tritium activity in groundwater from the monitored boreholes in the vicinity of ETE1,2 was below or at the limit of quantification. At some measuring locations at the ETE1,2 site, it was above the limit of quantification, with the highest measured

values up to 10 Bq/l. The legislation of the Czech Republic does not specify tritium activity limits for groundwater. An indicative value of 100 Bq/l for water intended for human consumption can be derived from Directive 98/83/EC. The investigation level of 20 Bq/l under the ETE1,2 monitoring program was not reached.

C.II.3.2.2.3.4. Food-chain item monitoring

Milk activity is monitored by measuring gamma and Sr-90 activity concentrations in samples collected from a cowshed in the Temelín NPP emergency planning zone. Milk samples are collected at two-week intervals from the Dynín agricultural cooperative (Bohunice cowshed) or, as applicable, from the Všemyslice production and commercial cooperative. The content of artificial radionuclides in the samples collected from 2018 to 2025 was below the minimum detectable activities. The measured values were orders of magnitude lower than those for the natural radionuclide K-40.

Fish activity is monitored by measuring gamma specific activity in fish collected from the Vltava River, the Býšov retention reservoir, or another water reservoir in the Temelín NPP emergency planning zone. Of the artificial radionuclides in the samples collected from 2018 to 2025, only Cs-137 was detected above the minimum detectable activity. It originates primarily from global fallout, and its activity was orders of magnitude lower than the activity of the natural radionuclide K-40 in the samples collected.

Crop monitoring is performed by measuring gamma specific activity in agricultural crops, cereals, fruit, forest fruits, vegetables, feed, and forage crops. The sampling locations are within 5 km of ETE1,2. The results of evaluating the activity of agricultural plant-production samples from 2018 to 2025 show no upward trend in activity values compared with the preceding period of operation of ETE1,2 or the period before ETE1,2 were put into operation. The activity of most samples is below the minimum detectable value. The occasionally recorded insignificant increase in Cs-137 activity in some samples is apparently related to a soil-water deficit during the growth period of the crops concerned.

C.II.3.2.2.3.5. Sediment monitoring

Sediment activity is monitored by measuring gamma specific activity in samples collected at the Vltava-Hladná and Býšov stormwater safety retention tank sampling locations. Of the artificial radionuclides, measurable Cs-137 activity originating predominantly from global fallout was present in the samples. Until 2022, the artificial radionuclide Cs-134 was also identified in sediments at the Býšov reservoirs and in the Vltava River at Hladná at concentrations of 2–3 Bq/kg. Its occurrence was associated with the leak in steam generator No. 4 at Temelín NPP Unit 2 in June 2015. Since 2023, Cs-134 activity has been below the minimum detectable value, which is related to its relatively short half-life (2 years). The activity values of this radionuclide were and remain orders of magnitude lower than those of the natural radionuclide K-40 and also below the investigation levels under the Temelín Nuclear Power Plant Environmental Monitoring Program (10 Bq/kg). Under the expanded Program for Monitoring the Environmental Impact of ETE1,2, the activity of sediment samples affected and unaffected by the operation of ETE1,2 through the discharge of the wastewater channel into the Vltava River is monitored. The measurement results show that the impact of the operation of ETE1,2 on sediment activity is minimal and virtually unidentifiable.

C.II.3.2.2.3.6. Soil monitoring

Soil activity is monitored by measuring gamma and Sr-90 specific activity at Bohunice, Litoradlice, Nová Ves, and Sedlec. Samples are collected from the soil profile at a depth of 0–5 cm. Of the artificial radionuclides in the samples analyzed, only Cs-137 activity originating from global fallout is measurable; it is orders of magnitude lower than the activity of the natural radionuclide K-40. Even over a longer time series, measurements of radionuclide activity in soil under the expanded Program for Monitoring the Environmental Impact of ETE1,2 do not reveal any trend in the radionuclides monitored, except for a slight decrease in Cs-137 activity. It follows that soil radionuclide activity in the vicinity of the Temelín site is not affected by the operation of ETE1,2.

C.II.3.2.2.3.7. Overall summary of environmental monitoring results and assessment of ambient radiation conditions

In summary, the environmental monitoring results and assessment of ambient radiation conditions show that, of the artificial radionuclides, only tritium and Cs-137 are determined by direct measurements using portable instruments in the vicinity of ETE1,2 or by collecting samples and subsequently processing them and measuring their radioactive substance content at the Temelín NPP Environmental Radiation Monitoring Laboratory. A substantial proportion of Cs-137 entered the environment as a result of nuclear tests and the 1986 accident at Unit 4 of the Chernobyl Nuclear Power Plant, which made a significant contribution to radioactive cesium contamination. In connection with the leak in steam generator No. 4 at Temelín NPP Unit 2 in June 2015, the isotopes Cs-137 and Cs-134 were identified in water and sediments in the Býšov stormwater safety retention tank; they are not otherwise detected there, including at present. Some tritium is produced in the atmosphere by cosmic radiation.

Tritium from discharges from ETE1,2 is measurable in samples of water from the Vltava River, into which wastewater from ETE1,2 is discharged at the Vltava-Kořensko profile. Tritium is also measurable at the Vltava-Solenice profile and other profiles downstream along the Vltava River, at levels not exceeding the investigation level and environmental quality standards under Government Decree No. 401/2015 Coll.

Although highly sensitive measurement methods are used for monitoring the surroundings of the Temelín Nuclear Power Plant, the other artificial radionuclides in environmental components in the vicinity of ETE1,2 are below the minimum detectable activities (except for those resulting from the steam generator leak described above in 2015). These measurements demonstrate that the contribution of radioactive substance discharges from the operation of ETE1,2 to the surrounding environment has remained negligible over the long term.

C.II.3.3. Other physical and biological characteristics

No other significant factors requiring consideration have been identified. The affected territory contains a number of electricity transmission and distribution system facilities and telecommunications facilities, which are always operated in compliance with the applicable public-health limits under Government Decree No. 291/2015 Coll., on health protection against non-ionizing radiation, as amended.

The Project area and its surroundings adjoin the industrial site of the Temelín Nuclear Power Plant (the ETE1,2 site), and the state of the environment reflects this character.

C.II.4. Surface water and groundwater

C.II.4.1. Surface water

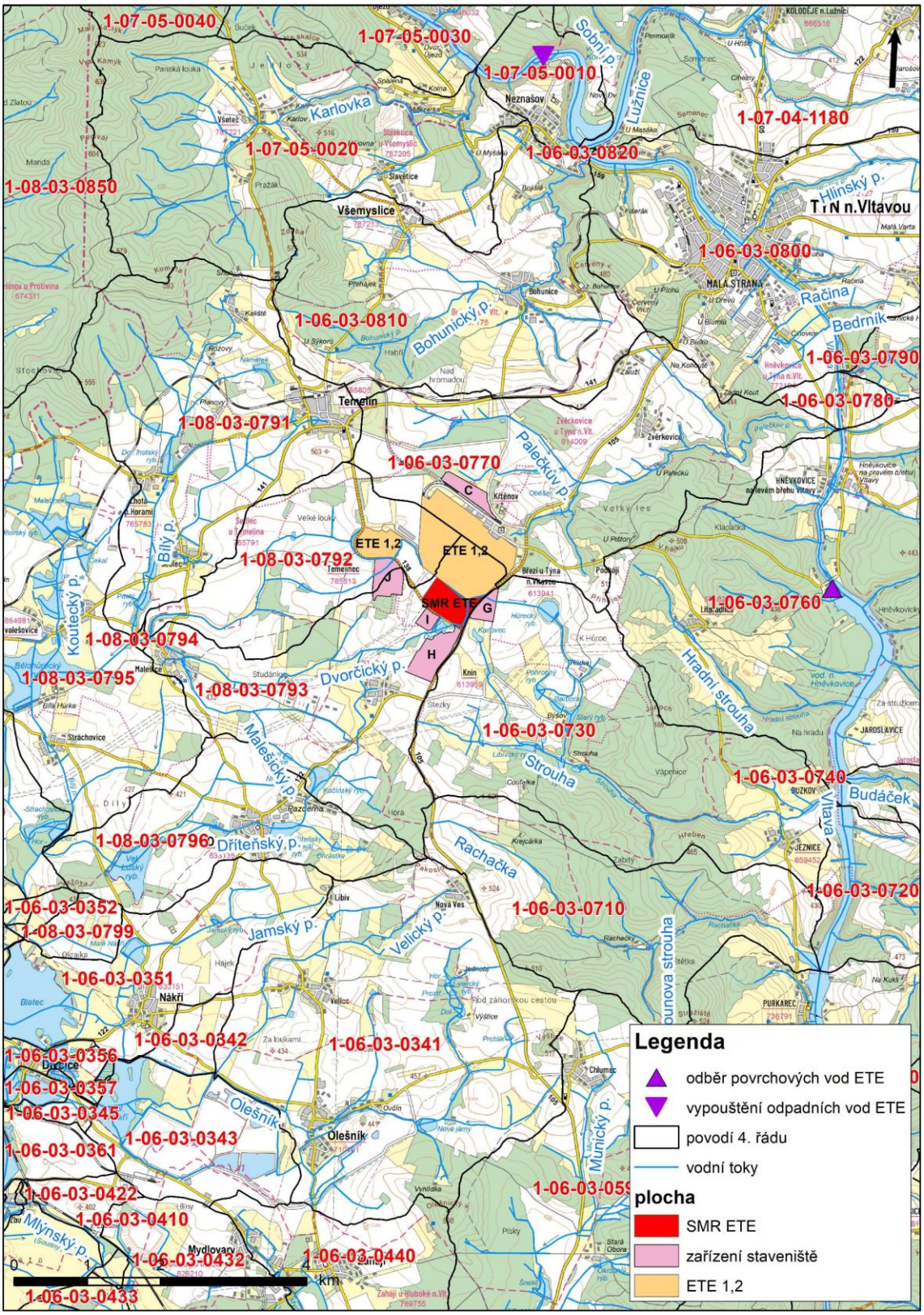
C.II.4.1.1 Basic hydrological data

From a regional hydrological perspective, the Project is located in the main river basin of the Czech Republic, the Elbe River basin 1-00-00 (North Sea drainage basin). Under the more detailed administrative classification, the affected territory lies within the Upper Vltava sub-basin. Within this area, the affected basins are second-order basins 1-06, Vltava to Lužnice, and 1-08, Otava and Vltava from Otava to Sázava, and third-order basins 1-06-03, Vltava from Malše to Lužnice, and 1-08-03, Blanice and Otava from Blanice to Lomnice. At the detailed classification level, the site of interest, i.e., the SMR siting area and technical-infrastructure areas/corridors, lies in the catchments of the following watercourses:

- Strouha Stream, hydrologic sequence No. 1-06-03-0730, with a catchment area of 13.2 km^2,
- Palečkův Stream, hydrologic sequence No. 1-06-03-0770, with a catchment area of 11.9 km^2,
- Temelínecký Stream, hydrologic sequence No. 1-08-03-0792, with a catchment area of 5.5 km^2,
- Malešický Stream, hydrologic sequence No. 1-08-03-0793, with a catchment area of 8.7 km^2.

The SMR area, the areas considered for construction site facilities H and I, and part of area J lie in the Malešický Stream catchment; part of construction site facility area J lies in the Temelínecký Stream catchment; construction site facility area C is defined in the Palečkův Stream catchment; and construction site facility area G is defined in the Strouha Stream catchment (see the following figure).

Fig. C.18: Catchments and watercourses in the affected territory, the surface-water abstraction point for ETE1,2, and the wastewater discharge point for ETE1,2



Source: Watersheds: Open geographic hydrological data, Czech Hydrometeorological Institute, online. Watercourses: Water-line centerlines, ISVS-VODA records, online.

Legenda	**Legend**
odběr povrchových vod ETE	Temelín NPP surface-water abstraction
vypouštění odpadních vod ETE	Temelín NPP wastewater discharge
povodí 4. řádu	fourth-order catchment

vodní toky	watercourses
plocha	area
SMR ETE	SMR ETE
zařízení staveniště	construction site facilities
ETE 1,2	ETE1,2

The following water reservoirs are located in the area:

- Dvorčice Pond (ID 108030793003), cadastral area of Kočín,
- Karlovec Pond (ID 106030730004), cadastral area of Knín,
- Hůrecký Pond (ID 106030730013), cadastral area of Březí u Týna nad Vltavou,
- reservoir (ID 106030770026), cadastral area of Březí u Týna nad Vltavou,
- Oběšený Pond (ID 106030770002), cadastral area of Březí u Týna nad Vltavou,
- Nový Pond (ID 106030770003), cadastral area of Březí u Týna nad Vltavou,
- reservoir (ID 106030770023), cadastral area of Křtěnov,
- reservoir (ID 106030770014), cadastral area of Křtěnov,
- reservoir (ID 106030770019), cadastral area of Křtěnov,
- reservoir (ID 108030792006), cadastral area of Křtěnov.

The following are affected through the technological infrastructure:

- Hněvkovice Reservoir (ID 106030760005), a significant water reservoir,
- Kořensko hydraulic structure (ID 107050010002).

Hněvkovice Reservoir is the surface-water abstraction point identified as ČEZ jaderná elektrárna Temelín (ID 111036), and the Kořensko hydraulic structure is the wastewater discharge point identified as ČEZ JE Temelín Kořensko (ID 111015).

The most significant watercourse in the affected territory is the Vltava River, which flows approximately 5 km east of the existing ETE1,2 site. The Vltava River rises in the Šumava Mountains near the village of Černý Kříž at the confluence of the Teplá Vltava and Studená Vltava rivers and flows into the Elbe River near Mělník. The Vltava River contains a system of nine hydraulic structures forming the Vltava Cascade: Lipno I Reservoir, Lipno II Reservoir, Hněvkovice Reservoir, the Kořensko hydraulic structure, Orlík Reservoir, Kamýk Reservoir, Slapy Reservoir, Štěchovice Reservoir, and Vrané Reservoir. The significant tributaries of the Vltava River are: The Malše; the Lužnice, which enters the Vltava at the Kořensko hydraulic structure upstream of the SMR ETE wastewater outfall; the Otava, which enters Orlík Reservoir; and the Sázava and Berounka, which enter the Vltava upstream of Prague. The Kořensko structure is used primarily to stabilize the river level, but it also performs power-generation, environmental, and transport functions. It maintains a constant water level in the Týn nad Vltavou area and helps homogenize wastewater from the Temelín power plant, which is discharged through the Kořensko dam structure profile (through piping at the ends of the weir piers or downstream of the hydroelectric power plant outlet). Hněvkovice Reservoir, located on the Vltava upstream of the Kořensko hydraulic structure, provides storage to secure the water abstraction for the Temelín power plant and also performs other power-generation, recreational, and water-management functions.

Dvorčický Stream, together with the small Dvorčice water reservoir (Dvorčice Pond) covering approximately 1.8 ha, drains the southern slope below ETE1,2. It is a left-bank tributary of Malešický Stream and descends approximately 82 m over its 5 km course. A diversion structure supplies a system of ponds on Dříteňský Stream. At present, neither stormwater nor groundwater pumped from the ETE1,2 site is discharged into Dvorčický Stream. The water regime is not optimal; the stream dries up during the summer months (for an average of 1–2 months). The main source of surface water flowing into Dvorčice Pond is the SMR ETE construction area (and construction site facility area H). The pond is located in the headwater area of Dvorčický Stream and is supplied by natural surface and subsurface runoff from the surrounding land (approximately 0.6 l/s), water conveyed by drainage systems from waterlogged parts of the SMR ETE area, and unobserved shallow and deeper groundwater inflows (approximately 1.1 l/s).

Strouha Stream is a left-bank tributary of the Vltava River and enters Hněvkovice Reservoir at river kilometer 214.118 near Buzkov. Its catchment area is 13.19 km^2. It drains the southeastern slope below ETE1,2 and serves as the receiving water for treated stormwater discharged from the separate sewer system of ETE1,2, which enters the stream downstream of the safety retention tanks between Libívský and Mlýnský ponds.

The cadastral areas of Kočín, Sedlec u Temelína, Temelínec, and Chvalešovice are classified as vulnerable zones under Government Decree No. 262/2012 Coll., on the designation of vulnerable zones and the action program, as amended.

The Project area is not part of any protected area of natural water accumulation or any area protected for surface-water accumulation. No protection zones for surface-water sources and/or medicinal water sources are defined near the Project, nor are any surface-water abstractions for human consumption recorded there. There are eight surface-water abstractions for human consumption (water-supply use) along the affected section of the Vltava River (the affected territory is considered to be the section of the Vltava from the Kořensko impoundment to the confluence of the Sázava and Vltava rivers), all of which are recorded as current sources. Four of these surface-water sources for human consumption have a designated protection zone that also includes the Vltava River.

Table C.30: Surface-water abstractions for human consumption and their protection zones along the section of the Vltava River of interest

Structure name	Abstraction ID	Water use	Abstraction volume in the reference year [thousand m³]	Reference year (last year in the records)	Protection zone ID	Protection zone name
1.SčV Příbram Solenice Vltava	120706	municipal	171.614	2024	178202 178302	Solenice surface-water abstraction
1.SčV Příbram Dublovice Zvírotice	120715	municipal	5.71	2023	227102 227202	Dublovice surface-water abstraction from the Vltava
VHS Benešov Živohošť ÚV	120120	municipal	2.336	2024		
Měřín Military Recreation Facility	120517	other	41.4	2024		
VHS Benešov Nová Rabyně	120502	municipal	8.833	2024		
Municipality of Slapy, Slapy ÚV	120522	other	24.784	2024	165002 165102 165202	Slapy Přestavlky surface-water abstraction
VHS Benešov Třebenice-Štěchovice Slapy Reservoir	120501	municipal	11.409	2024	232402	Třebenice surface-water abstraction, Slapy Lake
VHS Benešov Štěchovice	120519	municipal	65.632	2024		

With respect to the recreational use of water, 12 bathing areas have been identified along the section of the Vltava River of interest, in the areas of Orlík and Slapy reservoirs. They are listed in the following table.

Table C.31: Bathing areas along the section of the Vltava River of interest

Area ID	Area name
KO310801	Orlík Reservoir - Podolsko public campground
KO310701	Orlík Reservoir: Radava campsite
KO212301	Orlík Reservoir-Podskalí
KO212303	Orlík Reservoir-Trhovky
KO212001	Orlík Reservoir-Lavičky
KO212302	Orlík Reservoir-Popelíky
KO210702	Slapy Reservoir-Županovice
KO210103	Slapy Reservoir: Nová Živohošť
KO210701	Slapy Reservoir: Živohošť
KO210101	Slapy Reservoir: Měřín
KO210501	Slapy Reservoir: Ždáň
KO210102	Slapy Reservoir: Nová Rabyně

With respect to the suitability of surface water for the life and reproduction of native fish species and other aquatic animals, surface water in the area of interest is designated as cyprinid water by Government Decree No. 71/2003 Coll., on the designation of surface water suitable for the life and reproduction of native fish species and other aquatic animals and on the determination and assessment of the quality of such water, as amended. This applies to "Tributaries of Hněvkovice and Kořensko Reservoirs" in the section from the Hněvkovice Reservoir impoundment to the confluence with the Lužnice, "Lower Blanice" in the section from the confluence with Zlatý Stream to the confluence with the Otava, and "Tributaries of Orlík Reservoir". Salmonid water is designated in the section from the Štěchovice Reservoir dam to the confluence with the Sázava ("Štěchovice Vltava"). The regulation establishes water-quality requirements for these waters.

The affected territory also contains the following non-trout fishing grounds: Vltava 20-Kořensko; Vltava 16-19, Orlík Reservoir; Vltava 15, Kamýk Reservoir; Vltava 10-14, Slapy Reservoir; Vltava 9, Štěchovice Reservoir; and Vltava 8, Vrané nad Vltavou Reservoir.

The areas for siting and construction of the Project do not lie in the floodplain of any watercourse.

C.II.4.1.2. Quantitative data

The following table presents the mean monthly flows in the Vltava River at the České Budějovice gauging station from 2019 to 2025. Flows are not evaluated at profiles farther downstream (closer to the affected site) because they are influenced by the backwater effects of dams on the Vltava River.

Table C.32: Monthly flows at gauging station 115100, České Budějovice, from 2019 to 2025 (Czech Hydrometeorological Institute)

Month	1	2	3	4	5	6	7	8	9	10	11	12
Average [m³/s]	31.8	26.3	29.9	26.7	20.7	23.1	22.6	18.9	29.3	17.0	16.8	25.8

The minimum mean daily flow must be maintained in the Vltava downstream of the dams: 6.5 m³/s at Hněvkovice and 9.5 m³/s at the Kořensko profile (downstream of the confluence of the Vltava and Lužnice rivers).

The impact of the current operation of ETE1,2 on surface-water quantity is determined primarily by the volume of raw water pumped from Hněvkovice Reservoir for cooling. Part of the abstracted water is evaporated in the cooling circuit of ETE1,2, so the volume of wastewater discharged back into Kořensko Reservoir is lower. The volumes of raw water abstracted and wastewater discharged, including a comparison with the values authorized by the water authority's decision, are shown in the following table.

Table C.33: Annual volumes of raw water abstracted and wastewater discharged at ETE1,2 from 2019 to 2025

	Permit/license	2019	2020	2021	2022	2023	2024	2025
	[thousand m³/year]							
Abstraction	47,000	38,305	36,264	35,452	36,955	37,001	34,482	37,148
Discharge	10,800	8,637	8,317	7,730	7,884	8,296	7,773	8,922

The abstraction is authorized by Decision Ref. No. Vod 6804/93/Si of the České Budějovice District Authority water authority, dated December 15, 1993, replaced by Decision File No. OŽP/7497/2006/Si of the Týn nad Vltavou Municipal Authority, dated February 27, 2007, amended by Decision No. 08915/2010, Ref. No. OŽP/08915/2010/F of the Týn nad Vltavou Municipal Authority, dated June 14, 2010, and by the correction of manifest inaccuracies through Decision Ref. No. MÚT/07776/2012, File No. OŽP/07496/2012/F, dated May 9, 2012.

The discharge is authorized by Decision Ref. No. Vod 6804/93/Si of the České Budějovice District Authority water authority, dated December 15, 1993, which was repealed in Part B by Decision Ref. No. KUJCK 107824/2023, dated September 25, 2023. The currently valid wastewater-discharge decision is Decision Ref. No. KUJCK 107824/2023, dated September 25, 2023, and its supplement, Decision Ref. No. KUJCK 75749/2024, dated July 11, 2024.

Over the long term, the volume of raw water abstracted ranges from approximately 73 to 82 % of the authorized value, and the volume of wastewater discharged ranges from approximately 72 to 92 % of the authorized value.

Abstractions for the Temelín site and minimum flows at the Lipno I, Lipno II, Hněvkovice, and Kořensko profiles are secured primarily by managing the active storage of Lipno I Reservoir, with operational use of Hněvkovice balancing reservoir.

C.II.4.1.3 Qualitative data

C.II.4.1.3.1. Surface-water quality

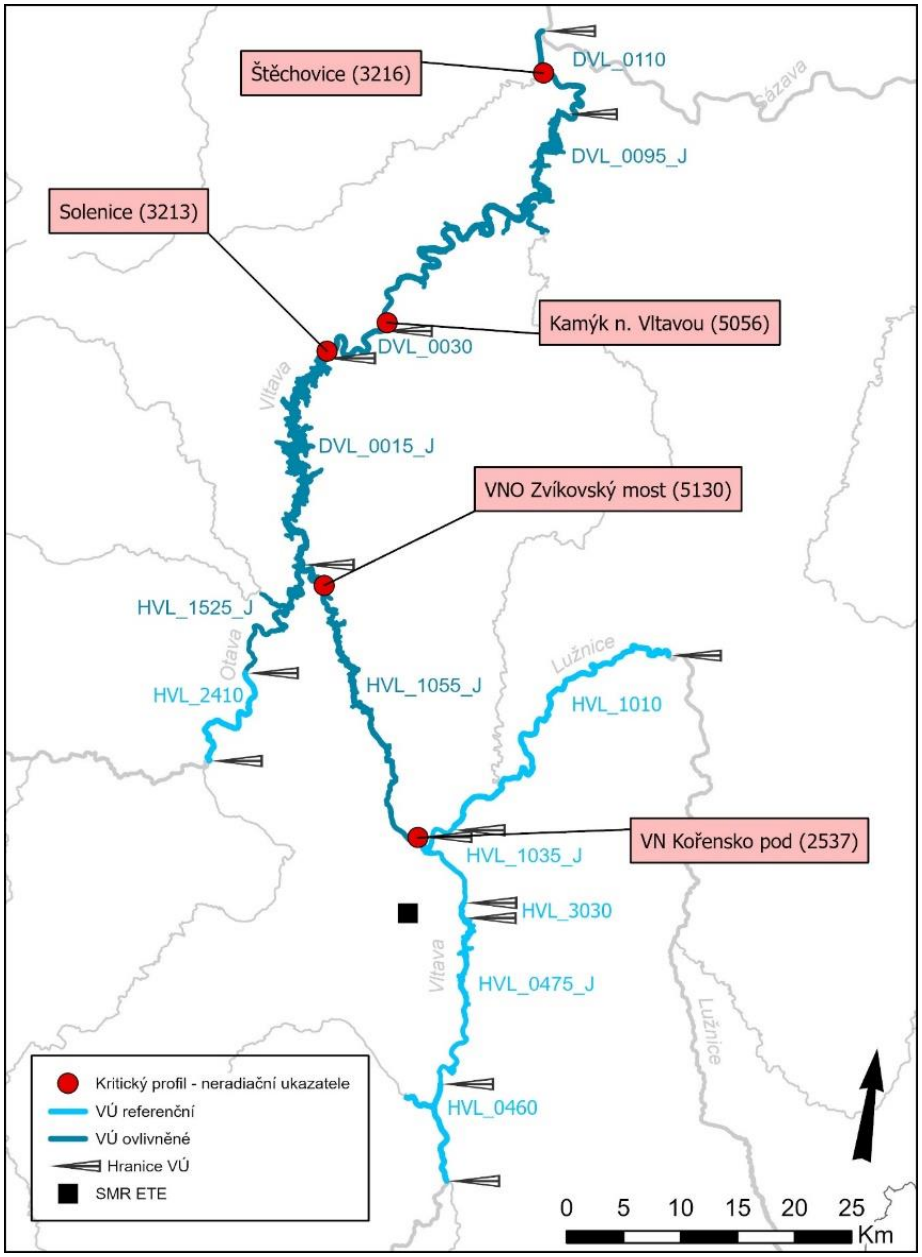
Surface-water quality in the affected territory is monitored under the Program for Monitoring and Assessing the Environmental Impact of the Temelín Nuclear Power Plant, specifically the Monitoring of Surface Water and Groundwater Quality at the Temelín Nuclear Power Plant (prepared by VÚV TGM, v.v.i.). Surface-water quality is also monitored by Povodí Vltavy, s.p.

For the purpose of assessing surface-water quality, critical profiles have been identified along the affected section of the river to assess the impact of SMR ETE on surface-water quality in terms of non-radiological parameters, including temperature (see the following table and figure). For these critical profiles, parameters for assessing the impact of SMR ETE on surface-water quality are specified so that they correspond to the surface-water quality requirements relevant to each critical profile.

Table C.34: Critical profiles for assessing the impact of SMR ETE on surface-water quality in terms of non-radiological parameters, including temperature

Profile ID	Watercourse	Profile name	Purpose of assessment
2537	Vltava	Downstream of Kořensko Reservoir	Direct impact of SMR ETE discharge, permissible surface-water pollution, bathing-water area
5130	Vltava	Orlík Reservoir, Zvíkov Bridge	Permissible surface-water pollution, ecological potential of the SWB (standing waters), bathing-water area
3213	Vltava	Solenice	Public water-supply use
5056	Vltava	Kamýk nad Vltavou	Ecological potential of the SWB (running waters)
3216	Vltava	Štěchovice	Salmonid waters

Fig. C.19: Critical profiles for assessing the impact of SMR ETE on surface-water quality in terms of non-radiological parameters, including temperature



Source: VÚV TGM

Kritický profil – neradiační ukazatele	Critical profile - non-radiological parameters
VÚ referenční	Reference SWB
VÚ ovlivněné	Affected water body
Hranice VÚ	SWB boundary
SMR ETE	SMR ETE

Downstream of Kořensko Reservoir (2537): This is the first critical profile downstream of the SMR ETE wastewater discharge point. It is directly affected by the discharge, which should be routed through the Kořensko hydraulic structure so that the wastewater is immediately mixed with the water in the receiving watercourse. The impact of SMR ETE is therefore assessed here in terms of permissible surface-water pollution under Government Decree No. 401/2015 Coll., on the indicators and values of permissible surface-water and wastewater pollution, the particulars of permits for discharging wastewater into surface water and sewer systems, and sensitive areas, as amended (hereinafter "Government Decree No. 401/2015 Coll."), and also in terms of bathing water because Orlík Reservoir, with the Podolsko bathing area, is located downstream.

Orlík Reservoir, Zvíkov Bridge (5130): This is the next critical profile downstream. It is assessed in terms of permissible surface-water pollution and also the ecological potential of standing surface water bodies because this profile is the representative profile for surface water body HVL_1055_J, Orlík Reservoir I on the Vltava River. The profile is also assessed in terms of bathing areas because several bathing areas are located downstream on Orlík Reservoir. The impact on cyprinid water, which is designated downstream of this profile in the Otava arm of Orlík Reservoir, is also assessed at this profile because a partial impact from SMR ETE wastewater discharges due to the impoundment of Orlík Reservoir cannot be excluded.

Solenice (3213): This is the third critical profile, assessed primarily in terms of the use of surface water for treatment into drinking water because the first water-supply abstraction downstream of the SMR ETE wastewater discharge is located downstream of this profile - 1. SčV Příbram Solenice Vltava.

Kamýk nad Vltavou (5056): This is the representative profile for water body DVL_0030, Vltava from the Orlík Reservoir dam to the Slapy Reservoir impoundment, and is therefore assessed in terms of the ecological potential of running water.

Štěchovice (3216): This is the final critical profile. Salmonid water is designated here, and stricter requirements therefore apply to selected parameters.

The mixed profile at the Hněvkovice Reservoir dam is included as a profile unaffected by ETE wastewater discharges (it is located upstream of the boundary between surface water bodies HVL_0475_J and HVL_3030; see the figure above). At this profile, surface-water quality is not affected by wastewater discharges from ETE1,2 or by the planned projects (New NPP ETE and SMR ETE).

Basic statistical characteristics for the period from 2015 to 2024 are evaluated for each parameter. The results available for the individual profiles and parameters are presented in tables below. The tables also include a comparison with the legislative requirements under Government Decree No. 401/2015 Coll. and the time trend. Attainment or exceedance of the applicable value is indicated by color formatting. All limit categories are compared so that the progression of values along the entire longitudinal profile is clear, even if a particular limit category is not relevant to a specific profile.

Notes to the following tables:

Zkratka	formát při překročení hodnoty
RP	přípustné znečištění - roční průměr/NEK-RP
MAX	přípustné znečištění - maximum/NEK-NPK
min	přípustné znečištění - minimum
LIM-B	přípustné znečištění - roční průměr/NEK-RP (vodárenské využití)
LIM-C	přípustné znečištění - roční průměr/NEK-RP (koupací vody)
LIM-D	přípustné znečištění - roční průměr/NEK-RP (lososové vody)
LIM-E	přípustné znečištění - roční průměr/NEK-RP (kaprové vody)
trend	statisticky významný ano/ne, ↑ ↓ rostoucí / klesající

V daném profilu nehodnocený parametr, použito pro hodnocení v podélném profilu

Zkratka – formát při překročení hodnoty	Abbreviation - format when the value is exceeded
RP – přípustné znečištění – roční průměr r/NEK-RP	AA - permissible pollution - annual average/EQS-AA
MAX – přípustné znečištění – maximum/NEK-NPK	MAX - permissible pollution - maximum/EQS-MAC
min – přípustné znečištění – minimum	min - permissible pollution - minimum
LIM-B – přípustné znečištění – roční průměr/NEK-RP (vodárenské využití)	LIM-B - permissible pollution - annual average/EQS-AA (water-supply use)
LIM-C – přípustné znečištění – roční průměr/NEK-RP (koupací vody)	LIM-C - permissible pollution - annual average/EQS-AA (bathing water)
LIM-D – přípustné znečištění – roční průměr/NEK-RP (lososové vody)	LIM-D - permissible pollution - annual average/EQS-AA (salmonid water)
LIM-E – přípustné znečištění – roční průměr/NEK-RP (kaprové vody)	LIM-E - permissible pollution - annual average/EQS-AA (cyprinid water)
trend – statistický význam ano/ne. rostoucí / klesající	trend - statistically significant: yes/no; increasing/decreasing
V daném profilu nehodnocený parametr, použito pro hodnocení v podélném profilu	*Parameter not assessed at this profile; used for assessment along the longitudinal profile*

Table C.35: Mixed profile at Hněvkovice Reservoir dam - basic statistical data evaluated from 2015 to 2024 and permissible pollution values

Profil VN Hněvkovice hráz směsný

ukazatel	jednotka	RP	MAX	min	LIM-B	LIM-C	LIM-D	LIM-E	období sledování	počet	% <MS	počet odl. hodnot	průměr	maximum	minimum	medián	trend
průhlednost	m								2015-2024	63	0	1	1,2	2	0,2	1,3	Ne
teplota vody	°C		29						2015-2021	35	0	0	17,8	26	6,8	18,9	Ne
reakce vody (pH)			9	5					2015-2021	36	0	0	8,4	9,8	7,2	8,4	Ne
kyslík (O_2) jako koncentrace rozpuštěného kyslíku	mg/l			9					2015-2021	36	0	0	10,1	12,9	8,0	9,85	Ne
kyslík (O_2) jako nasycení vody kyslíkem	%								2015-2021	36	0	0	106,1	146	81	104	Ne
biochemická spotřeba kyslíku (BSK_5)	mg/l	3,8			2,7		1,8	3,2	-	0							
chemická spotřeba kyslíku ($CHSK_{Cr}$)	mg/l	26			5,9				-	0							
celkový organický uhlík (TOC)	mg/l	10			4,5				2015-2019	35	0	0	10,6	19,0	7,7	9,8	Ano ↑
fosfor celkový (P_{celk})	mg/l	0,15				0,05			2015-2024	61	0	1	0,066	0,14	0,03	0,07	Ne
dusík celkový (N_{celk})	mg/l	6							2015-2018	28	7	0	1,25	2,50	0,50	1 200	Ne
fosfor fosforečnanový ($P\text{-}PO_4^{3-}$)	mg/l								2019-2019	7	71	0	0,01	0,02	0,01	0,01	Ne
dusík dusičnanový ($N\text{-}NO_3^-$)	mg/l	5,4							2015-2024	63	17	0	0,61	1,8	0,15	0,54	Ne
dusík dusitanový ($N\text{-}NO_2^-$)	mg/l						0,08	0,12	2015-2024	63	11	0	0,01	0,04	0,00	0,012	Ne
dusík amoniakální ($N\text{-}NH_4^+$)	mg/l	0,23					0,03	0,16	2015-2024	63	6	0	0,08	0,25	0,02	0,05	Ne
amoniak volný výpočtem	mg/l		0,005						2015-2021	35	97	1	0	0,025	0,001	0,003	Ne
rozpuštěné látky sušené (RL_{105})	mg/l	750							-	0							
rozpuštěné látky žíhané (RL_{550})	mg/l	470							-	0							
nerozpuštěné látky (NL_{105})	mg/l	20							-	0							
chloridy (Cl^-)	mg/l	150			65				2015-2018	29	0	1	10,4	14,0	7,9	10,0	Ano ↑
sírany (SO_4^{2-})	mg/l	200			180				2015-2018	28	0	0	16,8	24,0	12,0	16,5	Ne
hořčík (Mg)	mg/l	120							2015-2024	60	0	1	3,7	5,5	2,3	3,6	Ne
vápník (Ca)	mg/l	190							2015-2024	60	0	1	12,614	17,000	7,600	12,000	Ne
uhlovodíky C_{10}-C_{40}	mg/l	0,1			0,05				-	0							
fluoranthen	ug/l	0,0063	0,12						-	0							
benzo[a]pyren	ug/l	0,000017	0,27						-	0							
benzo[b]fluoranthen	ug/l		0,017						-	0							
benzo[k]fluoranthen	ug/l		0,017						-	0							
benzo[g,h,i]perylen	ug/l		0,0082						-	0							
nikl rozp.	ug/l	4	34						-	0							
AOX	ug/l	25			12				-	0							
fenantren	ug/l	0,03							-	0							
pyren	ug/l	0,024							-	0							
hliník	ug/l	1000			380				-	0							
EDTA	ug/l	5							-	0							
metabolity alachloru	ug/l	0,1							-	0							
metolachlor a jeho metabolity	ug/l	0,2							-	0							
terbuthylazin a jeho metabolity	ug/l	0,5							-	0							

Profil VN Hněvkovice hráz směsný	**Mixed profile at Hněvkovice Reservoir dam**
jednotka	unit
RP	AA
MAX	MAX
min	min
LIM-B	LIM-B
LIM-C	LIM-C
LIM-D	LIM-D
LIM-E	LIM-E
období sledování	monitoring period
počet	number
%<MS	%<LOQ
počet odl. hodnot	number of outliers
průměr	mean
maximum	maximum
minimum	minimum
medián	median
trend	trend
ukazatel	parameter
průhlednost	transparency
teplota vody	water temperature
reakce vody (pH)	water reaction (pH)
kyslík (O_2) jako koncentrace rozpuštěného kyslíku	oxygen (O_2) as dissolved oxygen concentration
kyslík (O_2) jako nasycení vody kyslíkem	oxygen (O_2) as oxygen saturation of water
biochemická spotřeba kyslíku (BSK_5)	biochemical oxygen demand (BOD_5)
chemická spotřeba kyslíku ($CHSK_{Cr}$)	chemical oxygen demand ($CHSK_{Cr}$)
celkový organický uhlík (TOC)	total organic carbon (TOC)
fosfor celkový (P_{celk})	total phosphorus (P_{total})
dusík celkový (N_{celk})	total nitrogen (N_{total})
fosfor fosforečnanový ($P\text{-}PO_4^{3-}$)	orthophosphate phosphorus ($P\text{-}PO_4^{3-}$)
dusík dusičnanový ($N\text{-}NNO_3^-$)	nitrate nitrogen ($N\text{-}NNO_3^-$)
dusík dusitanový ($N\text{-}NO_2^-$)	nitrite nitrogen ($N\text{-}NO_2^-$)
dusík amoniakální ($N\text{-}NH_4^+$)	ammonia nitrogen ($N\text{-}NH_4^+$)
amoniak volný výpočtem	calculated free ammonia
rozpuštěné látky sušené (RL_{105})	dried dissolved solids (DS_{105})
rozpuštěné látky žíhané (RL_{550})	ignited dissolved solids (DS_{550})
nerozpuštěné látky (NL_{105})	suspended solids (SS_{105})
chloridy (Cl^-)	chlorides (Cl^-)

sírany (SO_4^{2-})	sulfates (SO_4^{2-})
hořčík (Mg)	magnesium (Mg)
vápník (Ca)	calcium (Ca)
uhlovodíky C_{10}-C_{40}	C_{10}–C_{40} hydrocarbons
fluoranthen	fluoranthene
benzo[a]pyren	benzo[a]pyrene
benzo[b]fluoranthen	benzo[b]fluoranthene
benzo[k]fluoranthen	benzo[k]fluoranthene
benzo[g,h,i]perylen	benzo[g,h,i]perylene
nikl rozp.	dissolved nickel
AOX	AOX
fenantren	phenanthrene
pyren	pyrene
hliník	aluminum
EDTA	EDTA
metabolity alachloru	alachlor metabolites
metolachlor a jeho metabolity	metolachlor and its metabolites
terbuthylazin a jeho metabolity	terbuthylazine and its metabolites
m	m
°C	°C
mg/l	mg/l
ug/l	µg/l
Ano	Yes
Ne	No

Table C.36: Downstream of Kořensko Reservoir profile - basic statistical data evaluated from 2015 to 2024 and permissible pollution values

Profil VN Kořensko pod

ukazatel	jednotka	RP	MAX	min	LIM-B	LIM-C	LIM-D	LIM-E	období sledování	počet	% <MS	počet odl. hodnot	průměr	maximum	minimum	medián	trend
teplota vody	°C		29						2015-2024	120	0	0	11,8	24,7	0,3	11,55	Ne
reakce vody (pH)			9	5					2015-2024	120	0	0	7,5	9,1	6,8	7,5	Ne
kyslík (O_2) jako koncentrace rozpuštěného kyslíku	mg/l			9					2015-2024	120	0	0	10,4	14,3	5,6	10,7	Ne
kyslík (O_2) jako nasycení vody kyslíkem	%								2015-2024	120	0	1	93,5	121	64	94	Ne
biochemická spotřeba kyslíku (BSK_5)	mg/l		3,8		2,7		1,8	3,2	2015-2024	119	0	1	3,9	7,8	1,5	3,75	Ne
chemická spotřeba kyslíku ($CHSK_{Cr}$)	mg/l		26		5,9				2015-2024	120	0	1	29,1	47,0	19,0	28	Ne
celkový organický uhlík (TOC)	mg/l		10		4,5				2015-2024	120	0	0	11,3	18,0	7,6	10,8	Ne
fosfor celkový (P_{celk})	mg/l		0,15			0,05			2015-2024	120	0	1	0,11	0,19	0,045	0,110	Ne
dusík celkový (N_{celk})	mg/l		6						2015-2024	120	0	0	2,54	5,50	0,70	2,40	Ne
fosfor fosforečnanový ($P\text{-}PO_4^{3-}$)	mg/l								2015-2024	120	12	0	0,03	0,08	0,01	0,029	Ne
dusík dusičnanový ($N\text{-}NO_3^-$)	mg/l		5,4						2015-2024	120	1	0	1,53	4,70	0,15	1,25	Ne
dusík dusitanový ($N\text{-}NO_2^-$)	mg/l						0,08	0,12	2015-2024	120	0	0	0,02	0,043	0,007	0,019	Ne
dusík amoniakální ($N\text{-}NH_4^+$)	mg/l		0,23				0,03	0,16	2015-2024	120	0	0	0,13	0,37	0,02	0,12	Ano ↓
amoniak volný výpočtem	mg/l		*0,005*						*2015-2024*	*120*	*56*	*2*	*0,001*	*0,005*	*0,001*	*0,001*	*Ne*
rozpuštěné látky sušené (RL_{105})	mg/l		750						-	0							
rozpuštěné látky žíhané (RL_{550})	mg/l		470						-	0							
nerozpuštěné látky (NL_{105})	mg/l		20						2015-2024	120	0	0	13,6	39,0	4,3	13,0	Ne
chloridy (Cl^-)	mg/l		150		65				2015-2024	120	0	0	17,8	36,0	6,8	17,0	Ne
sírany (SO_4^{2-})	mg/l		200		180				2015-2024	120	0	0	21,1	44,0	10,0	21,0	Ano ↓
hořčík (Mg)	mg/l		120						2015-2024	120	0	0	5,1	9,6	3,0	5,2	Ne
vápník (Ca)	mg/l		190						2015-2024	119	0	0	17,8	31,0	11,0	18,0	Ne
uhlovodíky C_{10}-C_{40}	mg/l		0,1		0,05				-	0							
fluoranthen	ug/l	0,0063	0,12						-	0							
benzo[a]pyren	ug/l	0,000017	0,27						-	0							
benzo[b]fluoranthen	ug/l		0,017						-	0							
benzo[k]fluoranthen	ug/l		0,017						-	0							
benzo[g,h,i]perylen	ug/l		0,0082						-	0							
nikl rozp.	ug/l	4	34						-	0							
AOX	ug/l	25			12				-	0							
fenantren	ug/l	0,03							-	0							
pyren	ug/l	0,024							-	0							
hliník	ug/l	1000			380				-	0							
EDTA	ug/l	5							-	0							
metabolity alachloru	ug/l	0,1							-	0							
metolachlor a jeho metabolity	ug/l	0,2							-	0							
terbuthylazin a jeho metabolity	ug/l	0,5							-	0							

Profil VN Kořensko pod	**Profile downstream of Kořensko Reservoir**
jednotka	unit
RP	AA
MAX	MAX
min	min
LIM-B	LIM-B
LIM-C	LIM-C
LIM-D	LIM-D
LIM-E	LIM-E
období sledování	monitoring period
počet	number
%<MS	%<LOQ
počet odl. hodnot	number of outliers
průměr	mean
maximum	maximum
minimum	minimum
medián	median
trend	trend
ukazatel	parameter
teplota vody	water temperature
reakce vody (pH)	water reaction (pH)
kyslík (O_2) jako koncentrace rozpuštěného kyslíku	oxygen (O_2) as dissolved oxygen concentration
kyslík (O_2) jako nasycení vody kyslíkem	oxygen (O_2) as oxygen saturation of water
biochemická spotřeba kyslíku (BSK_5)	biochemical oxygen demand (BOD_5)
chemická spotřeba kyslíku ($CHSK_{Cr}$)	chemical oxygen demand ($CHSK_{Cr}$)
celkový organický uhlík (TOC)	total organic carbon (TOC)
fosfor celkový (P_{celk})	total phosphorus (P_{tot})
dusík celkový (N_{celk})	total nitrogen (N_{tot})
fosfor fosforečnanový ($P\text{-}PO_4^{3-}$)	orthophosphate phosphorus ($P\text{-}PO_4^{3-}$)
dusík dusičnanový ($N\text{-}NO_3$)	nitrate nitrogen ($N\text{-}NO_3$)
dusík dusitanový($N\text{-}NO_2^-$)	nitrite nitrogen($N\text{-}NO_2^-$)
dusík amoniakální ($N\text{-}NH_4^+$)	ammonia nitrogen ($N\text{-}NH_4^+$)
amoniak volný výpočtem	calculated free ammonia
rozpuštěné látky sušené (RL_{105})	dried dissolved solids (DS_{105})
rozpuštěné látky žíhané (RL_{550})	ignited dissolved solids (DS_{550})
nerozpuštěné látky (NL_{105})	suspended solids (SS_{105})
chloridy (Cl^-)	chlorides (Cl^-)
sírany (SO_4^{2-})	sulfates (SO_4^{2-})

hořčík (Mg)	magnesium (Mg)
vápník (Ca)	calcium (Ca)
uhlovodíky C_{10}-C_{40}	C_{10}–C_{40} hydrocarbons
fluoranthen	fluoranthene
benzo[a]pyren	benzo[a]pyrene
benzo[b]fluoranthen	benzo[b]fluoranthene
benzo[k]fluoranthen	benzo[k]fluoranthene
benzo[g,h,i]perylen	benzo[g,h,i]perylene
nikl rozp.	dissolved nickel
AOX	AOX
fenantren	phenanthrene
pyren	pyrene
hliník	aluminum
EDTA	EDTA
metabolity alachloru	alachlor metabolites
metolachlor a jeho metabolity	metolachlor and its metabolites
terbuthylazin a jeho metabolity	terbuthylazine and its metabolites
°C	°C
mg/l	mg/l
ug/l	µg/l
Ano	Yes
Ne	No

Table C.37: Mixed profile at Orlík Reservoir, Zvíkov Bridge - basic statistical data evaluated from 2015 to 2024 and permissible pollution values

Profil VNO Zvíkovský most směsný

ukazatel	jednotka	RP	MAX	min	LIM-B	LIM-C	LIM-D	LIM-E	období sledování	počet	% <MS	počet odl. hodnot	průměr	maximum	minimum	medián	trend
průhlednost									2021-2024	27	0	0	1,6	3	0,35	1,6	Ne
teplota vody	°C		29						-	0							
reakce vody (pH)			9	5					-	0							
kyslík (O_2) jako koncentrace rozpuštěného kyslíku	mg/l			9					-	0							
kyslík (O_2) jako nasycení vody kyslíkem	%								-	0							
biochemická spotřeba kyslíku (BSK_5)	mg/l	3,8			2,7		1,8	3,2	-	0							
chemická spotřeba kyslíku ($CHSK_{Cr}$)	mg/l	26			5,9				-	0							
celkový organický uhlík (TOC)	mg/l	10			4,5				2015-2024	63	0	0	10,6	18	6,9	10	Ne
fosfor celkový (P_{celk})	mg/l	0,15				0,05			2015-2024	63	0	0	0,07	0,13	0,03	0,06	Ne
dusík celkový (N_{celk})	mg/l	6							2015-2024	58	3	0	1,73	4,8	0,5	1,6	Ano ↑
fosfor fosforečnanový ($P\text{-}PO_4^{3-}$)	*mg/l*								*2015-2020*	*40*	*35*	*0*	*0*	*0,05*	*0,01*	*0,0125*	*Ne*
dusík dusičnanový ($N\text{-}NO_3^-$)	mg/l	5,4							2015-2024	63	8	0	0,95	3,6	0,15	0,75	Ne
dusík dusitanový ($N\text{-}NO_2^-$)	mg/l						0,08	0,12	2015-2024	58	3	2	0,02	0,05	0,00	0,0185	Ne
dusík amoniakální ($N\text{-}NH_4^+$)	mg/l	0,23					0,03	0,16	2015-2024	63	10	0	0,09	0,3	0,02	0,06	Ano ↑
amoniak volný výpočtem	*mg/l*		*0,005*						-	*0*							
rozpuštěné látky sušené (RL_{105})	mg/l	750							-	0							
rozpuštěné látky žíhané (RL_{550})	mg/l	470							-	0							
nerozpuštěné látky (NL_{105})	mg/l	20							-	0							
chloridy (Cl^-)	mg/l	150			65				-	0							
sírany (SO_4^{2-})	mg/l	200			180				-	0							
hořčík (Mg)	mg/l	120							2015-2024	58	0	0	4,6	6,4	3,2	4,6	Ne
vápník (Ca)	mg/l	190							2015-2024	58	0	0	16	22	11	16	Ne
uhlovodíky C_{10}–C_{40}	mg/l	0,1			0,05				-	0							
fluoranthen	ug/l	0,0063	0,12						-	0							
benzo[a]pyren	ug/l	0,000017	0,27						-	0							
benzo[b]fluoranthen	ug/l		0,017						-	0							
benzo[k]fluoranthen	ug/l		0,017						-	0							
benzo[g,h,i]perylen	ug/l		0,0082						-	0							
nikl rozp.	ug/l	4	34			12			-	0							
AOX	ug/l	25							-	0							
fenantren	ug/l	0,03							-	0							
pyren	ug/l	0,024							-	0							
hliník	ug/l	1000			380				-	0							
EDTA	ug/l	5							-	0							

Profil VNO Zvíkovský most směsný	**Mixed profile at Orlík Reservoir, Zvíkov Bridge**
jednotka	unit
RP	AA
MAX	MAX
min	min
LIM-B	LIM-B
LIM-C	LIM-C
LIM-D	LIM-D
LIM-E	LIM-E
období sledování	monitoring period
počet	number
%<MS	%<LOQ
počet odl. hodnot	number of outliers
průměr	mean
maximum	maximum
minimum	minimum
medián	median
trend	trend
ukazatel	parameter
průhlednost	transparency
teplota vody	water temperature
reakce vody (pH)	water reaction (pH)
kyslík (O_2) jako koncentrace rozpuštěného kyslíku	oxygen (O_2) as dissolved oxygen concentration
kyslík (O_2) jako nasycení vody kyslíkem	oxygen (O_2) as oxygen saturation of water
biochemická spotřeba kyslíku (BSK_5)	biochemical oxygen demand (BOD_5)
chemická spotřeba kyslíku ($CHSK_{Cr}$)	chemical oxygen demand ($CHSK_{Cr}$)
celkový organický uhlík (TOC)	total organic carbon (TOC)
fosfor celkový (P_{celk})	total phosphorus (P_{tot})
dusík celkový (N_{celk})	total nitrogen (N_{tot})
fosfor fosforečnanový ($P\text{-}PO_4^{3-}$)	orthophosphate phosphorus ($P\text{-}PO_4^{3-}$)
dusík dusičnanový ($N\text{-}NO_3$)	nitrate nitrogen ($N\text{-}NO_3$)
dusík dusitanový($N\text{-}NO_2^-$)	nitrite nitrogen($N\text{-}NO_2^-$)
dusík amoniakální ($N\text{-}NH_4^+$)	ammonia nitrogen ($N\text{-}NH_4^+$)
amoniak volný výpočtem	calculated free ammonia
rozpuštěné látky sušené (RL_{105})	dried dissolved solids (DS_{105})
rozpuštěné látky žíhané (RL_{550})	ignited dissolved solids (DS_{550})
nerozpuštěné látky (NL_{105})	suspended solids (SS_{105})
chloridy (Cl^-)	chlorides (Cl^-)

sírany (SO_4^{2-})	sulfates (SO_4^{2-})
hořčík (Mg)	magnesium (Mg)
vápník (Ca)	calcium (Ca)
uhlovodíky C_{10}-C_{40}	C_{10}–C_{40} hydrocarbons
fluoranthen	fluoranthene
benzo[a]pyren	benzo[a]pyrene
benzo[b]fluoranthen	benzo[b]fluoranthene
benzo[k]fluoranthen	benzo[k]fluoranthene
benzo[g,h,i]perylen	benzo[g,h,i]perylene
nikl rozp.	dissolved nickel
AOX	AOX
fenantren	phenanthrene
pyren	pyrene
hliník	aluminum
EDTA	EDTA
°C	°C
mg/l	mg/l
ug/l	µg/l
Ano	Yes
Ne	No

Table C.38: Solenice, Kamýk nad Vltavou, and Štěchovice profiles - basic statistical data evaluated from 2015 to 2024 and permissible pollution values

Profil Solenice

ukazatel	jednotka	RP	MAX	min	LIM-B	LIM-C	LIM-D	LIM-E	období sledování	počet	% <MS	počet odl. hodnot	průměr	maximum	minimum	medián	trend
teplota vody	°C		29						2015-2024	120	0	0	9,7	19,8	2,3	9,0	Ne
reakce vody (pH)			9	5					2015-2024	120	0	0	7,3	8,1	6,6	7,3	Ano ↓
kyslík (O_2) jako koncentrace rozpuštěného kyslíku	mg/l			9					2015-2024	120	0	0	7,4	12,6	1,7	7,85	Ne
kyslík (O_2) jako nasycení vody kyslíkem	%								2015-2024	120	0	0	63,3	93	18	68,5	Ne
biochemická spotřeba kyslíku (BSK_5)	mg/l	3,8			2,7		1,8	3,2	2015-2024	118	1	0	1,85	4,3	0,5	1,7	Ne
chemická spotřeba kyslíku ($CHSK_{Cr}$)	mg/l	26			5,9				2015-2024	120	0	0	21	36	14	21	Ano ↑
celkový organický uhlík (TOC)	mg/l	10			4,5				2015-2024	119	0	1	8,4	12	6,1	8,1	Ano ↑
fosfor celkový (P_{celk})	mg/l	0,15				0,05			2015-2024	120	0	1	0,061	0,110	0,027	0,058	Ano ↑
fosfor fosforečnanový ($P\text{-}PO_4^{3-}$)	mg/l								2015-2024	120	1	0	0,037	0,090	0,010	0,035	Ano ↑
dusík dusičnanový ($N\text{-}NO_3^-$)	mg/l	5,4							2015-2024	120	0	0	2,07	4,70	0,43	1,80	Ne
dusík dusitanový ($N\text{-}NO_2^-$)	*mg/l*						*0,08*	*0,12*	*2015-2024*	*119*	*3*	*0*	*0,015*	*0,052*	*0,002*	*0,01*	*Ne*
dusík amoniakální ($N\text{-}NH_4^+$)	mg/l	0,23					0,03	0,16	2015-2024	120	16	0	0,08	0,44	0,02	0,04	Ne
amoniak volný výpočtem	*mg/l*		*0,005*						*2015-2024*	*120*	*89*	*0*	*0,001*	*0,005*	*0,001*	*0,001*	*Ne*
sírany (SO_4^{2-})	mg/l	200			180				2015-2024	120	0	0	22,4	32,0	16,0	22	Ano ↓
hořčík (Mg)	mg/l	120							2015-2024	120	0	0	5,5	7,3	3,9	5,45	Ne
vápník (Ca)	mg/l	190							2015-2024	120	0	1	18,8	27,0	13,0	19	Ano ↓

Profil Kamýk n. Vltavou

ukazatel	jednotka	RP	MAX	min	LIM-B	LIM-C	LIM-D	LIM-E	období sledování	počet	% <MS	počet odl. hodnot	průměr	maximum	minimum	medián	trend
teplota vody	°C		29						2015-2024	119	0	0	9,6	19,5	2,3	8,9	Ne
reakce vody (pH)			9	5					2015-2024	119	0	0	7,6	8,5	6,9	7,5	Ne
kyslík (O_2) jako koncentrace rozpuštěného kyslíku	mg/l			9					2015-2024	119	0	0	8,0	14,0	1,4	8,7	Ne
kyslík (O_2) jako nasycení vody kyslíkem	%								2015-2024	119	0	0	70,2	109	15,1	76,5	Ne
biochemická spotřeba kyslíku (BSK_5)	mg/l	3,8			2,7		1,8	3,2	2015-2024	111	1	1	1,14	3,2	0,5	1,0	Ne
fosfor celkový (P_{celk})	mg/l	0,15				0,05			2015-2024	119	0	2	0,055	0,100	0,026	0,053	Ne
fosfor fosforečnanový ($P\text{-}PO_4^{3-}$)	mg/l								2015-2024	118	4	0	0,033	0,072	0,010	0,033	Ne
dusík dusičnanový ($N\text{-}NO_3^-$)	mg/l	5,4							2015-2024	119	0	0	2,07	4,70	0,50	1,90	Ne
dusík dusitanový ($N\text{-}NO_2^-$)	*mg/l*						*0,08*	*0,12*	*2015-2024*	*118*	*46*	*0*	*0,018*	*0,061*	*0,003*	*0,0105*	*Ano ↑*
dusík amoniakální ($N\text{-}NH_4^+$)	mg/l	0,23					0,03	0,16	2015-2024	119	50	0	0,06	0,30	0,03	0,03	Ne
amoniak volný výpočtem	*mg/l*		*0,005*						*2015-2024*	*119*	*82*	*0*	*0,001*	*0,004*	*0,001*	*0,001*	*Ne*

Profil Štěchovice

ukazatel	jednotka	RP	MAX	min	LIM-B	LIM-C	LIM-D	LIM-E	období sledování	počet	% <MS	počet odl. hodnot	průměr	maximum	minimum	medián	trend
teplota vody	°C		29						2015-2024	120	0	0	9,8	18,6	2,9	9,5	Ne
reakce vody (pH)			9	5					2015-2024	120	0	0	7,5	8,4	6,8	7,5	Ano ↓
kyslík (O_2) jako koncentrace rozpuštěného kyslíku	mg/l			9					2015-2024	120	0	0	8,5	13,1	2,5	8,85	Ano ↓
kyslík (O_2) jako nasycení vody kyslíkem	%								2015-2024	120	0	0	75,3	107	26,3	78,75	Ano ↓
biochemická spotřeba kyslíku (BSK_5)	mg/l	3,8			2,7		1,8	3,2	2015-2024	111	7	2	0,81	1,7	0,3	0,8	Ne
dusík dusitanový ($N\text{-}NO_2^-$)	mg/l						0,08	0,12	2015-2024	120	70	1	0,01	0,03	0,003	0,01	Ne
dusík amoniakální ($N\text{-}NH_4^+$)	mg/l	0,23					0,03	0,16	2015-2024	120	83	0	0,03	0,12	0,03	0,03	Ne
amoniak volný výpočtem	*mg/l*		*0,005*						*2015-2024*	*120*	*96*	*0*	*0,001*	*0,003*	*0,001*	*0,001*	*Ne*

Profil Solenice	**Solenice profile**
jednotka	unit
RP	AA
MAX	MAX
min	min
LIM-B	LIM-B
LIM-C	LIM-C
LIM-D	LIM-D
LIM-E	LIM-E
období sledování	monitoring period
počet	number
%<MS	%<LOQ
počet odl. hodnot	number of outliers
průměr	mean
maximum	maximum
minimum	minimum
medián	median
trend	trend
ukazatel	parameter
průhlednost	transparency
teplota vody	water temperature
reakce vody (pH)	water reaction (pH)
kyslík (O_2) jako koncentrace rozpuštěného kyslíku	oxygen (O_2) as dissolved oxygen concentration
kyslík (O_2) jako nasycení vody kyslíkem	oxygen (O_2) as oxygen saturation of water
biochemická spotřeba kyslíku (BSK_5)	biochemical oxygen demand (BOD_5)
chemická spotřeba kyslíku ($CHSK_{Cr}$)	chemical oxygen demand ($CHSK_{Cr}$)
celkový organický uhlík (TOC)	total organic carbon (TOC)
fosfor celkový (P_{celk})	total phosphorus (P_{tot})
dusík celkový (N_{celk})	total nitrogen (N_{tot})
fosfor fosforečnanový ($P\text{-}PO_4^{3-}$)	orthophosphate phosphorus ($P\text{-}PO_4^{3-}$)
dusík dusičnanový ($N\text{-}NO_3$)	nitrate nitrogen ($N\text{-}NO_3$)
dusík dusitanový($N\text{-}NO_2^-$)	nitrite nitrogen($N\text{-}NO_2^-$)
dusík amoniakální ($N\text{-}NH_4^+$)	ammonia nitrogen ($N\text{-}NH_4^+$)
amoniak volný výpočtem	calculated free ammonia
sírany (SO_4^{2-})	sulfates (SO_4^{2-})
hořčík (Mg)	magnesium (Mg)
vápník (Ca)	calcium (Ca)
°C	°C

mg/l	mg/l
Ano	Yes
Ne	No

Profil Kamýk n. Vltavou	**Kamýk nad Vltavou**
jednotka	unit
RP	AA
MAX	MAX
min	min
LIM-B	LIM-B
LIM-C	LIM-C
LIM-D	LIM-D
LIM-E	LIM-E
období sledování	monitoring period
počet	number
%<MS	%<LOQ
počet odl. hodnot	number of outliers
průměr	mean
maximum	maximum
minimum	minimum
medián	median
trend	trend
ukazatel	parameter
teplota vody	water temperature
reakce vody (pH)	water reaction (pH)
kyslík (O_2) jako koncentrace rozpuštěného kyslíku	oxygen (O_2) as dissolved oxygen concentration
kyslík (O_2) jako nasycení vody kyslíkem	oxygen (O_2) as oxygen saturation of water
biochemická spotřeba kyslíku (BSK_5)	biochemical oxygen demand (BOD_5)
chemická spotřeba kyslíku ($CHSK_{Cr}$)	chemical oxygen demand ($CHSK_{Cr}$)
fosfor celkový (P_{celk})	total phosphorus (P_{tot})
fosfor fosforečnanový ($P\text{-}PO_4^{3-}$)	orthophosphate phosphorus ($P\text{-}PO_4^{3-}$)
dusík dusičnanový ($N\text{-}NO_3$)	nitrate nitrogen ($N\text{-}NO_3$)
dusík dusitanový($N\text{-}NO_2^-$)	nitrite nitrogen($N\text{-}NO_2^-$)
dusík amoniakální ($N\text{-}NH_4^+$)	ammonia nitrogen ($N\text{-}NH_4^+$)
amoniak volný výpočtem	calculated free ammonia
°C	°C
mg/l	mg/l
Ano	Yes

Ne	No

Profil Štechovice	**Štěchovice profile**
jednotka	unit
RP	AA
MAX	MAX
min	min
LIM-B	LIM-B
LIM-C	LIM-C
LIM-D	LIM-D
LIM-E	LIM-E
období sledování	monitoring period
počet	number
%<MS	%<LOQ
počet odl. hodnot	number of outliers
průměr	mean
maximum	maximum
minimum	minimum
medián	median
trend	trend
ukazatel	parameter
teplota vody	water temperature
reakce vody (pH)	water reaction (pH)
kyslík (O_2) jako koncentrace rozpuštěného kyslíku	oxygen (O_2) as dissolved oxygen concentration
kyslík (O_2) jako nasycení vody kyslíkem	oxygen (O_2) as oxygen saturation of water
biochemická spotřeba kyslíku (BSK_5)	biochemical oxygen demand (BOD_5)
dusík dusitanový($N\text{-}NO_2^-$)	nitrite nitrogen($N\text{-}NO_2^-$)
dusík amoniakální ($N\text{-}NH_4^+$)	ammonia nitrogen ($N\text{-}NH_4^+$)
amoniak volný výpočtem	calculated free ammonia
°C	°C
mg/l	mg/l
Ano	Yes
Ne	No

The tables show that the range of parameters monitored differs among profiles and that data are missing for some profiles. A brief assessment of each parameter, a comparison of the evaluated values with the relevant permissible pollution values under Government Decree No. 401/2015 Coll., and an evaluation of trends in the monitored parameter values over time at the individual profiles are provided below.

No statistically significant change in the monitored values over time was identified for the transparency parameter.

For the temperature parameter, the permissible pollution values (maximum) under Government Decree No. 401/2015 Coll. were not reached/exceeded anywhere along the entire longitudinal profile of the Vltava, and no statistically significant decreasing or increasing trend in the values was identified.

For the water reaction (pH) parameter, the values identified were not always within the range specified by Government Decree No. 401/2015 Coll. at the mixed profile at the Hněvkovice Reservoir dam and the downstream Kořensko Reservoir profile. At these profiles, the maximum value identified was higher than that specified in Government Decree No. 401/2015 Coll. During the monitoring period, a statistically significant decreasing trend was identified at the Solenice and Kamýk nad Vltavou.

For the dissolved oxygen parameter, minima below the permissible pollution value (minimum) under Government Decree No. 401/2015 Coll. were identified at the monitored profiles along the entire longitudinal profile of the Vltava. A statistically significant change was identified only at Kamýk nad Vltavou, where the values decreased during the monitoring period (deterioration).

A statistically significant change in the oxygen saturation of water parameter was identified at Kamýk nad Vltavou, where the values decreased during the monitoring period.

For biochemical oxygen demand (BOD_5), the permissible pollution value (annual average) under Government Decree No. 401/2015 Coll., the value for water-supply use, and the value for cyprinid water (annual average) were reached/exceeded at the downstream Kořensko Reservoir profile. The value for salmonid water (annual average) was exceeded along almost the entire longitudinal profile except at the Kamýk and Štěchovice profiles. No statistically significant decreasing or increasing trend was identified at any profile during the monitoring period.

For chemical oxygen demand ($CHSK_{Cr}$), the permissible pollution values (annual average) under Government Decree No. 401/2015 Coll. were reached/exceeded at the downstream Kořensko Reservoir profile. The value for water-supply use (annual average) was reached/exceeded at all profiles for which data were available. A statistically significant increasing trend, i.e., deterioration in the values over time, was identified at the Solenice profile.

For total organic carbon (TOC), the permissible pollution values (annual average) under Government Decree No. 401/2015 Coll. were reached/exceeded at the downstream Kořensko Reservoir profile and the mixed profile at Orlík Reservoir, Zvíkov Bridge. The value for water-supply use (annual average) was reached/exceeded at all profiles for which data were available. A statistically significant increasing trend was identified at the mixed profile at the Hněvkovice Reservoir dam and the Solenice profile.

For total phosphorus (P_{total}), the permissible pollution value (annual average) under Government Decree No. 401/2015 Coll. was met at all profiles. The value for salmonid water (annual average) was reached/exceeded at all profiles. A statistically significant increasing trend was recorded at the Solenice profile.

A statistically significant increasing trend in orthophosphate phosphorus ($P\text{-}PO_4^{3-}$) was identified at the Solenice profile.

For total nitrogen (N_{total}) and nitrate nitrogen ($N\text{-}NO_3^-$), the permissible pollution values (annual average) under Government Decree No. 401/2015 Coll. were not reached/exceeded at any monitored profile. For total nitrogen (N_{total}), a statistically significant increasing trend was identified at the mixed Zvíkov Bridge profile during the monitoring period; no trend was demonstrated for nitrate nitrogen ($N\text{-}NO_3^-$).

For nitrite nitrogen ($N\text{-}NO_2^-$), the permissible pollution values (annual average) under Government Decree No. 401/2015 Coll. for salmonid and cyprinid waters were not reached/exceeded. A statistically significant increasing trend was recorded at Kamýk nad Vltavou.

For ammonia nitrogen ($N\text{-}NH_4^+$), the permissible pollution value (annual average) under Government Decree No. 401/2015 Coll. was not reached/exceeded. The value for salmonid water was reached/exceeded along the entire longitudinal profile. During the monitoring period, a statistically significant decreasing trend was identified at the downstream Kořensko Reservoir profile and an increasing trend at the mixed profile at Orlík Reservoir, Zvíkov Bridge.

For suspended solids (SS_{105}), the permissible pollution values (annual average) under Government Decree No. 401/2015 Coll. were met at all profiles, and no statistically significant trend was identified at any profile during the monitoring period.

The chlorides (Cl^-) parameter was monitored only at the mixed profile at the Hněvkovice Reservoir dam and the downstream Kořensko Reservoir profile. At both profiles, the evaluated average was significantly below the permissible pollution value (annual average) under Government Decree No. 401/2015 Coll. and the stricter value for water-supply use. A statistically significant increasing trend was identified at the mixed profile at the Hněvkovice Reservoir dam.

The sulfates (SO_4^{2-}) parameter was monitored only at the mixed profile at the Hněvkovice Reservoir dam, the downstream Kořensko Reservoir profile, and the Solenice profile. At all profiles, the evaluated average was significantly below the permissible pollution value (annual average) under Government Decree No. 401/2015 Coll. and the stricter value for water-supply use. During the monitoring period, a statistically significant decreasing trend was identified at the downstream Kořensko Reservoir and Solenice profiles.

For magnesium (Mg) and calcium (Ca), the evaluated average at all profiles was significantly below the permissible pollution value (annual average) under Government Decree No. 401/2015 Coll. No statistically significant trend in magnesium (Mg) concentrations was identified during the monitoring period; for calcium (Ca), a statistically significant decreasing trend was identified at the Solenice profile during the monitoring period.

The C_{10}–C_{40} hydrocarbons parameter was not monitored at any profile.

For the critical profiles at the mixed profile at Orlík Reservoir, Zvíkov Bridge, and Kamýk nad Vltavou, the parameters evaluated were also compared with the values of general physicochemical and chemical parameters for assessing the ecological potential of running or standing surface water bodies (the boundary between good and moderate potential) for the relevant water-body type. A higher value for total phosphorus (P_{total}) was identified at the mixed Zvíkov Bridge profile. At Kamýk nad Vltavou, lower minimum temperatures were identified for April, May, and June, together with lower oxygen saturation; the maximum pH reached the threshold value, as did the median for total phosphorus (P_{total}).

For the critical Štěchovice profile, the parameters evaluated were also compared with the surface-water quality values suitable for the life and reproduction of native fish species and other aquatic animals under Government Decree No. 71/2003 Coll. In this comparison, the target value for ammonia nitrogen, or ammonium ions, was not met. For dissolved oxygen, neither the target value nor the permissible value was met.

C.II.4.1.3.2. Quality of water abstracted and discharged by ETE1,2

The quality of water abstracted and discharged by ETE1,2 from 2015 to 2024 is summarized in the following tables. The data are based on information from the operator of ETE1,2 (ČEZ, a. s.).

Table C.39: Mean annual concentrations of monitored parameters measured in raw water pumped by ETE1,2 from 2015 to 2024

Raw water for ETE1,2												
Parameter	Unit	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Mean
water temperature	°C	11.9	11.7	11.9	12.0	11.3	11.4	10.8	11.5	11.4	12.6	11.7
water reaction (pH)	-	7.4	7.6	7.4	7.5	7.6	7.5	7.5	7.5	7.4	7.4	7.5
dissolved oxygen (O_2)	mg/l	7.9	7.8	6.9	7.9	8.1	8.6	9.6	8.9	8.4	8.7	8.3
biochemical oxygen demand (BOD_5)	mg/l	1.9	1.9	2.0	2.3	1.7	1.9	2.0	2.2	2.2	2.1	2.0
chemical oxygen demand ($CHSK_{Cr}$)	mg/l	19.1	19.3	19.4	19.9	17.9	22.8	20.7	19.8	21.3	19.9	20.0
total phosphorus (P_{total})	mg/l	0.08	0.13	0.08	0.09	0.08	0.08	0.09	0.09	0.09	0.07	0.09
orthophosphate phosphorus ($P\text{-}PO_4^{3-}$)	mg/l	0.03	0.10	0.07	0.07	0.02	0.02	0.02	0.03	0.10	0.02	0.05
nitrate nitrogen ($N\text{-}NO_3^-$)	mg/l	0.85	0.99	1.08	0.84	0.96	1.05	0.85	0.86	1.24	1.23	0.99
ammonia nitrogen ($N\text{-}NH_4^+$)	mg/l	0.16	0.17	0.20	0.18	0.18	0.13	0.12	0.14	0.24	0.15	0.17
dried dissolved solids (DS_{105})	mg/l	110	119	124	108	108	114	113	113	119	106	113
ignited dissolved solids (DS_{500})	mg/l	62	71	66	74	73	77	74	73	78	70	72
suspended solids (SS_{105})	mg/l	7.0	7.3	7.4	7.2	6.5	9.9	7.0	6.5	7.2	6.6	7.3
chlorides (Cl^-)	mg/l	9.6	11.2	11.8	12.0	12.5	11.9	11.9	12.5	15.0	13.5	12.2
sulfates (SO_4^{2-})	mg/l	16.9	17.8	17.7	15.1	14.9	15.9	14.5	13.7	15.9	14.8	15.7
magnesium (Mg)	mg/l	3.6	3.6	4.1	3.4	3.7	3.9	3.7	3.7	3.9	3.6	3.7
calcium (Ca)	mg/l	13.2	13.0	14.5	12.3	12.9	13.4	12.9	13.2	13.7	12.9	13.2
C_{10}–C_{40} hydrocarbons	mg/l	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
AOX	µg/l	24.8	19.5	21.3	22.6	20.5	19.2	16.9	20.6	16.4	17.2	19.9

Table C.40: Mean annual concentrations of monitored parameters measured in wastewater discharged by ETE1,2 from 2015 to 2024

Wastewater from ETE1,2												
Parameter	Unit	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Mean
water temperature	°C	19.4	19.2	20.5	20.7	19.8	21.8	19.8	19.8	18.5	20.7	20.0
water reaction (pH)	-	8.2	8.0	8.4	8.2	8.3	8.3	8.3	8.2	8.1	8.0	8.2
biochemical oxygen demand (BOD_5)	mg/l	1.9	1.7	2.0	2.1	2.0	2.0	1.9	2.0	2.4	2.2	2.0
chemical oxygen demand ($CHSK_{Cr}$)	mg/l	50	49	55	57	61	65	64	63	59	64	59
total organic carbon (TOC)	mg/l									24	21	23
total phosphorus (P_{total})	mg/l	0.34	0.32	0.31	0.30	0.31	0.31	0.34	0.33	0.31	0.34	0.32
orthophosphate phosphorus ($P\text{-}PO_4^{3-}$)	mg/l	0.21	0.19	0.18	0.14	0.17	0.18	0.18	0.17	0.17	0.18	0.18
nitrate nitrogen ($N\text{-}NO_3^-$)	mg/l	8.5	8.8	10.3								9.2
nitrite nitrogen ($N\text{-}NO_2^-$)	mg/l	0.15	0.12	0.21								0.16
ammonia nitrogen ($N\text{-}NH_4^+$)	mg/l	0.16	0.12	0.17								0.15
ignited dissolved solids (DS_{500})	mg/l	403	354	415	358	383	415	437	420	418	399	400
suspended solids (SS_{105})	mg/l	12.6	11.2	12.2	16.8	14.1	12.5	14.6	11.8	15.1	18.2	13.9
chlorides (Cl^-)	mg/l							59	64	66	60	62
sulfates (SO_4^{2-})	mg/l	117	110	114	94	93	122	111	113	130	133	114
C_{10}–C_{40} hydrocarbons	mg/l									<0.1	0.1	0.1
AOX	µg/l	91	70	77	72	60	123	80	112	157	135	98

For the great majority of parameters evaluated, the impact of the operation of ETE1,2 on surface-water quality is caused by pumping raw water from Hněvkovice Reservoir for cooling ETE1,2, evaporating part of the water in the cooling towers of ETE1,2, and discharging wastewater concentrated by evaporation back into the Vltava River at the Kořensko weir impoundment. The resulting concentrations of parameters in wastewater from ETE1,2 are therefore fundamentally influenced by the concentrations of substances in the raw water abstracted for ETE1,2.

In addition to this effect, which is decisive for most parameters, the concentrations of some parameters in wastewater from ETE1,2 are also affected by the use of specific substances in the operation of ETE1,2. In particular, these substances slightly increase the total content of dissolved inorganic salts (RAS), sulfate concentrations, water reaction (pH), AOX, and nitrogen concentrations.

The temperature parameter is also monitored in both raw water and wastewater; this parameter is not subject to "concentration", but the water is heated in the cooling circuit.

From 2015 to 2024, both the concentration and mass-balance pollution parameters in wastewater discharged from ETE1,2 met the conditions for discharging wastewater into surface water specified in the water authority decision valid for the relevant year. The highest proportion of the authorized annual mass-balance limit used each year was for RAS (dissolved inorganic salts), at approximately 90 %, except in 2016 (71 %) and 2017 (99.6 %).

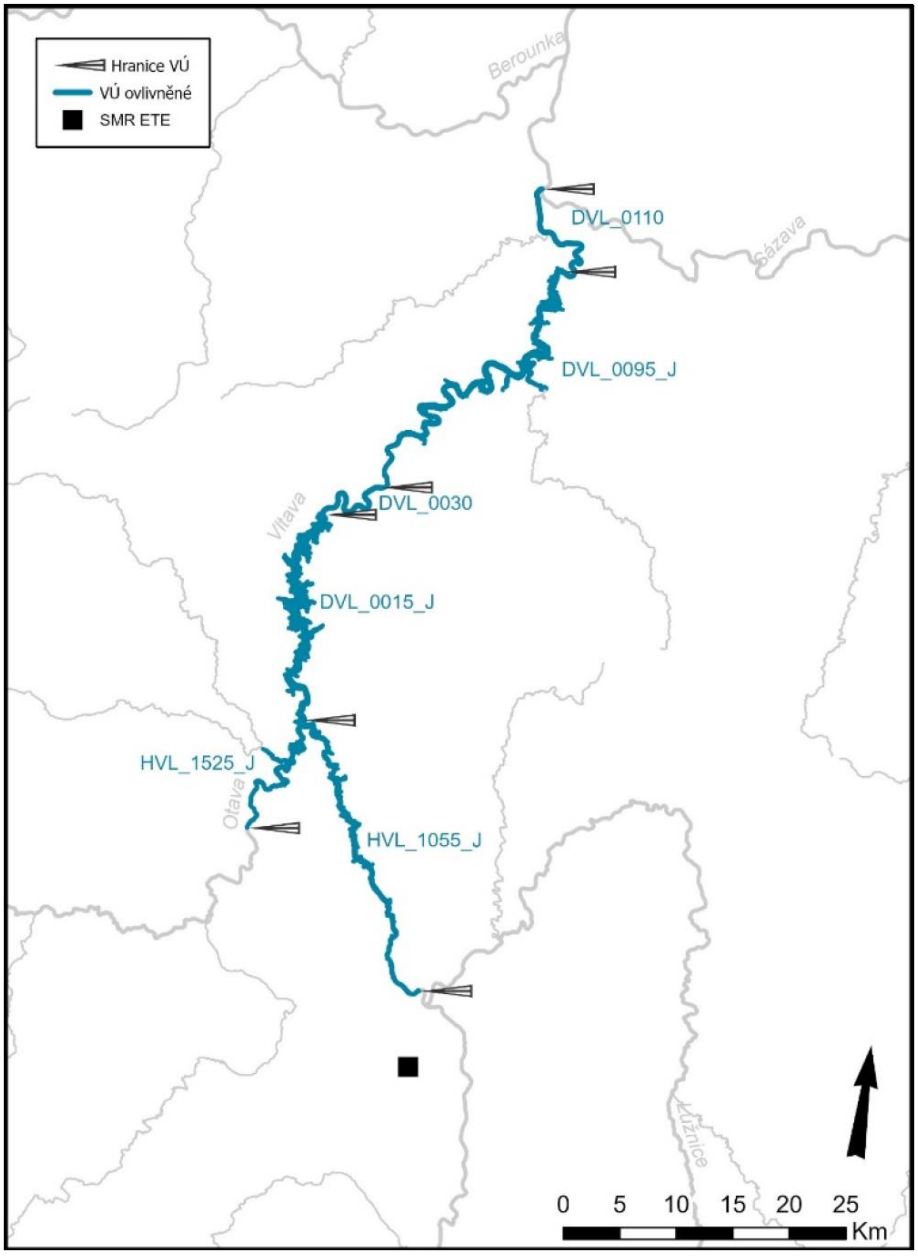
C.II.4.1.4. Surface water bodies

According to the third-cycle Upper Vltava and Lower Vltava Sub-basin Plans, the following surface water bodies are defined in the affected territory (the affected section of the Vltava from the Kořensko hydraulic structure to the confluence of the Vltava and Sázava rivers, including the Otava River arm):

- HVL_1055_J Orlík Reservoir I on the Vltava River, lake category,
- HVL_1525_J Orlík Reservoir II on the Otava River, lake category,
- DVL_0015_J Orlík Reservoir III on the Vltava River, lake category,
- DVL_0030 Vltava from the Orlík Reservoir dam to the Slapy Reservoir impoundment, river category,
- DVL_0095_J Slapy Reservoir on the Vltava River, lake category,
- DVL_0110 Vltava from the Slapy Reservoir dam to the Sázava River, river category.

The locations of these bodies are shown in the following figure.

Fig. C.20: Water bodies in the affected territory



Source: VÚV TGM

Hranice VÚ	SWB boundary
VÚ ovlivněné	Affected water body
SMR ETE	SMR ETE

The assessment of surface water bodies is based on the third-cycle Lower Vltava Sub-basin Plan and Upper Vltava Sub-basin Plan for 2021–2027, using monitoring data from 2016 to 2018. Sub-basin plans for 2027–2033, which will be based on data from 2022 to 2024, are currently being prepared; these plans are not currently in force.

Depending on the physical form of a water body and the degree to which it is affected by human activity, its hydromorphological character is classified as "natural", "heavily modified", or "artificial". For natural water bodies, chemical and ecological status are assessed; for heavily modified and artificial bodies, chemical status and ecological potential are assessed. Chemical status is assessed in the same manner for all categories of bodies, regardless of whether they are natural, heavily modified, or artificial. Ecological status is assessed by component, with biological components assessed as primary and chemical, physicochemical, and hydromorphological components assessed as supporting components. The resulting status or potential of a water body is determined as the poorer result of the chemical-status assessment and the ecological-status or ecological-potential assessment. As a general rule, if even one parameter within a component is unsatisfactory, the assessment of the entire component is unsatisfactory.

The assessment of the affected water bodies is summarized in the following table.

Table C.41: Results of the assessment of ecological status/potential and chemical status of surface water bodies

ID water body	Category	Name	Hydromorphological character	Ecological potential	Chemical status	Overall assessment status
HVL_1055_J	lake	Orlík I Reservoir on the Vltava River	heavily modified	damaged	unknown	poor
HVL_1525_J	lake	Orlík II Reservoir on the Otava River	heavily modified	damaged	unknown	poor
DVL_0015_J	lake	Orlík III Reservoir on the Vltava River	heavily modified	damaged	unknown	poor
DVL_0030	river	Vltava from the Orlík reservoir dam to the backwater of the Slapy reservoir	heavily modified	damaged	unknown	poor
DVL_0095_J	lake	Slapy Reservoir on the Vltava River	heavily modified	good and better	unknown	good
DVL_0110	river	Vltava from the Slapy reservoir dam to the Sázava	heavily modified	medium	good	poor

Assessment criteria:

Ecological potential: good and above - moderate - poor - bad
Chemical status: good - failure to achieve good status - unknown
Overall assessment: good status - unsatisfactory status

In terms of ecological-potential assessment, water bodies HVL_1055_J, HVL_1525_J, DVL_0015_J, and DVL_0030 are classified as poor; DVL_0110 is classified as moderate; and only DVL_0095_J is classified as good and above. For most water bodies, the biological components determine the overall ecological-potential assessment because they have the poorest rating. A poorer rating for the general physicochemical components is most often caused by nutrient conditions, particularly P_{total}, followed by temperature and O_2 saturation. The principal source responsible for the failure to achieve good ecological potential in the water bodies assessed is the background substance load conveyed by the Vltava, Lužnice, and Otava rivers.

Chemical status is reported as unknown for most water bodies in the section assessed and as good only for DVL_0110.

Except for DVL_0095_J, the overall status of all affected surface water bodies is assessed as unsatisfactory.

C.II.4.2. Groundwater

C.II.4.2.1. Hydrogeological characteristics of the affected territory

The Project is located in basic-layer hydrogeological region 6320, Crystalline Rocks in the Middle Vltava Basin. In general, the crystalline rocks can be regarded as a structure of low hydrogeological significance. This is a low-permeability rock complex with relatively higher permeability in the weathering mantle, the near-surface fracture-opening zone, tectonically disturbed zones, and intercalations of more rigid rocks. The principal groundwater aquifer at the immediate site is the fracture network in the crystalline rocks, particularly the near-surface fracture-opening zone.

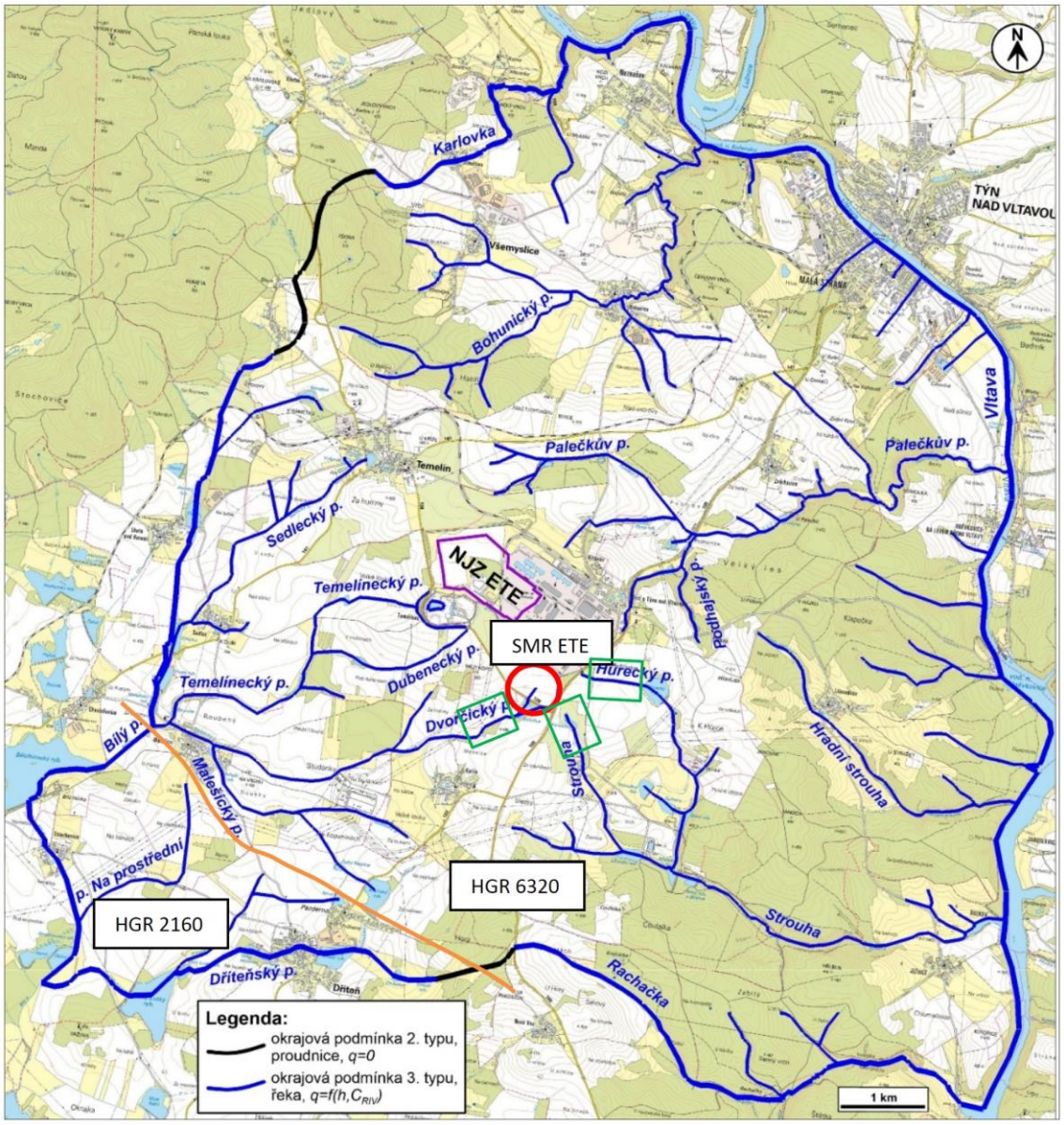
The weathering mantle of the crystalline rocks and the Quaternary cover, together with the near-surface fracture-opening zone of the bedrock, form a relatively uniform shallow-circulation aquifer with intergranular-fracture permeability that becomes distinctly fracture-controlled with increasing depth. The intergranular permeability of the cover deposits and gneiss eluvium is low, averaging $k = 2.8 \times 10^{-7}$ m/s. The groundwater level is usually at the interface between the Quaternary cover and crystalline-rock eluvium or at the base of the eluvium; in the Project area, it is an average of several meters below ground level.

The Crystalline Rocks in the Middle Vltava Basin hydrogeological region does not contain major groundwater reserves. Existing sources use shallow groundwater from depths of no more than several tens of meters, with yields no higher than the lower tenths of a liter per second.

In terms of chemical composition, the water has low total mineralization, is neutral to slightly acidic, and is dominated by Na-Ca-Mg-HCO_3-SO_4 ions.

For the description of hydrogeological characteristics, the area of interest is defined as the area potentially affected by the Project in terms of groundwater flow and quantity, including the spread of a potential release of contaminated water. The definition of this area is based on the regional groundwater-flow and solute-transport model. It is elongated in the north-south direction, with a length of approximately 30 km, and is up to 14 km wide in the east-west direction (see the following figure).

Fig. C.21: Boundary of the detailed mathematical groundwater-flow and solute-transport model



Source: VÚV TGM

Legenda:	Legend:
okrajová podmínka 2. typu, proudnice, q=0	type 2 boundary condition, flow line, q=0
okrajová podmínka 3. typu, řeka, q=f(h, C_{riv})	third-type boundary condition, river, q=f(h, C_{riv})

Two groundwater abstractions exceeding 6,000 m³ per year or 500 m³ per month are recorded in the area of interest defined in this manner (the records are maintained by Povodí Vltavy, s.p.):

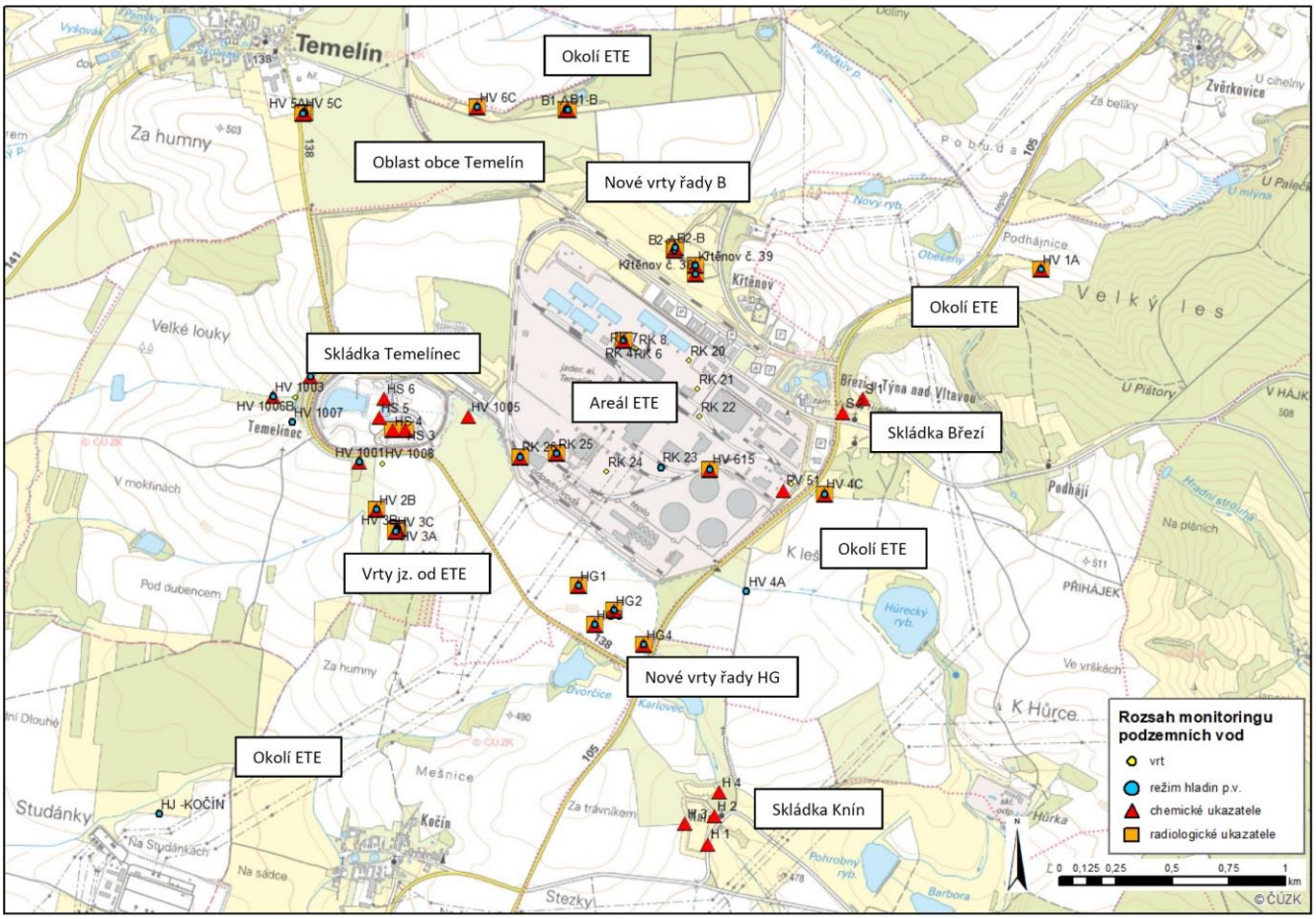
- WIENERBERGER cihelna Týn nad Vltavou (ICOC 111005), with an average abstraction of 0.23 l/s from 2009 to 2024, and
- ČEZ JE Temelín Březí (ICOC 111068), with an average abstraction of 1.69 l/s from 2009 to 2023 (this comprises all drainage boreholes at the ETE site, operated under a valid permit for the purpose of lowering the water level, not for drinking-water purposes).

One abstraction of mine water (Lom Slavětice) is also recorded. It is classified as a surface-water abstraction even though it is, in fact, more akin to a groundwater abstraction. An average of 1.34 l/s of groundwater was abstracted there.

No designated protection zones for water sources are recorded in the groundwater area of interest, nor are there any protected areas of natural water accumulation.

Hydrogeological conditions (groundwater quantity and quality) have long been monitored by ČEZ, a. s. using a network of hydrogeological monitoring boreholes around ETE and are regularly evaluated at annual intervals (Marešová et al., VÚV TGM). The monitoring network and its structure are shown in the following figure.

Fig. C.22: Location of monitoring boreholes at the Temelín site



Okolí ETE	Surroundings of ETE
Oblast obce Temelín	Village of Temelín area
Nové vrty řady B	New B-series wells
Skládka Temelínec	Temelínec landfill
Areál ETE	ETE site
Skládka Březí	Březí landfill
Vrty jz. od ETE	Wells southwest of ETE
Nové vrty řady HG	New HG-series wells
Skládka Knín	Knín landfill
Rozsah monitoringu podzemních vod	Scope of groundwater monitoring
vrt	well
režim hladin p.v.	groundwater-level regime
chemické ukazatele	chemical parameters
radiologické ukazatele	radiological parameters

For groundwater-level monitoring, 30 boreholes were divided into five subareas according to the parameters monitored. Groundwater levels were found to be stable from 2009 to 2024. The overall level trend during the period assessed is slightly decreasing, primarily as a result of the dry period from 2014 to 2019. In recent years, beginning in 2020, levels have generally risen slightly as a result of higher precipitation in the most recent years. The recorded levels confirm the shallow- and intermediate-flow groundwater drainage directions in and around the ETE area. Specifically, on the SMR ETE Project site, groundwater drains toward local drainage bases comprising the valleys of Dvorčický Stream, Strouha Stream, and Hůrecký Stream.

In accordance with simulations of climate-change impacts, levels are expected to rise slightly until 2040 (by 1–2 m), after which a sustained decline of several meters is expected, reaching a maximum of 5–10 m at watersheds by 2100.

Groundwater quality is monitored in groups of boreholes expected to have similar groundwater chemistry. A total of 34 boreholes were monitored from 2009 to 2024 (all components of groundwater monitoring (levels, quality - non-radiological parameters, and quality - radiological parameters) are conducted concurrently at 19 boreholes). Monitoring of some boreholes began only recently, and the amount of data available for statistically evaluating the individual parameters is insufficient.

Groundwater quality in the area assessed is stable, with no significant adverse changes identified. Nitrate concentrations are often lower than is typical in the present-day Czech landscape. This is attributed to restrictions on settlement and agricultural activities (including restrictions on the use of industrial fertilizers in agricultural activities) in the area since the construction of ETE1,2. The specific characteristics of the natural groundwater composition at the site are typically reflected in higher iron and conductivity values and lower groundwater hardness. Anthropogenic influence is most commonly reflected in higher chemical oxygen demand (CHSK), an indicator of biodegradable organic-substance content. Slightly elevated levels of various contaminants occur locally, indicating specific (historical) burdens in different parts of the area, such as ammonium ions (NH_4^+), C_{10}–C_{40} hydrocarbons and chlorides (Cl^-), and metals near landfills. These values are not serious; exceedances of the limits under the relevant decrees very often apply only to maximum values, rather than average values, for the period assessed.

No significant changes in the chemical composition of groundwater in the monitored area were identified during the period assessed.

C.II.4.2.2. Groundwater bodies

The siting of the Project affects basic-layer groundwater body 63201, Crystalline Rocks in the Middle Vltava Basin, Southern Part. Other groundwater bodies may also be potentially affected because of the hydraulic connection between groundwater and surface water, i.e., along the Vltava from the ETE wastewater discharge point at the Kořensko hydraulic structure to the confluence with the Sázava.

Under Decree No. 5/2011 Coll., on the definition of hydrogeological regions and groundwater bodies, the method for assessing groundwater status, and the particulars of programs for determining and assessing groundwater status, as amended, groundwater-body status is assessed by evaluating chemical and quantitative status. For quantitative status, the assessment is based on a water-balance procedure, specifically the ratio of total actual abstractions to the long-term and annual values of natural resources at the hydrogeological-region level. Chemical-status assessment is much more complex: status is first assessed at individual monitoring locations, then for the groundwater body's working units, and only then is the result aggregated for the groundwater body. Groundwater-body status is determined as the poorer result of the chemical-status and quantitative-status assessments. The resulting status may be good or unsatisfactory.

The following figure and table provide an overview of the affected groundwater bodies and their assessment. Data from 2019 to 2024 are used to assess quantitative and chemical status; these data will form the basis for the future fourth-cycle Upper Vltava and Lower Vltava Sub-basin Plans.

Fig. C.23: Locations of groundwater bodies in the section from Kořensko to the mouth of the Sázava

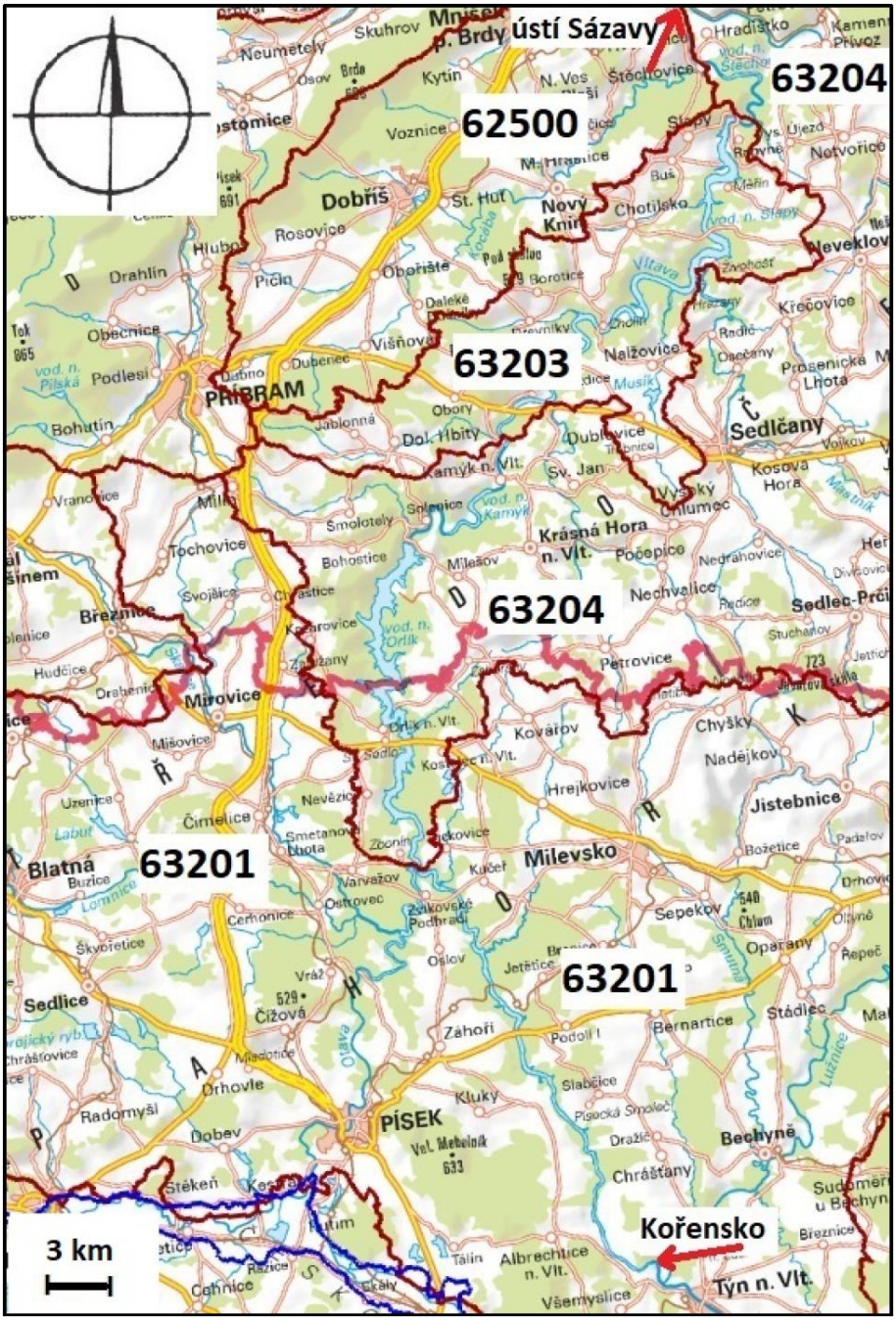


Table C.42: Affected groundwater bodies and their status

Body ID	Name	Area [km²]	Quantitative status	Chemical status (unsatisfactory parameters)
63201	Crystalline Rocks in the Middle Vltava Basin, Southern Part	2,852.8	good	poor (pesticides)
63204	Crystalline Rocks in the Middle Vltava Basin, Northern Part	2,393.1	good	good
63203	Crystalline Rocks in the Middle Vltava Basin, Vltava Interbasin from the Confluence with Vápenický Stream to Slapy	264.6	good	poor (nitrates, pesticides)
62500	Proterozoic and Paleozoic rocks in the catchments of the Vltava tributaries	1,181.5	good	good

Assessment criteria:

Quantitative status: good - unsatisfactory - not classified
Chemical status: good - unsatisfactory - not classified

Groundwater bodies 63204, Crystalline Rocks in the Middle Vltava Basin, Northern Part, and 62500, Proterozoic and Paleozoic Rocks in the Vltava Tributary Basins, are assessed as having good status. Groundwater bodies 63201, Crystalline Rocks in the Middle Vltava Basin, Southern Part, and 63203, Crystalline Rocks in the Middle Vltava Basin, Vltava Interbasin from the Confluence with Vápenický Stream to Slapy, have unsatisfactory status.

For the area that may be affected by wastewater discharge at Kořensko, all groundwater bodies except 63203, Crystalline Rocks in the Middle Vltava Basin, Vltava Interbasin from the Confluence with Vápenický Stream to Slapy, are too large, and it is necessary to focus on the relevant working units (see the following table).

Table C.43: Assessment of relevant groundwater-body working units

Body ID	Groundwater-body working unit ID	Area [km²]	Chemical status (unsatisfactory parameters)
63201	632010225	27.4	unknown
63201	632010227	255.6	unknown
63204	632040246	121.6	unknown
63204	632040247	54.6	unknown
63204	632040248	45.9	poor (nitrates, pesticides)
63204	632040254	14.1	unknown
63203	632030280	264.6	poor (nitrates, pesticides)
63204	632040256	31.2	Unknown
62500	625000115	313.2	good (only nitrates for associated aquatic ecosystems are unsatisfactory)

C.II.5. Land

C.II.5.1. Land

Land for siting the Project is used predominantly for agriculture and is recorded in the Cadastre of Real Estate as arable land and/or permanent grassland. A small proportion of the area also comprises land designated for the fulfillment of forest functions. According to data from the Czech Office for Surveying, Mapping and Cadastre, the areas addressed contain the following land types: arable land (71.94 %), permanent grassland (14.23 %), forest (4.61 %), and other land (9.2 %). The areas of the land types are specified in the following table.

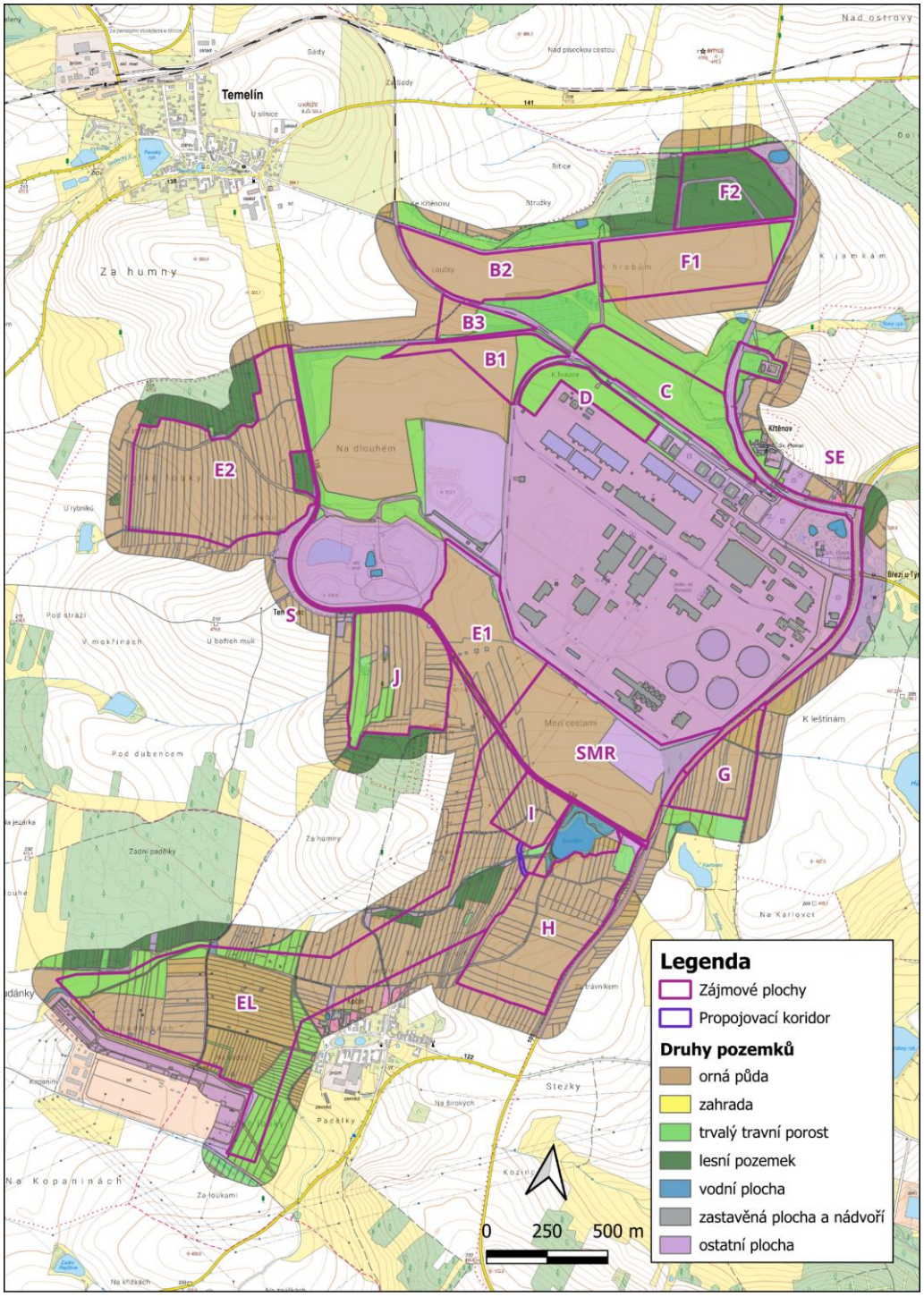
Table C.44: Representation of land types in the areas addressed according to the Cadastre of Real Estate

Area	Agricultural land fund			Forest	Other	Total
	Arable land	Permanent grassland	Total			
	[ha]					
SMR ETE siting area, main construction site						
SMR	21.24	---	21.24	---	8.41	29.65
SMR ETE power evacuation and backup power-supply corridor to the Kočín transformer station						
EL - power evacuation corridor	55.06	11.89	66.95	2.30	4.21	73.46
Road II/138 widening corridor, service-road widening/modification corridor (passing bays)						
S - widening of Road II/138	0.36	---	0.36	---	2.95	3.31
V1 - passing bay, service road	---	0.02	0.02	---	---	0.02
V2 - passing bay, service road	---	---	---	---	0.02	0.02
Temporary construction-site facility areas and corridors for the construction of SMR ETE						
C	---	13.87	13.87	---	---	13.87
G	8.90	---	8.90	---	0.53	9.43
H	24.33	0.82	25.15	---	0.61	25.76
I	5.55	---	5.55	---	0.04	5.59
J	14.81	4.13	18.94	0.02	0.32	19.28
SE - construction-site power-supply corridor	0.39	1.29	1.68	0.15	8.92	10.75
Other/reserve temporary construction-site facility areas						
B1	5.31	2.41	7.72	---	---	7.72
B2	14.85	---	14.85	---	---	14.85
B3	2.16	1.85	4.01	---	---	4.01
D	---	6.34	6.34	---	0.04	6.38
E1	15.98	0.11	16.09	---	1.42	17.51
E2	36.11	0.02	36.13	0.02	0.15	36.30

F1	17.25	1.22	18.47	---	0.01	18.48
F2	---	---	---	11.78	0.81	12.59
Total	222.30	43.97	266.27	14.27	28.44	308.98

The land types in the affected territory are shown in the following figure.

Fig. C.24: Land types in the affected territory



Legenda	**Legend**
Zájmové plochy	Areas of interest
Propojovací koridor	Interconnection corridor
Druhy pozemků	**Land types**
orná půda	arable land

zahrada	garden
trvalý travní porost	permanent grassland
lesní pozemek	forest land
vodní plocha	water area
zastavěná plocha a nádvoří	built-up area and courtyard
ostatní plocha	other land

The affected territory is dominated by brown soils, or Cambisols (HP or KA under the Czech Republic soil classification), which are the predominant or most widespread soil type throughout the Czech Republic and form primarily through weathering of crystalline rocks. The varieties present are gleyed Cambisol (KAg) and Pseudogleys, modal or typical Cambisol (KAm), acidic mesobasic Cambisol (KAa), and rankeric Cambisol (KAs). Gleysols are concentrated primarily along watercourses.

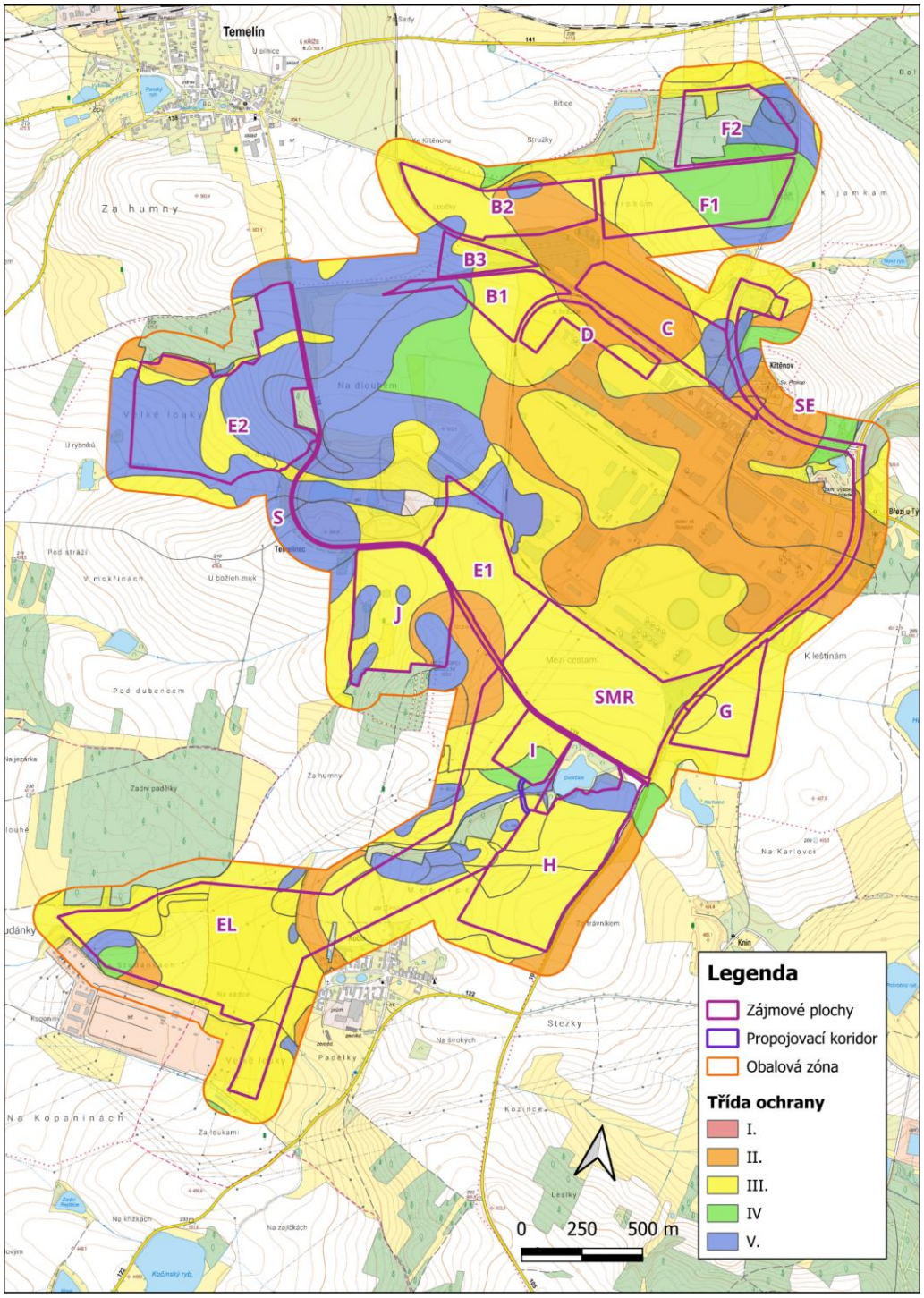
Soils in protection class I, the highest protection class, do not occur in the affected territory. Protection class II contains 12 % of the evaluated areas; the largest proportion, 64 %, falls within class III; 6 % is in class IV; and 18 % of the evaluated areas are classified in class V according to the records of evaluated soil-ecological units (BPEJ).

The SMR main construction site consists almost exclusively of Pseudogley (BPEJ 5.50.01, protection class III). These soils have a low infiltration rate, range from clay loam to clay, and have very low productivity (their point productivity is expressed as 43 on a scale from 6 to 100). Their production potential is affected particularly in the spring months by, among other factors, excessive moisture that delays machinery access to the land and by fluctuations and periodic reductions in aeration and redox potential (periodically waterlogged soil).

Temporary land-take areas (construction-site support areas and construction-site facilities) consist predominantly of brown soils in protection classes II (a minor proportion), III, IV, and V. These soils are of medium to lower quality (their humus content varies greatly and its composition is generally of lower quality), have a moderate infiltration rate, are moderately to well drained, and range from sandy loam to clay loam. The main disadvantages are the shallow soil profile and frequent stoniness, locally influenced by the representation of the individual subtypes.

The distribution of protection classes in the affected territory is shown in the following figure.

Fig. C.25: Representation of protection classes in the affected territory



Note: BPEJ, and thus the protection classes, are also recorded in the VÚMOP register for the ETE1,2 site and therefore do not reflect land previously taken for non-agricultural purposes. In practice, however, this land is not part of the agricultural land fund (ZPF).

Legenda	**Legend**
Zájmové plochy	Areas of interest
Propojovací koridor	Interconnection corridor
Obalová zóna	Buffer zone
Třída ochrany	Protection class

Forests account for a small proportion of the affected territory, 14.27 ha (approximately 5 % of the area). They occur in areas J, E2, and F2 and in the EL electrical-connection corridor (the SMR power evacuation and backup power-supply corridor) and SE corridor (the construction-site

power-supply corridor). These are production forests comprising acidophilous and gleyed beech forest types. In every case, the forests are classified as production forests, whose primary function is timber production. From a pedological perspective, the forest soils consist predominantly of modal and lithic Cambisols. These are lighter, permeable soils with a shallow humus horizon.

Environmentally significant features, referred to as landscape features in agricultural landscapes, are recorded in the Project areas and are defined in Government Decree No. 307/2014 Coll., as amended. These comprise groups of woody plants, specifically copses in the center and along the boundary of construction site facility area J and in the Road II/138 widening corridor (a group of aspens alongside Road II/138).

In accordance with the natural conditions, the affected territory contains low-productivity agricultural soils, specifically Cambisols (including the gleyed subtype), Pseudogleys, and locally Gleysols, which developed on crystalline rocks or deluvial or fluvial sediments. These are slightly acidic soils with medium to low humus reserves and, apart from a low phosphorus supply, relatively satisfactory macronutrient content. Within the region, however, these Cambisol-type soils are among the agronomically valuable soils, which is why some BPEJ are classified in protection class II. In terms of texture, the sandy-loam soil category predominates, with moderate to high vulnerability resulting from accelerated infiltration of precipitation water through the soil profile. Drainage systems occur across more than half of the affected territory (approximately 53 %, 162 ha). The functionality of the drainage systems (damage, blocked outlets, etc.) is unknown, but their contribution to accelerated subsurface runoff cannot be excluded.

Most of the affected territory is at relatively low risk of water erosion. The exceptions are the more steeply sloping areas E2, F1, and J, which fall within the category of moderately erosion-prone land under Government Decree No. 80/2025 Coll., but have a higher risk of erosion occurring and causing adverse impacts. The long-term average soil loss due to water erosion in the affected territory is most commonly 0 to 9 t/ha/year. Some areas, however, contain individual locations with soil loss exceeding 20 t/ha/year, so an area-wide average is used for the assessment. On an area-wide average basis, area E2, with a calculated value of G = 12.38 t/ha/year, did not meet the permissible limit (Gp = 9 t/ha/year). Soils in areas B1, B2, C, D, F2, G, and I and the passing-bay areas on the ETE1,2 service road are assessed as being at very low to low risk of water erosion. The SMR, E1 (reserve), EL, F1, H, and J areas and the construction-site power-supply corridor can be classified as being at moderate risk. Soils in areas B3 and E2 and in the construction-site power-supply corridor are at the greatest risk of water erosion. The area's susceptibility to wind erosion is very low to negligible.

C.II.6. Natural resources

C.II.6.1. Natural resources

In the Project area, Geofond ČR does not record any mineral deposits, old mine workings, or undermined areas. Given the character of the area, no geological or paleontological monuments are expected to occur.

The SMR ETE construction site does not extend into any area containing a prognostic mineral resource.

The nearest designated protected deposit area to the Project (approximately 4.7 km to the north) is Bohunice nad Vltavou (ID 13990000), with the Bohunice nad Vltavou exclusive deposit (ID 3139900) and the actively mined Bohunice I mining area (ID 71125). The mineral is brickmaking raw material comprising diatomite, loam, clay, lignite, and loess loam. The mineral is extracted by surface mining, and extraction is currently in progress.

C.II.7. Biodiversity

C.II.7.1. Biogeographic characteristics of the area

According to the biogeographical classification of the Czech Republic (Culek 1996), the affected territory lies in bioregion 1.21, Bechyně. The fourth, beech vegetation zone predominates in the bioregion, while the third, oak-beech vegetation zone is represented in the Vltava valley.

According to the zoogeographical classification (Mařan in Buchar 1983), the area lies in the Bohemian section of the deciduous forest province.

Under the regional phytogeographical classification (Skalický in Hejný and Slavík 1988), the area lies in the Mesophyticum phytogeographical region, the Bohemian-Moravian Mesophyticum district, the South Bohemian Uplands subprovince, and the Písek-Hluboká Ridge subdistrict.

According to the map of potential natural vegetation (Neuhäuslová, Moravec et al. 1997), the area of interest lies in the Central Bohemian Uplands-Tábor Uplands area. Acidophilous woodrush or fir-oak forests *(Luzulo albidae-Quercetum, Abieti-Quercetum)* predominate at lower to middle elevations on drier undulating plateaus forming planation surfaces.

According to the geobotanical reconstruction map (Mikyška et al. 1968), acidophilous oak forests *(Quercion robori-petraeae)* predominate in the "average" positions of the undulating plateaus.

C.II.7.2. Specially protected areas and Natura 2000 sites

C.II.7.2.1. Specially protected areas

Neither the areas for siting and construction of the Project nor the existing power plant site contain or extend into any large-scale or small-scale specially protected areas under Act No. 114/1992 Coll., on Nature and Landscape Conservation, as amended, i.e., national parks (NP), protected landscape areas (CHKO), national nature reserves (NPR), nature reserves (PR), national nature monuments (NPP), or nature monuments (PP).

The nearest specially protected areas are:

- Lužnice Nature Monument (approximately 6 km to the northeast),
- Velký a Malý Kamýk Nature Reserve (approximately 8 km to the northwest).

C.II.7.2.2. Natura 2000 sites

Natura 2000 is a European network of protected areas established to protect selected natural habitat types and species of importance to the European Union. It comprises Sites of Community Importance (EVL), designated to protect natural habitats and populations of selected species, and Special Protection Areas (PO), designated to protect selected bird species and their habitats.

None of the areas designated for siting and construction of the Project or the existing power plant site lies within or extends into a Natura 2000 site.

The Natura screening examines in greater detail the Natura 2000 sites selected according to three criteria: sites within 10 km of the Project (twice the threshold distance at which identifiable significant adverse effects from Project implementation may occur) (K1); Sites of Community Importance for which a possible functional link was examined through effects on the habitat connecting these sites for selected specially protected large mammal species (K2); and Special Protection Area CZ0311037, Českobudějovické rybníky, because the graylag goose was identified as a potentially affected subject of protection (K3). The Natura screening identifies the following as potentially affected subjects of protection: Eurasian lynx *(Lynx lynx)* at EVL CZ0314124 Blanský les, EVL CZ0314123 Boletice, EVL CZ0314024 Šumava, and EVL CZ0724089 Beskydy; gray wolf *(Canis lupus)* at EVL CZ0724089 Beskydy; and graylag goose *(Anser anser)* at PO CZ0311037 Českobudějovické rybníky.

Table C.45: Overview of Natura 2000 sites assessed for possible impacts from the Project

Type	Code	Site name	Criterion	Distance	Direction/relationship to the Project component
EVL	CZ0313106	Lužnice a Nežárka	K1	4.0 km	north of area F2
EVL	CZ0310020	Velký a Malý Kamýk	K1	4.6 km	northwest of area B2
EVL	CZ0314126	Hlubocké obory	K1	6.0 km	southeast of area H
EVL	CZ0310019	Zelendárky	K1	6.7 km	northeast of area E2
EVL	CZ0313116	Radomilická mokřina	K1	7.3 km	southwest of the power evacuation corridor
EVL	CZ0310629	Blana	K1	8.4 km	southeast of the power evacuation corridor
EVL	CZ0314124	Blanský les	K2; Eurasian lynx *(Lynx lynx)*	19.8 km	southwest of the power evacuation corridor
EVL	CZ0314024	Šumava	K2; Eurasian lynx *(Lynx lynx)*	29.4 km	southwest of the power evacuation corridor
EVL	CZ0314123	Boletice	K2; Eurasian lynx *(Lynx lynx)*	31.6 km	southwest of the power evacuation corridor
EVL	CZ0724089	Beskydy	K2; Eurasian lynx *(Lynx lynx)*, gray wolf *(Canis lupus)*	264 km	east of area G
PO	CZ0311037	Českobudějovické rybníky	K1, K3	4.5 km	southwest of the power evacuation corridor
PO	CZ0311036	Hlubocké obory	K1	6.0 km	southeast of area H

Note: K1 ... site within 10 km of the Project; K2 ... examination of a possible functional link through connecting large-mammal habitat; K3 ... graylag goose as a potentially affected subject of protection

C.II.7.3. Nature parks, significant landscape features, and memorial trees

C.II.7.3.1. Nature parks

Under Act No. 114/1992 Coll., on Nature and Landscape Conservation, as amended, a nature park is intended to protect landscape character with significant concentrations of aesthetic and natural values; the nature conservation authority may restrict uses of the area that would destroy, damage, or disturb its condition.

Neither the areas for siting and construction of the Project nor the existing power plant site contains or extends into any nature park. The nature park nearest to the Project is Písecké hory, approximately 7 km northwest of the Project.

C.II.7.3.2. Significant landscape features

Under Act No. 114/1992 Coll., on Nature and Landscape Conservation, as amended, a significant landscape feature (VKP) is defined as an ecologically, geomorphologically, or aesthetically valuable part of the landscape that forms its characteristic appearance or contributes to maintaining its stability. Significant landscape features are designated at two levels: statutory VKP (which include all forests, peat bogs, watercourses, ponds, lakes, and valley floodplains) and registered VKP (which may include other parts of the landscape registered by a nature conservation authority).

Forests, watercourses, and fishponds occur in the area addressed in the immediate vicinity of the Project and construction-site areas. The areas for siting and construction of the Project affect the following statutory VKP.

Watercourses and their floodplains:

- Unnamed tributary of Hůrecký Pond (northern part of the area considered for expansion of construction site facility area G), crossing the northern part of area G. This is an artificial water channel that was dry during the most recent field survey and has accompanying stands of shrubby plum trees.
- Dvorčický Stream (extends into the eastern part of the SMR construction area and is crossed by the EL power evacuation corridor and the connection between areas H and I). This is an artificial water channel running along the eastern boundary of the Project area; the stream is culverted in the northern part of the area.
- Temelínecký Stream: its headwater flows through construction site facility area E2 at Velké louky (Loučky), enters Temelínecký Pond west of area E2, and then continues southwest.
- Dubenecký Stream: the left-bank headwater of Temelínecký Stream rises in construction site facility area E1 and is routed as an underground watercourse through area J.
- Palečkův Stream and its floodplain (northern boundary of area F2).

Forests and non-forest woody vegetation stands:

- A younger forest stand occurs at the northeastern tip of the SMR ETE area. In the Cadastre of Real Estate, it is recorded as other land, not forest land (affected by permanent land take for the SMR area).
- Křtěnov, south of the ETE1,2 site, bounded by the existing ETE1,2 site to the north and Road II/105 to the east; northeastern tip of SMR ETE; land type according to the Cadastre of Real Estate: other land.
- Křtěnov, in the northern part of the cadastral area, bounded by Palečkův Stream to the north and located north of the ETE1,2 site; entire area F2; land type according to the Cadastre of Real Estate: forest land.
- Křtěnov, northwest of the ETE1,2 site; southernmost part of area B2; land type according to the Cadastre of Real Estate: arable land.
- Křtěnov, northwest of the ETE1,2 site, around the rail siding leading into the ETE1,2 site; eastern half of area B3; land type according to the Cadastre of Real Estate: permanent grassland.
- Kočín, in the northern part of the cadastral area, on the left bank of Dvorčický Stream downstream of Dvorčice Pond; northern half of the power evacuation area; forest land.
- Březí u Týna nad Vltavou, at the Road II/105 intersection, west of Vysoký Hrádek Chateau; northeastern part of the construction-site power-supply corridor.

Fishponds:

- Dvorčice, Karlovec, and Hůrka ponds are located in the immediate vicinity of the Project (as statutory VKP). An unnamed pond is located along the western boundary of area E2 at Velké Louky (Loučky) on Temelínecký Stream.

No registered VKP occur in the affected territory. The nearest registered VKP lie within the Týn nad Vltavou ORP administrative district and comprise:

- Fišárecká strouha VKP, approximately 6 km to the north-northeast,
- Lipová alej Kostelec VKP, approximately 6 km to the north-northeast.

C.II.7.3.3. Memorial trees

Under Act No. 114/1992 Coll., on Nature and Landscape Conservation, as amended, memorial trees are defined as exceptionally significant trees, groups of trees, and avenues that may be declared memorial trees by decision of the nature conservation authority. Memorial trees fall into three categories: individual memorial trees, groups of memorial trees, and memorial avenues. Memorial trees must not be damaged, destroyed, or disturbed in their natural development; they are treated with the consent of the authority that declared their protection.

No memorial trees occur in the affected territory. The nearest memorial tree is:

- an individual small-leaved lime, approximately 3 km to the east (within the built-up area of Litoradlice).

C.II.7.4. Territorial system of ecological stability (ÚSES)

Under Act No. 114/1992 Coll., on Nature and Landscape Conservation, as amended, a territorial system of ecological stability (ÚSES) is defined as an interconnected set of natural and modified, yet near-natural ecosystems that maintain the natural balance. The principal purpose of ÚSES is to strengthen the ecological stability of the landscape by preserving or restoring stable ecosystems and their interconnections. The objective is to create an optimal spatial framework of ecologically stable areas (segments) in the landscape that ensures optimal gene-pool transfer through the landscape, including their maximum beneficial effect on surrounding, less stable parts of the landscape.

ÚSES consists of constituent elements comprising biocorridors and biocenters at the supraregional, regional, and local levels, supplemented by interaction elements.

The Project does not spatially overlap any supraregional- or regional-level ÚSES element. The nearest supraregional- and regional-level ÚSES elements are:

- NBK2, designated along the Vltava River, approximately 5.5 km to the east,
- RBC Janoch, approximately 2.5 km to the east.

The local ÚSES elements and interaction elements listed in the following table were identified in the Project area of interest and its immediate vicinity. The SMR ETE construction area itself does not directly overlap any local-level biocenter or biocorridor. The spatial overlaps primarily concern construction-site facility areas, associated corridors, power evacuation, and other temporarily affected areas.

Table C.46: Overview of ÚSES elements

Municipality	Element code	Element name	ÚSES type	Functionality	Affected area/part of the Project
Temelín	LBC1a	Dvorčice	LBC	functional	between area H, the SMR ETE site, and area I (no direct spatial overlap)
Temelín	LBK2a	Malešický Stream	LBK	partially functional	power evacuation; bridge
Temelín	LBK3	Karlovec	LBK	partially functional	areas G and H
Temelín	LBK26	Palečkův Stream	LBK	nonfunctional	F2
Temelín	IP13b	Za humny	IP	functional	power evacuation
Temelín	IP15b	Na sádce	IP	functional	power evacuation
Temelín	IP16b	Millrace	IP	functional	power evacuation
Temelín	IP17b	Velké louky	IP	functional	power evacuation (no direct spatial overlap)
Temelín	IP40	Vysoký hrádek - park	IP	functional	construction-site power-supply corridor
Temelín	IP42	Palečkův Stream	IP	functional	F2
Temelín	IP45	Křtěnov	IP	functional	construction-site power-supply corridor
Temelín	IP46	Mezi cestami	IP	functional	SMR ETE, E1, H, I, J; Road II/138
Temelín	IP47	K Temelínu	IP	functional	E2; Road II/138
Temelín	IP48	Temelínecký Stream	IP	functional	E2
Temelín	IP49	V mokřinách	IP	functional	J (no direct spatial overlap)
Dříteň	LBC 0205	Na Studánkách	LBC	functional	power evacuation
Dříteň	LBK 0332	Malešovický Stream-Studánky	LBK	nonfunctional	power evacuation

Note: ÚSES type: LBC ... local biocenter; LBK ... local biocorridor; IP ... interaction element.

C.II.7.5. Flora and fauna

The state of flora and fauna in the affected territory was verified by a biological survey from March 2025 to June 2026. The complete results of the surveys performed are documented in Annex 3.1 (Biological Assessment) to this Documentation.

The surveys covered late-summer and spring vegetation conditions (botany) and the occurrence of relevant groups of fauna: mollusks (malacology), insects (entomology), amphibians and reptiles (batrachology and herpetology), birds (ornithology), and mammals (mammalogy), including bats (chiropterology). The field-survey results are supplemented with data from the Nature Conservation Agency of the Czech Republic species occurrence database (NDOP) and other available sources (Bejček 2009; Kostkan 2017, 2019).

The findings of more valuable species presented below are categorized as follows:

- Plant species included in the Czech Republic Red List (Grulich & Chobot 2012): C2b - highly threatened, declining; C3 - threatened; C4a - species requiring attention.
- Animal species included in the Czech Republic Red Lists (Chobot & Němec 2017; Hejda, Farkač & Chobot 2017): CR - critically endangered; EN - endangered; VU - vulnerable; NT - near threatened.
- Species specially protected under Decree No. 395/1992 Coll., as amended: KO – critically endangered; SO – strongly endangered; O – endangered.
- Species that are subjects of protection under European Community law: BD - species for which Special Protection Areas are designated; HD II - species for which protected areas are designated; HD IV - species requiring strict protection.

The locations/designations of the areas below are based on Annex 1.1 to this Documentation; any more precise information is provided in a note.

C.II.7.5.1. Flora

C.II.7.5.1.1. Botanical survey

The botanical surveys performed in the area of interest for the SMR ETE Project confirm that the vegetation in the affected areas is predominantly anthropogenic to semi-natural in character. The area is dominated by intensively managed fields, managed meadows and pastures, ruderal herbaceous vegetation, self-seeded stands of pioneer woody plants, non-forest tree plantings, and, locally, young forest plantations. Natural and more near-natural habitats were recorded only locally, particularly in association with wetter meadow stands, scrub fringes, wetland willow stands, and self-seeded stands developing toward forest habitats.

The SMR ETE construction area itself is dominated by intensively managed agricultural land with common weed and ruderal vegetation. The habitats represented are principally X2, intensively managed fields; X7B, ruderal herbaceous vegetation outside settlements; X9A, forest plantations of non-native conifers; X12B, self-seeded stands of pioneer woody plants; and X13, non-forest tree plantings outside settlements. The proportion of natural habitats in this area was assessed as zero. A smaller woody formation resembling a reclamation stand and up to approximately 30 years old is, however, located in the northeastern part of the area. Although it is not a natural habitat of high floristic value, it represents a more significant vegetation structure in the context of the predominantly agricultural and technical uses of the surrounding area.

The power evacuation corridor contains a mosaic of intensively managed fields, managed meadows, field roads, ruderal stands, self-seeded woody plants, non-forest tree plantings, and, locally, more near-natural habitats. The natural or near-natural habitats recorded were principally K3, tall mesic and xeric scrub, and T1.9, intermittently wet Molinia meadows, with local transitions to T1.1 mesic Arrhenatherum meadows. The botanically more significant part of the corridor is principally the intermittently wet meadow in its southwestern part; the specific occurrences of significant species are listed in the table below.

The construction-site facility areas differ in botanical value. Areas G, I, E1, E2, F1, D, B1, and B2 consist predominantly of intensively managed fields, managed meadows, ruderal vegetation, non-forest tree plantings, or self-seeded stands. The proportion of natural habitats in most of these areas was assessed as zero. Similarly, area H consists predominantly of intensively managed agricultural land without natural habitats. At its margin, however, it includes self-seeded stands around Dvorčice Pond that are significant primarily because of their continuity with aquatic and wetland habitats and their ecological-stabilization function in the area. Areas J, C, and B3 have higher botanical and ecological value in particular. Area J contains a mosaic of intensively managed fields, wetter meadow stands, and lines or groups of mature woody plants. Area C consists of managed meadows, locally with the semi-natural character of mesic Arrhenatherum and wet Cirsium meadows, together with self-seeded stands and non-forest tree plantings. Among the construction-site facility areas, the highest proportion of natural and near-natural habitats was identified in area B3, where wet Cirsium meadows, lower-quality intermittently wet Molinia meadows, wetland willow stands, and a self-seeded stand developing toward acidophilous oak forest were recorded.

Area F2 contains young plantings of woody plants and self-seeded stands corresponding predominantly to young forest plantations and their marginal fringes. Although the proportion of natural habitats was assessed as very low (see the following table), the woody stands here represent a more significant vegetation structure in the context of the surrounding landscape affected by agricultural and technical uses. Like the woody formations in the SMR ETE area, these stands provide ecosystem services.

Overall, most of the affected areas have low to moderate floristic value and consist predominantly of intensively managed or secondary habitats. The botanically and ecologically more valuable segments are concentrated principally in wetter meadow stands, scrub fringes, wetland willow stands, self-seeded woody formations, and stands developing toward forest habitats, as well as in the associated aquatic and wetland sites around the Project (the areas of Dvorčice and Karlovec ponds). Significant plant species identified during the botanical survey are listed in the following table and are taken into account in the assessment of the Project's impacts on biodiversity and in the proposed measures to minimize interference with the botanically and ecologically more valuable parts of the area.

Table C.47: Overview of affected areas in terms of the representation of natural and non-natural habitats and the occurrence of species of conservation significance

Area/site	Natural habitats	Non-natural habitats	ZCHD and Red List species, including abundance
SMR ETE site	0 %	100 %	-
SMR ETE power evacuation corridor	7 %	93 %	Siberian iris *(Iris sibirica)* - **ZCHD Section 2**, C3, at least 119 clumps northern bedstraw *(Galium boreale)* - C4a, thousands of individuals; rat's-tail fescue *(Vulpia myuros)* - C3, several individuals/a small group
Area I	0 %	100 %	-
Area E1	0 %	100 %	-
Area E2	0 %	100 %	-
Area H	0 %	100 %	night-flowering catchfly *(Silene noctiflora)* - C4a, several dozen specimens
Area G	3 %	97 %	changing forget-me-not *(Myosotis discolor)* - C2b, several specimens
Area J	20 %	80 %	-
Area B1	0 %	100 %	-
Area B2	0 %	100 %	-
Area B3	52 %	48 %	-

table continued >>>

Area C	18 %	82 %	common centaury *(Centaurium erythraea)* - C4a, populations numbering in the thousands; northern bedstraw *(Galium boreale)* - C4a, dozens of specimens/scattered
Area D	0 %	100 %	-
Area F1	1 %	99 %	European cornel *(Cornus mas)* - **ZCHD Section 3**, C4a, 45 shrubs
Area F2	1 %	99 %	common centaury *(Centaurium erythraea)* - C4a, dozens of specimens; broad-leaved helleborine *(Epipactis helleborine)* - C4a, dozens of specimens
Karlovec Pond	100 %	0 %	Bohemian sedge *(Carex bohemica)* - C4a, dozens of specimens; cyperus sedge *(Carex pseudocyperus)* - C4a, dozens of specimens; southern bladderwort *(Utricularia australis)* - C4a
Dvorčice Pond	90 %	10 %	southern bladderwort *(Utricularia australis)* - C4a, abundant/large population; cyperus sedge *(Carex pseudocyperus)* - C4a, Bohemian sedge *(Carex bohemica)* - C4a,
Meadow near Dvorčice Pond	95 %	5 %	Siberian iris *(Iris sibirica)* - **ZCHD Section 2**, C3, approximately 15 clumps; western marsh orchid *(Dactylorhiza majalis)* - **ZCHD Section 3**, C3, 22 flowering specimens shining meadow-rue *(Thalictrum lucidum)* - C3, 30 flowering specimens; marsh valerian *(Valeriana dioica)* - C4a, hundreds of specimens; two-ranked sedge *(Carex disticha)* - C4a, dozens of ramets; Hartman's sedge *(Carex hartmanii)* - C4a, dozens of ramets; bay willow *(Salix pentandra)* - C4a, several small trees; hoary willowherb *(Epilobium parviflorum)* - C3
Construction-site power-supply corridor	20 %	80 %	-
Widening of Road II/138	2 %	98 %	-
H-I connection corridor (bridge)	0 %	100 %	-
Service road	0 %	100 %	-

C.II.7.5.2. Fauna

C.II.7.5.2.1. Malacological survey

A total of 35 mollusk species were identified during the survey. Predominantly common species with broad ecological tolerance were recorded, including hygrophilous and aquatic species and species associated with synanthropic habitats.

The more significant finding was the occurrence of the narrow-mouthed whorl snail *(Vertigo angustior)* in the wet meadow adjoining Dvorčice Pond; this species is associated with better-preserved wetland and riparian habitats. This species is included among species of Community importance (HD II) and is listed as vulnerable (VU) in the Czech Republic Red List.

C.II.7.5.2.2. Hydrobiological survey

The hydrobiological survey covered a total of 10 surface-water sites in the area of interest, comprising four standing-water sites and six running-water sites. A total of 66 aquatic invertebrate taxa were recorded in standing water and 68 taxa in running water. Species composition corresponded primarily to common standing- and running-water communities, with differences resulting principally from the character and morphology of the individual sites. The running-water sites surveyed were primarily small watercourses around the Project. Palečkův Stream, the left-bank tributary of Temelínecký Stream, and Dvorčický Stream supported predominantly common running-water species, locally with a higher representation of indicator groups such as mayflies and caddisflies. The lower reach of Strouha Stream downstream of Nový Pond near Býšov appeared to have the most valuable macrozoobenthos community, while the reach of Strouha Stream downstream of Karlovec Pond was dry during the survey.

The taxa of conservation significance recorded included two species on the Red List of invertebrates: the shining ramshorn snail *(Segmentina nitida)*, in category VU, in Dvorčice Pond, and the aquatic beetle *Hydraena belgica*, in category NT, in the lower reach of Strouha Stream. Dvorčice and Karlovec ponds are shallow, partially overgrown standing waters with developed aquatic invertebrate communities; Dvorčice Pond was particularly species-rich. Of the retention basins, concrete Retention Basin 1 was substantially poorer, while Retention Basin 2 supported a richer community because aquatic vegetation had developed.

C.II.7.5.2.3. Entomological survey

Of the total taxa identified, 19 are specially protected under Decree No. 395/1992 Coll., and 25 species are included in the Red List of invertebrates (Hejda et al. 2017); see the following table. A total of 461 taxa were identified; a complete overview is provided in Annex 3.1 to this Documentation.

From an entomological perspective, the areas identified as more significant were principally reclaimed area C, area B3, the western part of area J, waterlogged and wetter areas near Dvorčice and Karlovec ponds, the wet meadow adjoining the southern edge of area G, and individual wetter margins of the SMR ETE area and power evacuation corridor. These areas predominantly comprise more species-rich meadow, wetland, scrub, or woody habitats, with a higher representation of invertebrate species of conservation significance. By contrast, the intensively farmed sections,

most field areas, and corridors affected only technically or at their margins were assessed as having low to negligible entomological significance and generally supported common and widespread species.

Table C.48: Overview of the occurrence of species of conservation significance identified during the entomological survey

Species		Protection			Subarea																
English name	Scientific name	ZOPK	ČS	HD	SMR	B1	B2	B3	C	D	E1	E2	F1	F2	G	H	I	J	EL	SE	KOM
red-tailed bumblebee	*Bombus lapidarius*	O			x	x		x	x	x						x		x	x	x	x
common carder bee	*Bombus pascuorum*	O			x	x			x	x					x			x			
red-shanked carder bee	*Bombus ruderarius*	O				x			x	x											
bumblebee	*Bombus sp.*	O			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
buff-tailed bumblebee	*Bombus terrestris*	O			x	x		x	x	x			x		x	x		x	x	x	x
dusky ant	*Formica fusca*	O				x			x	x											
red-cheeked ant	*Formica rufibarbis*	O				x			x	x									x	x	x
ant	*Formica sp.*	O			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Morice's masked bee	*Hylaeus moricei*		NT													x					
poplar jewel beetle	*Agrilus ater*		VU															x			
honeysuckle jewel beetle	*Agrilus cyanescens*		NT						x												
St John's-wort jewel beetle	*Agrilus hyperici*		NT						x												
meadow jewel beetle	*Agrilus pratensis*		NT		x																
musk beetle	*Aromia moschata*		NT		x			x								x				x	
Scheidler's ground beetle	*Carabus scheidleri*	O			x	x		x	x	x				x	x	x		x	x	x	x
soft-winged flower beetle	*Cerapheles terminatus*		VU													x			x		
weevil	*Ceutorhynchus barbareae*		NT		x																
green tiger beetle	*Cicindela campestris*	O							x	x								x			
cinnabar flat bark beetle	*Cucujus cinnaberinus*	SO	VU	II, IV														x			
willow jewel beetle	*Lamprodila decipiens*		VU					x	x												
lime jewel beetle	*Lamprodila rutilans*		NT															x			
weevil	*Lixus myagri*		VU		x																
striped fungus beetle	*Mycetochara maura*		NT															x			
white-spotted rose beetle	*Oxythyrea funesta*	O			x	x	x	x	x	x	x	x	x		x	x		x	x	x	x
fungus weevil	*Pseudeuparius sepicola*		NT															x			
European mantis	*Mantis religiosa*	KO	VU						x												
lesser purple emperor	*Apatura ilia*	O						x	x					x				x			
purple emperor	*Apatura iris*	O						x	x												
pearly heath	*Coenonympha arcania*		NT						x												
small blue	*Cupido minimus*		VU						x	x											
large copper	*Lycaena dispar*	SO		II, IV												x					
Glanville fritillary	*Melitaea cinxia*		VU						x						x						
Old World swallowtail	*Papilio machaon*	O				x			x	x					x	x		x	x		x
dusky large blue	*Phengaris nausithous*	SO	NT	II, IV											x				x		
Amanda's blue	*Polyommatus amandus*		NT			x			x	x					x						

table continued >>>

field cricket	*Gryllus campestris*		NT		x		x		x	x	x	x	x		x		x	x	x		x
northern damselfly	*Coenagrion hastulatum*		NT													x					
southern emerald damselfly	*Lestes barbarus*		NT						x	x						x					
scarce emerald damselfly	*Lestes dryas*		NT						x	x						x					
large white-faced darter	*Leucorrhinia pectoralis*	SO	NT	II, IV												x					

Note: ZOPK ... Nature and Landscape Conservation Act; ČS ... Red List; HD ... Habitats Directive

C.II.7.5.2.4. Ichthyological survey

The ichthyological survey included five sites: Dvorčice and Karlovec ponds and three concrete reservoirs situated north of the existing ETE1,2 site. Fish occurrence in the affected territory is limited to reservoirs because the streams are intermittent or have little flow. Several common chub *(Squalius cephalus)* and common roach *(Rutilus rutilus)* were found in one of the concrete reservoirs. Of the fishponds assessed, only Dvorčice Pond is used for fish rearing; Karlovec Pond has a highly fluctuating water level and is becoming heavily overgrown with riparian vegetation. Only common and stocked fish species were identified; the occurrence of more valuable species (ZCHD, ČS) was not confirmed.

C.II.7.5.2.5. Batrachological survey

The batrachological survey included five aquatic sites: Dvorčice and Karlovec ponds and three concrete reservoirs situated north of the existing ETE1,2 site. Reproductive use by amphibians was confirmed at all aquatic sites assessed. Some of the affected areas are also terrestrial amphibian habitat; see the following table. The surveys confirmed the presence of 13 amphibian species, 12 of which are specially protected.

Table C.49: Overview of the occurrence of species of conservation significance identified during the batrachological survey

Species		Protection			Subarea												
English name	Scientific name	ZOPK	ČS	HD	SMR	RD	RK	N1	N2	N3	Constr. site facil.	EL	SE	KOM II/138	KOM SR	KOM H-I	Immediate vicinity
smooth newt	*Lissotriton vulgaris*	SO	VU			x		x	x	x	H					x	x
alpine newt	*Ichthyosaura alpestris*	SO	VU						2016								2016
great crested newt	*Triturus cristatus*	KO	VU	II, IV		x		2009								x	2016
common spadefoot	*Pelobates fuscus*	SO	NT	IV		x	2009	2009	2009		H					x	x
European fire-bellied toad	*Bombina bombina*	SO	VU	II, IV		x	x	2009	2009		H, I	2016				x	x
common frog	*Rana temporaria*		VU	V							B3, J (2009)						x
agile frog	*Rana dalmatina*	SO	NT	IV		x	x	x	x		C, F2, H		x			x	x
pool frog	*Pelophylax lessonae*	SO	VU	IV		x	x	2009	2009		H					x	x
marsh frog	*Pelophylax ridibundus*	KO	NT	V			2012										2012
edible frog	*Pelophylax esculentus*	SO	VU	V		x	x	x	x	x	H	2009	x			x	x
European tree frog	*Hyla arborea*	SO	NT	IV		x		2009	2009		H, J (2009)	2009	x				
common toad	*Bufo bufo*	O	VU		x	x	x	x	x	x	B2, C, F2, H	X				x	x
European green toad	*Bufotes viridis*	SO	VU	IV		x					H					x	x

Note: ZOPK ... Nature and Landscape Conservation Act; ČS ... Red List; HD ... Habitats Directive; RD ... Dvorčice Pond; RK ... Karlovec Pond
N1, N2, N3 ... reservoirs N1 to N3. The presence of a species at a subsite is indicated by the letter x or by the letter designating the construction-site facility area. For species records more than four years old, the year of the most recent observation is provided.

C.II.7.5.2.6. Herpetological survey

A total of six species were recorded in the area of interest, all of which are specially protected. The occurrence of these species was documented primarily around Dvorčice and Karlovec ponds, in construction-site facility areas, in corridors associated with the Project, and in the immediate vicinity of the area addressed. In addition to recent findings from 2025 to 2026, the source materials include literature records from 2023 to 2024 and older data; see the following table.

Table C.50: Overview of the occurrence of species of conservation significance identified during the batrachological survey

Species		Protection			Subarea									
English name	Scientific name	ZOPK	ČS	HD	SMR	RD	RK	Constr. site facil.	EL	SE	KOM II/138	KOM SR	KOM H-I	Immediate vicinity
sand lizard	*Lacerta agilis*	SO	VU	IV	x	x	x	B2, C, J, 2009: B1, B3, C, D, F2, G, J, 2024: H, G, F1, F2	x, 2009	x	x	x		2023
viviparous lizard	*Zootoca vivipara*	SO	NT			2009		F2, H, E, J, 2009: B3, F2	2009	x	x			2009
slow worm	*Anguis fragilis*	O	NT			x, 2024	x	B2, F2, C, E, 2024: H, F2	x	x		x	x	2017
smooth snake	*Coronella austriaca*	SO	VU	IV										x
grass snake	*Natrix natrix*	O	NT			x	x	B2, C, 2009: C, F2, 2024: H	2009	x			x	2016
common European adder	*Vipera berus*	KO	VU					H						

Note: ZOPK ... Nature and Landscape Conservation Act; ČS ... Red List; HD ... Habitats Directive; RD ... Dvorčice Pond; RK ... Karlovec Pond
The presence of a species at a subsite is indicated by the letter x or by the letter designating the construction-site facility area. For species records more than four years old, the year of the most recent observation is provided.

C.II.7.5.2.7. Ornithological survey

A total of 100 bird species were identified in the area of interest, 30 of which are specially protected; another six specially protected species were added based on a review of occurrence data. The species identified include birds of agricultural landscapes, scattered greenery, forest and scrub stands, and aquatic and wetland habitats, as well as species using the area only for overflight or foraging. The occurrence of specially protected species was documented primarily in the SMR ETE and construction-site facility subareas, in corridors associated with the Project, at Dvorčice and Karlovec ponds, and in their immediate vicinity; a closer association with the directly affected areas was not demonstrated for some species. A complete list of all species identified is provided in Annex 3.1 (Biological Assessment) to this Documentation.

Table C.51: Overview of the occurrence of species of conservation significance identified during the ornithological survey

Species		Protection			Type of occurrence (area)	Number
English name	Scientific name	ZOPK	ČS	BD		
common snipe	*Gallinago gallinago*	SO	EN		migration (Dvorčice)	1
European stonechat	*Saxicola rubicola*	O	VU		A1 (power evacuation)	1M
white stork	*Ciconia ciconia*	O	NT	I	flyover (G, Karlovec)	2P
lapwing	*Vanellus vanellus*		VU		flyover (Karlovec)	1-n10
rook	*Corvus frugilegus*		VU		0 (B1/B2/B3)	
graylag goose	*Anser anser*		VU		C14, migration (Dvorčice, H)	47
water rail	*Rallus aquaticus*	SO	VU		B4 (Dvorčice, Karlovec)	3
house martin	*Delichon urbicum*		NT		foraging (SMR ETE, I, power evacuation, Dvorčice, Karlovec)	6
western yellow wagtail	*Motacilla flava*	SO	VU		B (G)	1–2P
cormorant	*Phalacrocorax carbo*		VU		0	
partridge	*Perdix perdix*	O	NT		A (SMR ETE, E1, power evacuation)	2 families
sparrowhawk	*Accipiter nisus*	SO	VU		A (SMR ETE, E1)	2
raven	*Corvus corax*	O	LC		B3 (F2, J, power evacuation)	1–2P
wryneck	*Jynx torquilla*	SO	VU		A (Dvorčice)	1
quail	*Coturnix coturnix*	SO	NT		B1	1M
mute swan	*Cygnus olor*		VU		C12 (Dvorčice)	1P, 3 juv
kingfisher	*Alcedo atthis*	SO	VU	I	A (Dvorčice, Karlovec)	1
red kite	*Milvus milvus*	KO	CR	I	A1 (F2, H)	1
goosander	*Mergus merganser*	KO	CR		0	
Montagu's harrier	*Circus pygargus*	SO	EN	I	foraging (power evacuation)	1 juv
marsh harrier	*Circus aeruginosus*	O	VU	I	B3, E1 (I, Dvorčice)	1P+1
white-tailed eagle	*Haliaeetus albicilla*	KO	EN	I	flyover/foraging (power evacuation, Dvorčice)	1
Eurasian hobby	*Falco subbuteo*	SO	EN		0	

little grebe	*Tachybaptus ruficollis*	O	VU		A1 (Dvorčice)	1
black-headed gull	*Chroicocephalus ridibundus*		VU		0	
great reed warbler	*Acrocephalus arundinaceus*	SO	VU		A2 (B3) (Dvorčice, Karlovec)	2–3M
common swift	*Apus apus*	O	LC		foraging (SMR ETE, I)	12
nightingale	*Luscinia megarhynchos*	O	LC		B (B3, Dvorčice, Karlovec, construction-site power-supply corridor)	3
common moorhen	*Gallinula chloropus*		NT		C (Dvorčice, Karlovec)	2
peregrine falcon	*Falco peregrinus*	KO	EN	BD I	C (SMR ETE, C, I)	1P
middle spotted woodpecker	*Dendrocoptes medius*	O	VU	BD I	A2 (J)	1
corn bunting	*Emberiza calandra*	KO	VU		A2 (power evacuation)	1
red-backed shrike	*Lanius collurio*	O	NT	BD I	B3, C11 (power evacuation, construction-site power-supply corridor)	2–3P
honey buzzard	*Pernis apivorus*	SO	EN	BD I	flyover (power evacuation)	1
barn swallow	*Hirundo rustica*	O	NT		foraging (power evacuation, Karlovec)	10
green sandpiper	*Tringa ochropus*	SO	EN		migration (C)	1
great white heron	*Ardea alba*	SO		BD I	foraging (Dvorčice)	1
gray heron	*Ardea cinerea*		NT		foraging (F2, Dvorčice)	1
gray-headed woodpecker	*Picus canus*		VU	BD I	A (C, Dvorčice, Karlovec)	2
golden oriole	*Oriolus oriolus*	SO	LC		A2 (power evacuation)	2

Note: ZOPK ... Nature and Landscape Conservation Act; ČS ... Red List; BD ... Birds Directive

In addition to data from the survey conducted for this assessment and the earlier survey (Kostkan 2023–2024), species-occurrence data were processed from records in the AVIF faunistic database (Czech Society for Ornithology 2026) and the Nature Conservation Species Occurrence Database (Nature Conservation Agency of the Czech Republic 2026). Only species not identified during the survey conducted for this assessment or the 2023–2024 survey are listed:

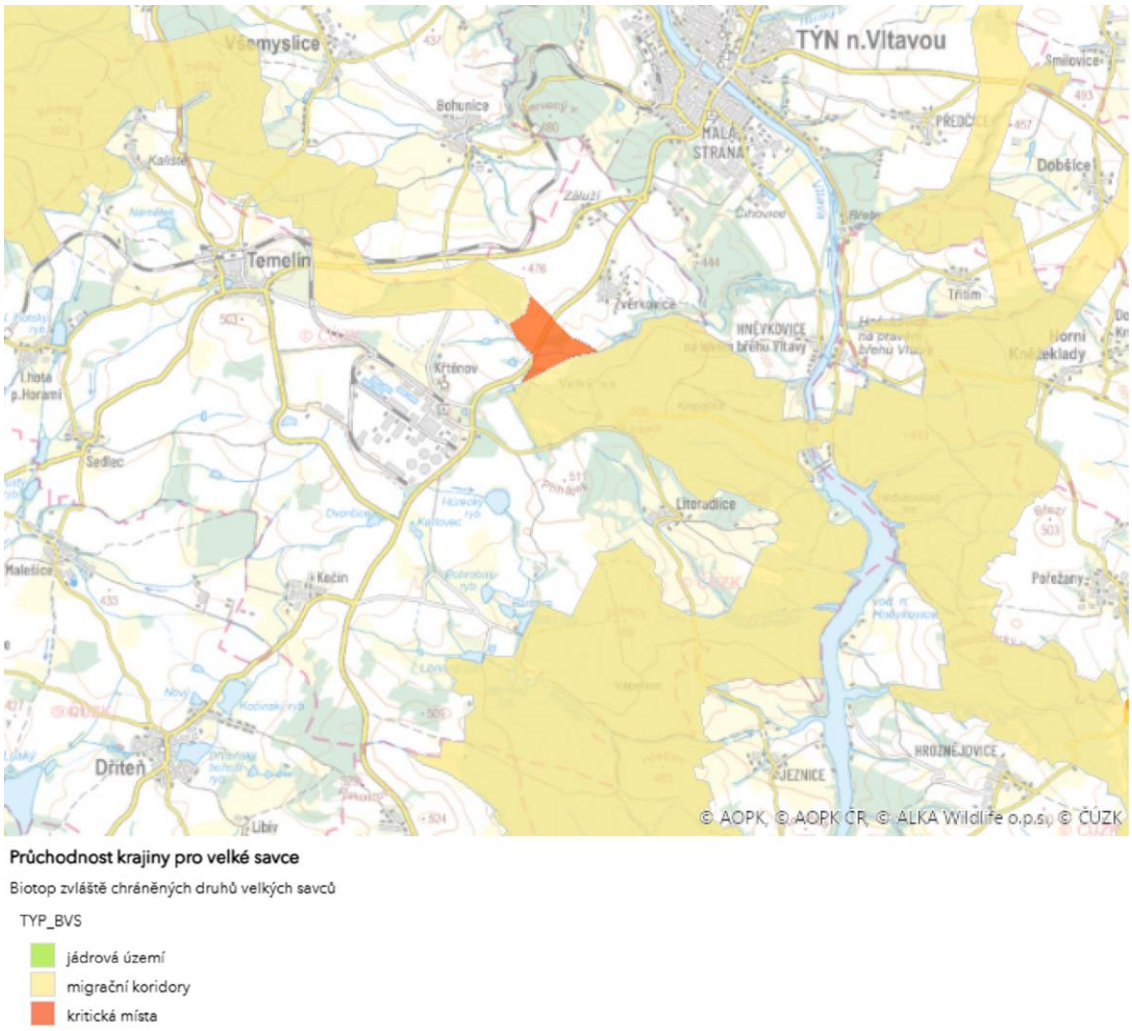
- whinchat *(Saxicola rubetra)*, O, LC, 1 M, area G (2020),
- black stork *(Ciconia nigra)*, SO, VU, BD I, Hůrecký Pond (2025),
- northern goshawk *(Accipiter gentilis)*, O, VU, west of area H (2016),
- gadwall *(Mareca strepera)*, O, VU, Karlovec, ETE1,2 (2024),
- little ringed plover *(Charadrius dubius)*, VU, nest with eggs found (2020),
- great gray shrike *(Lanius excubitor)*, O, VU, occurrence outside the breeding season, south of area E2 (2021).

C.II.7.5.2.8. Mammalogical survey

A total of 41 mammal species were recorded in the area of interest, including small terrestrial mammals, carnivores, bats, ungulates, and small carnivores. A complete list of the species identified is provided in Annex 3.1 (Biological Assessment) to this Documentation. Specially protected species were documented principally among bats; the occurrence of the bicolored shrew, hazel dormouse, Eurasian red squirrel, and Eurasian otter was also recorded. Mammals were identified around Dvorčice and Karlovec ponds, in construction-site facility areas, in corridors associated with the Project, and in the immediate vicinity of the area addressed, based on trapping, direct observations, bat-detector surveys, and field signs (for details, see Annex 3.1).

A migration corridor for specially protected large mammal species (wolf, lynx, bear, and moose) passes through the Project area (temporary construction site facility areas F1 and F2 and the edge of B2). The section of the corridor crossing Road II/105 between Březí u Týna nad Vltavou and Zvěrkovice is designated as critical (see the following figure).

Fig. C.26: Habitat of specially protected large mammal species



Průchodnost krajiny pro velké savce	**Landscape permeability for large mammals**
Biotop zvláště chráněných druhů velkých savců	Habitat of specially protected large mammal species
jádrová území	core areas
migrační koridory	migration corridors
kritická místa	critical sites

Table C.52: Overview of the occurrence of species of conservation significance identified during the mammalogical survey

Species		Protection			Subarea								
English name	Scientific name	ZOPK	ČS	HD	SMR	RD	RK	Constr. site facil.	EL	SE	KOM II/138	KOM SR	KOM H-I	Immediate vicinity
bicolored shrew	*Crocidura leucodon*	O	LC					C, 2024: C						
gray long-eared bat	*Plecotus austriacus*	SO	VU	IV	x			B1, B2, C, H, 2024 E1						2024
common pipistrelle	*Pipistrellus pipistrellus*	SO	LC	IV		x		B2, C, H						x
soprano pipistrelle	*Pipistrellus pygmaeus*	SO	LC	IV		2024		2024: H						2024
Nathusius's pipistrelle	*Pipistrellus nathusii*	SO	LC	IV	x	x		B1, B2, C, H, 2009: B3, F2,						
common noctule	*Nyctalus noctula*	SO	LC	IV	x	x		C, H, 2024: H						x
Natterer's bat	*Myotis nattereri*	SO		IV										2024
northern bat	*Eptesicus*	SO	LC	IV										2024

	nilsonii													
brown long-eared bat	*Plecotus auritus*	SO	LC	IV	x			B1, B2, C, H, 2024 F2						1991
serotine bat	*Eptesicus serotinus*	SO	LC	IV										2024
Daubenton's bat	*Myotis daubentonii*	SO	LC	IV	x	x		B1, C, H, 2024: H						

table continued >>>

hazel dormouse	*Muscardinus avellanarius*	SO	LC	IV				C		x				
red squirrel	*Sciurus vulgaris*	O	DD		x	x		B2, E2, F2, J, 2024: locally	x	x				x
Eurasian otter	*Lutra lutra*	SO	NT			x	x	2024: locally	2006					2025
European hare	*Lepus europaeus*		NT		x	x		B1, B2, B3, C, E1, E2, F1, F2, I, J, G, H 2024: common	x	x			x	x

Note: ZOPK ... Nature and Landscape Conservation Act; ČS ... Red List; HD ... Habitats Directive; RD ... Dvorčice Pond; RK ... Karlovec Pond
The presence of a species at a subsite is indicated by the letter x or by the letter designating the construction-site facility area. For species records more than four years old, the year of the most recent observation is provided.

C.II.8. Landscape

C.II.8.1. Landscape

C.II.8.1.1. Basic characteristics of the landscape in the affected territory

From a historical and landscape-typological perspective, the affected territory lies within a settlement landscape dating from the High Medieval colonization period. Most of the broader area of interest is a typical forest-agricultural landscape at middle elevations in the Hercynian uplands to highlands, which have been continuously settled only since the High Middle Ages. Larger enclaves of forest landscape occur in the northwestern part of the broader area of interest (the forested Vysoký Kamýk ridges) and along the Vltava River. The edge of a basin landscape of fishponds, representing a distinctive landscape type, extends into the area from the southwest and south.

A wide variety of types alternate within the broader area of interest in terms of land use and current vegetation cover. Forest stands are associated predominantly with the valleys of the Vltava and Malše rivers, higher elevations on the Vysoký Kamýk ridges, and the hilly areas around Litoradlice and farther south. Arable land with numerous copses predominates on the deforested undulating plateaus. The ETE1,2 site itself lies in a deforested enclave in a slightly elevated position. To the northwest, the terrain rises gently into a forest-agricultural and forest landscape, in which the forested Vysoký Kamýk ridge is a more prominent feature. To the north and northeast, the terrain slopes gently toward the Vltava valley. Týn nad Vltavou, located in the Vltava valley, is a relatively large settlement. Its substantial development in recent decades was stimulated by construction of the nearby Temelín Nuclear Power Plant, as reflected primarily in the prefabricated apartment buildings. To the southwest, the terrain slopes gradually into the České Budějovice Basin, where consolidated, medium-sized, irregularly shaped blocks of arable land are interspersed with numerous copses and fishponds. From many locations around ETE, panoramic views open southward into the České Budějovice Basin; in good visibility, the Šumava foothills and Blanský les with Mount Kleť are clearly visible on the horizon. In addition to copses, the landscape mosaic is diversified by numerous, predominantly smaller fishponds (particularly in the southwest) and by linear, riparian, and floodplain vegetation along the dense network of watercourses and fishponds.

The ETE1,2 site itself is a significant and extensive technical structure, or complex of structures, and a landmark of the broader region. Its operating structures, particularly the cooling towers with their characteristic water-vapor plumes, are visible from long distances. Extra-high- and high-voltage transmission-line corridors are concentrated south of the ETE1,2 site and converge from the broad surrounding area on the Kočín substation.

C.II.8.1.2. Landscape-typological characteristics of the affected territory

According to the General Landscape Character Study for the South Bohemian Region (Vorel et al. 2009), the area of interest lies within the Bechyňsko-Vltavotýnsko landscape-character area (ObKR), with the České Budějovice Basin ObKR extending into it from the southwest. The ETE1,2 site, however, affects a total of 11 areas within the affected landscape area (DOKP):

- ObKR 05 Písecko, extending negligibly into the western margin of the DOKP
- ObKR 06 Milevsko, extending into the northern part of the DOKP
- ObKR 07 Táborsko-Soběslavsko, extending into the eastern part of the DOKP
- ObKR 11 Putimsko-Protivínsko, extending into the northwestern margin of the DOKP

- ObKR 12 Bechyňsko-Vltavotýnsko, the entire area lying within the DOKP
- ObKR 13 Volyňsko-Prachaticko, extending into the western margin of the DOKP
- ObKR 14 České Budějovice Basin, the entire area lying within the DOKP
- ObKR 15 Lišovský práh-Western Třeboňsko, extending into the southeastern margin of the DOKP
- ObKR 16 Třeboňsko (CHKO), extending into the eastern margin of the DOKP
- ObKR 22 Blanský les (CHKO), extending into the southern margin of the DOKP
- ObKR 23 Kamenoújezdsko, extending into the southern margin of the DOKP

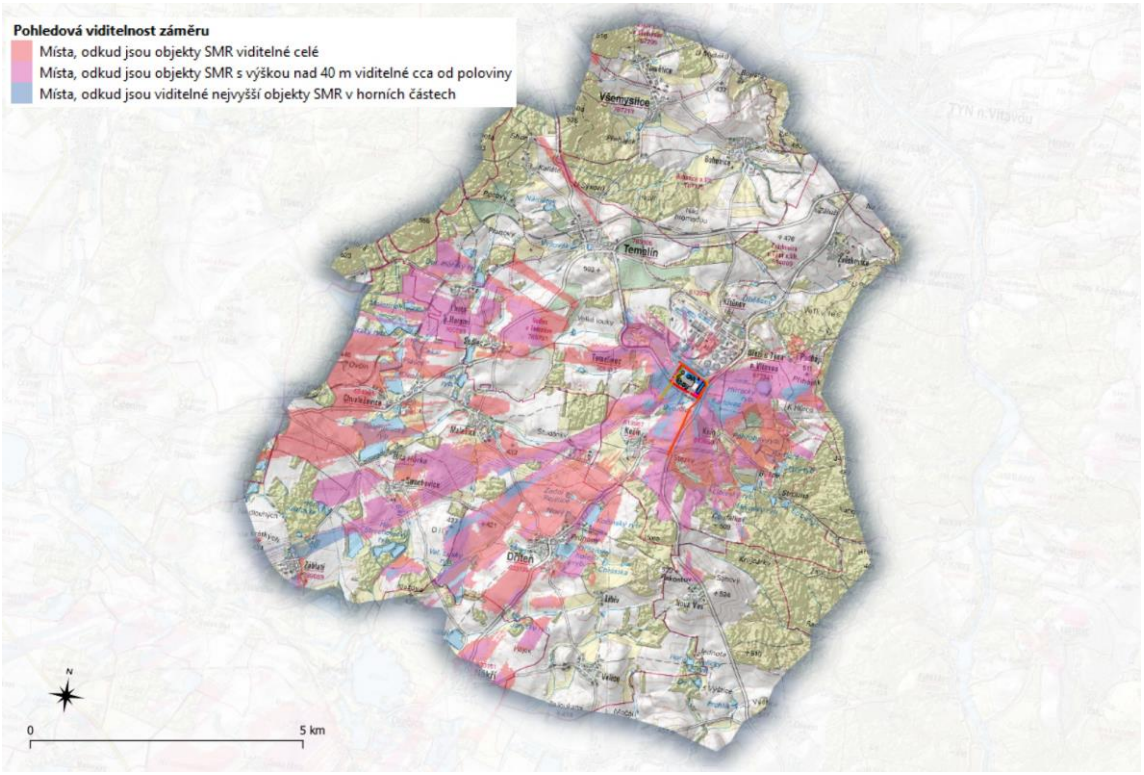
C.II.8.1.3. Affected landscape area

C.II.8.1.3.1. Definition of the affected landscape area

A potentially affected landscape area (DOKP) is defined based on a spatial analysis and an analysis of the Project's viewshed and visibility. The change in the visual character of the Temelín site will be apparent in the landscape primarily to the south and, in the adjoining areas, slightly to the west. This results from the landscape relief and the configuration of the individual dominant areas, the arrangement of greenery, and forested areas. The DOKP includes both the area that may be directly affected by the Project and the parts of the landscape associated with that area. On the northern and eastern sides, the space is relatively clearly bounded by the edges of the incised Vltava Valley; on the north-western side by the forested hills of the Mehelnice Highland; and on the western and southern sides by divides separating the individual parts of the hilly landscape of the Chvalešovice Uplands.

The definition of the affected landscape area in relation to the Project's visibility is shown in the following figure.

Fig. C.27: Definition of the affected landscape area



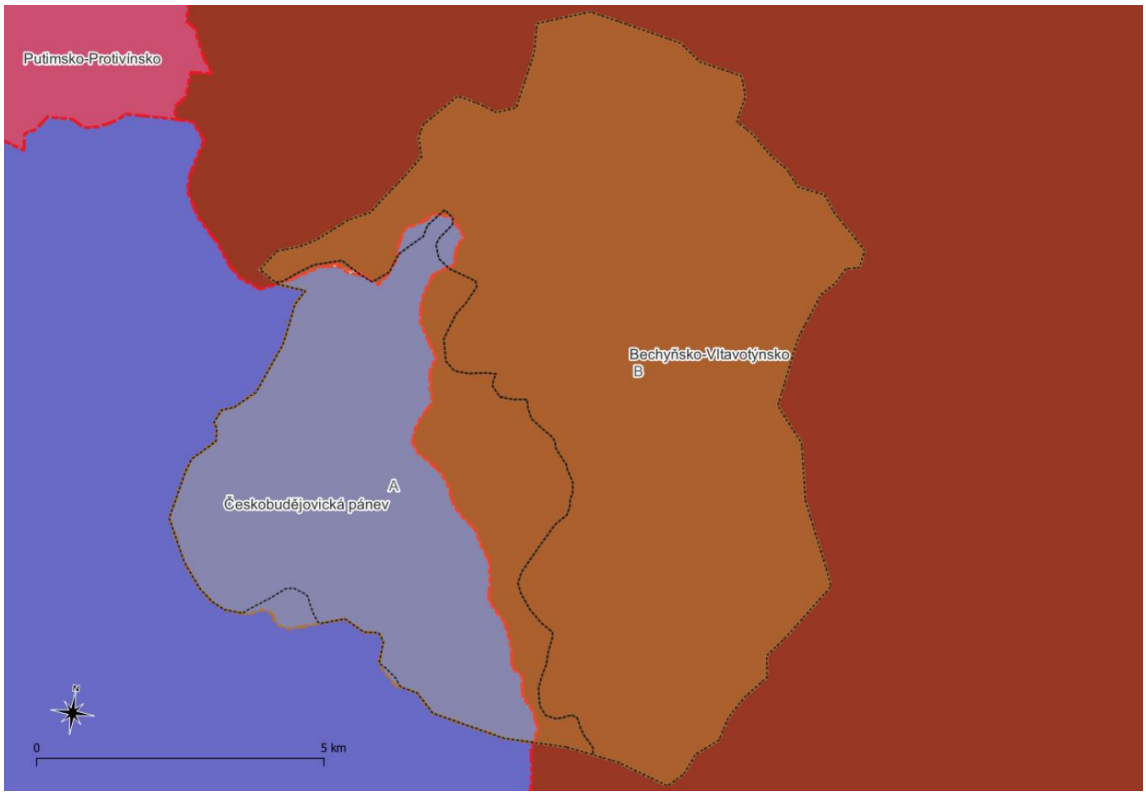
Pohledová viditelnost záměru	Project visibility
Místa, odkud jsou objekty SMR viditelné celé	Locations from which the SMR structures are visible in their entirety
Místa, odkud jsou objekty SMR s výškou nad 40 m viditelné cca od poloviny	Locations from which SMR structures over 40 m high are visible from approximately their midpoint
Místa, odkud jsou viditelné nejvyšší objekty SMR v horních částech	Locations from which the upper portions of the tallest SMR structures are visible

The affected landscape area extends into two landscape-character areas (ObKR) defined in the General Landscape Character Study for the South Bohemian Region (March 2009):

- ObKR 12 Bechyňsko-Vltavotýnsko,
- ObKR 14 České Budějovice Basin.

This is shown in the following figure.

Fig. C.28: Defined affected landscape area superimposed on the landscape-character areas of the South Bohemian Region



The current state of the landscape in the landscape-character areas extending into the affected landscape area is described below.

C.II.8.1.3.2. Characteristics of ObKR 12 Bechyňsko-Vltavotýnsko

Basic characteristics of the landscape-character areas

The Bechyně-Týn nad Vltavou landscape character area lies in the central Vltava region and includes the northern part of the České Budějovice District and peripheral parts of the Písek and Tábor Districts. The focal points of settlement are Týn nad Vltavou in the south and Bechyně, the historic center of the northern part of the area, which is one of the oldest administrative centers in Bohemia (Bechyně Region). From a typological perspective, the High Medieval settlement landscape of the Hercynian region is principally a forest-agricultural landscape and locally a forest landscape. In terms of relief, it is a landscape of the Hercynian highlands, and along the Lužnice River a landscape of incised valleys.

The axes of this extensive landscape character area are the pronounced valley corridors of the Vltava and Lužnice Rivers. The river corridors are accompanied by forest stands, as are the valleys of tributaries (Židova strouha, Smutná). A more open agricultural landscape develops in upland positions on interfluve ridges. The contrast between the larger scale and the enclosed scenes of the incised positions creates distinct aesthetic values. The landscape has a harmonious scale, and its scenery (particularly in incised, enclosed areas) features a unique harmony between historic settlements and the landscape framework of the valleys (Bechyně, Koloděje nad Lužnicí). The historic Hluboká landscape with its game preserves already extends into the southern part of the area.

Principal characteristics of the natural environment

Upland relief of the area: The area lies within the Písek Uplands, specifically the Mehelnice, Zvíkov, Bechyně, and Týn upland districts. This upland lies in the Vltava, Lužnice, and Otava basins and has a dissected erosion-denudation surface, locally affected by tectonic disturbance, with structural ridges and monadnocks, remnants of planation surfaces, and deeply incised valleys of the Vltava, Lužnice, and their tributaries, locally bordered along the main watercourses by pediments and Pleistocene river terraces.

Watercourses as significant landscape axes: The principal axis of the landscape is the Vltava River, which is joined from the right by the Lužnice north of Týn nad Vltavou (with its tributary, the Smutná, near Bechyně). The watercourse network is otherwise

supplemented only by their small tributaries in the form of streams. The rivers locally form deeply incised valleys that are now partially filled by reservoirs of the Vltava Cascade.

Hydraulic structures on the Vltava: Several hydraulic structures forming part of the Vltava Cascade have been constructed on the Vltava. Orlík Reservoir extends into the northern part of the area. The newest stages of the Vltava Cascade are Hněvkovice Dam, constructed on the Vltava River from 1986 to 1991, and the Kořensko hydraulic structure.

Moderate forest cover, substantial in the south: The area has moderate forest cover comprising pine and spruce stands. In the southern part of the area, there is a continuous complex of mixed forests dominated by spruce with admixtures of pine, fir, beech, ash, oak, sycamore maple, lime, and larch.

Smaller naturally valuable sites: Valuable natural sites are protected within several small-scale specially protected areas (associated primarily with floodplains and fishponds); the area contains no larger protected areas. Plziny Nature Park and Kukle Nature Park have been designated near Bechyně.

Principal characteristics of the cultural environment

Landscape structure of the cultural area: The earliest settlement of the area dates to the Bronze Age. Forests, particularly spruce and pine forests, divide the areas of fields and meadows. The distribution pattern of forests and arable land corresponds to historical maps and follows the original landscape structure. The area is traversed primarily by lower-class roads that follow the historic road network documented on historical maps.

Preserved settlement structure: The principal settlements in the area are the towns of Bechyně and Týn nad Vltavou. The settlement structure is supplemented by smaller rural settlements, originally agricultural villages, some of which retain their urban structure and original character (the village conservation areas of Bechyňská Smoleč, Hodonice u Bechyně, Chřešťovice, Kočín, and Libív). Bechyně is one of the oldest administrative centers in Bohemia (the Bechyně Region). Settlement at the site of the original Slavic settlement, on a high promontory above the Lužnice River, is documented in written sources as early as 993. Since 1990, its very well-preserved historic center has been one of the most valuable urban conservation areas in Bohemia. The oldest surviving written record confirming the existence of Týn and documenting the local episcopal domain dates from December 1229.

Temelín Nuclear Power Plant (ETE): The Temelín Nuclear Power Plant, approved for occupancy in 2006, is a prominent new landmark throughout a large part of the South Bohemian Region lying within the area.

Significant heritage structures and cultural landmarks: The area contains numerous architecturally valuable structures and complexes. In addition to Bechyně and Týn nad Vltavou (urban conservation areas containing numerous monuments), many monuments are also registered in other settlements in the area (churches, chapels, and fortresses).

Historic landscape modifications: Černice Game Preserve and the Hluboká area: The extensive Černice Game Preserve, now a nature park, lies east of Bechyně. The extensive Černice Game Preserve was established in 1586 by Petr Vok of Rosenberg. It was used primarily to breed wild boar, fallow deer, and red deer. In 1880, one of the oldest nature reserves in Bohemia was established in part of the game preserve. It protects a remnant overmature mixed stand of pine, spruce, oak, and hornbeam. To the south, the area includes the extensive, historically cultivated Hluboká landscape, an architecturally composed Schwarzenberg landscape shaped in conjunction with the noble residence (fishponds, pheasantries, game preserves, and avenues).

Principal spatial characteristics

- The prominent georelief of the incised, dissected valleys of the Vltava and Lužnice, with flat ridges and incised tributary side valleys.
- The prominent role of forest stands in river-valley scenery.
- A richly articulated spatial landscape with abundant non-forest structural greenery.
- Distinct morphological lines in flat and gently undulating terrain (horizons and ridgelines).
- The prominent presence of cultural landmarks (Bechyně).
- Historic landscape modifications in the Hluboká area.

C.II.8.1.3.3. Characteristics of ObKR 14 České Budějovice Basin

Basic characteristics of the landscape-character areas

The České Budějovice Basin landscape-character area extends northwest-southeast from Vodňany to České Budějovice, the regional capital and the cultural, social, industrial, historical, and administrative center of South Bohemia. South of Hluboká nad Vltavou, the area includes the composed, architecturally designed Schwarzenberg landscape of the Hluboká area; south of Vodňany, the Buquoy landscape of the Libějovice-Lomec area; and, in the Blanský les foothills, landscape units associated with historical agricultural modifications of the landscape. A large number of structures, sets, and settlements with uniquely preserved vernacular architecture have survived in the area.

In typological terms, the area lies within the High Medieval settlement landscape of the Hercynian area. In terms of relief, this is a Hercynian upland landscape; in terms of land use, it is a forest-agricultural and agricultural landscape. Large landscape segments in the České Budějovice Basin are fishpond landscapes.

The landscape character area includes one of the principal and typical spaces of South Bohemia. It has two contrasting characters interacting within an enclosed spatial framework: the highly urbanized landscape of the large city, gradually filling the space between the slopes of Rudolfov, Hosín, and Blanský les, and the extensive fishpond landscape extending from České Budějovice to Bosňany. Together with the individual scenes of the fishpond landscape, the area's spatial definition by the prominent Blanský les massif, dominated by Mount Kleť, and the pronounced edge of the Tábor Uplands, into which the Vltava valley is incised as far as Hluboká, are the principal attributes of its aesthetic appeal. Outside the urbanized area, the landscape within the fishpond systems is distinguished by a harmonious scale and harmonious spatial relationships. Significant values are brought into the landscape by the historic landscape modifications of the Hluboká Area, with overlapping layers of gradual cultivation from the medieval fishpond system to the late Romantic modifications of the second half of the 19th century.

Principal characteristics of the natural environment

Flat basin relief of the area: Much of the area lies in the Blata Basin (the Vodňany and Zliv basins and the Chvalešovice Uplands), the southeastern part of the České Budějovice Basin. This is a broad tectonic graben depression elongated northwest-southeast (a flat upland to plateau surface and the depositional georelief of low Vltava and Blanice terraces and broad watercourse floodplains).

Numerous watercourses, tributaries of the Blanice and Vltava: The floodplain contains numerous watercourses and tributaries of the Blanice and Vltava, with side arms, peatlands, oxbow channels, streams, and many fishponds.

Numerous fishponds of the České Budějovice-Hluboká group: The České Budějovice Basin in the Vltava catchment contains the prominent České Budějovice-Hluboká fishpond group, including Bezdrev, the largest fishpond, constructed in the late 15th century. Among the other fishponds in this group, Munický Pond near Hluboká nad Vltavou is of interest to tourists, for example.

Low forest cover in the area: The area has low forest cover comprising spruce and pine stands with English oak and, less frequently, oak stands.

Waterlogged areas and littoral vegetation: Associated with the numerous fishponds are valuable wetlands; shoreline wetlands; moist, riparian, and littoral vegetation; and reed beds.

Smaller naturally valuable sites: Valuable natural sites are protected within several small-scale specially protected areas (associated principally with water areas and their banks); the area contains no larger protected areas. The area is bounded to the southwest by the boundaries of the Blanský les Protected Landscape Area.

Principal characteristics of the cultural environment

Landscape structure of the cultural area: The center of the area was originally marshy, so settlement probably occurred somewhat later than in the adjoining Šumava foothills. More extensive evidence dates only from around the beginning of the Common Era. Today, the landscape is predominantly deforested; the wet meadows typical in the past have largely been converted to arable land or drained. The landscape contains numerous fishponds. Road I/20 forms the area's axis. České Budějovice is a major road and rail transport hub. The principal road network, like the distribution of the principal areas in the region, corresponds to the original structure documented on historical maps.

Preserved settlement structure, with the regional capital of České Budějovice: The southern edge of the area is occupied by the highly urbanized area of České Budějovice and its conurbation. The royal town of České Budějovice is the administrative, historical, cultural, transport, and industrial center of the region. České Budějovice was founded in 1265 by King Přemysl Otakar II of Bohemia; the town was sited and designed by the king's knight, Hirzo. The new royal town was intended to provide the previously missing base of royal power in South Bohemia and counterbalance the power of the Vítkovci, or Rosenbergs. In addition to České Budějovice, Hluboká nad Vltavou (1378), Zliv (1409), and Vodňany (1336) have town status. The area contains numerous smaller rural agricultural settlements.

Architecturally valuable structures and complexes and cultural landmarks: The area contains numerous architecturally valuable structures and complexes. Hluboká nad Vltavou Chateau, a prominent landmark rising above the České Budějovice Basin, and Ohrada Hunting Chateau are national cultural monuments. České Budějovice is an urban conservation reserve, and Vodňany is an urban conservation area. A number of villages are village conservation reserves or areas.

Historic fishpond area of the České Budějovice-Hluboká group: The České Budějovice Basin in the Vltava catchment contains the prominent České Budějovice-Hluboká fishpond group, including Bezdrev, the largest fishpond, constructed in the late 15th century. Most of the fishponds date from the 16th century.

Composed landscape sites: A highly harmonious, cultivated hunting landscape with elements of designed landscape compositions was created on the Schwarzenberg estate at Hluboká. A composed landscape associated with architectural structures is also present on the Buquoy estate at Libějovice (the Libějovice-Lomec area).

Prominent region of vernacular architecture: West of České Budějovice, the fishpond landscape contains numerous rural settlements forming a unique ensemble of vernacular architecture. The Holašovice Village Conservation Reserve has been inscribed as a UNESCO World Heritage property. Holašovice is one of the best-preserved and most impressive examples of the unique South Bohemian architecture of the second half of the 19th century. Plástovice, Záboří, and Malé Chrášťany are conservation reserves, and Lipanovice, Třešňový Újezdec, Dobčice, Zvěřetice, Břehov, Munice, and Mahouš are conservation areas.

Principal spatial characteristics

- A prominent contrast between the České Budějovice Basin depression and the bounding margins of geomorphologically different areas.
- The highly urbanized landscape of the České Budějovice conurbation and its presence in landscape panoramas.
- A richly articulated spatial fishpond landscape with abundant non-forest structural greenery.
- Distinct morphological lines in the undulating terrain (horizons and ridgelines), with prominent terrain landmarks in Blanský les.
- A markedly harmonious landscape scale, with harmony between development and the landscape framework.
- Unique values of rural settlements: vernacular architecture and the urban structure of villages.
- The unique presence of architectural landmarks (Hluboká).
- The presence of historic settlements in the landscape scene.
- The manifestation of historic landscape modifications in the landscape scene and the harmony of spatial relationships (the Hluboká and Lomec areas).

C.II.8.1.4 Subareas of the affected landscape area

C.II.8.1.4.1. Definition of subareas of the affected landscape area

The Project is set within a hilly area at the interface between the landscapes of the South Bohemian Basins (Chvalešovice Uplands) and the Central Bohemian Uplands (Týn Uplands).

The landscape of this interface is dominated in its central and northern parts by blocks of arable land subdivided by roads, small woods, and streams with small fishponds. Settlements in this subarea consist predominantly of small villages. This subarea is strongly dominated by the Temelín NPP site, with its characteristic cooling-tower structures and reactor-unit buildings. The space of the northern part of the area is distinctly bounded by the forested sections along the edges of the Vltava Valley and by the peripheral hills of the Mehelnice Highland, which also visually encloses the western side of the area.

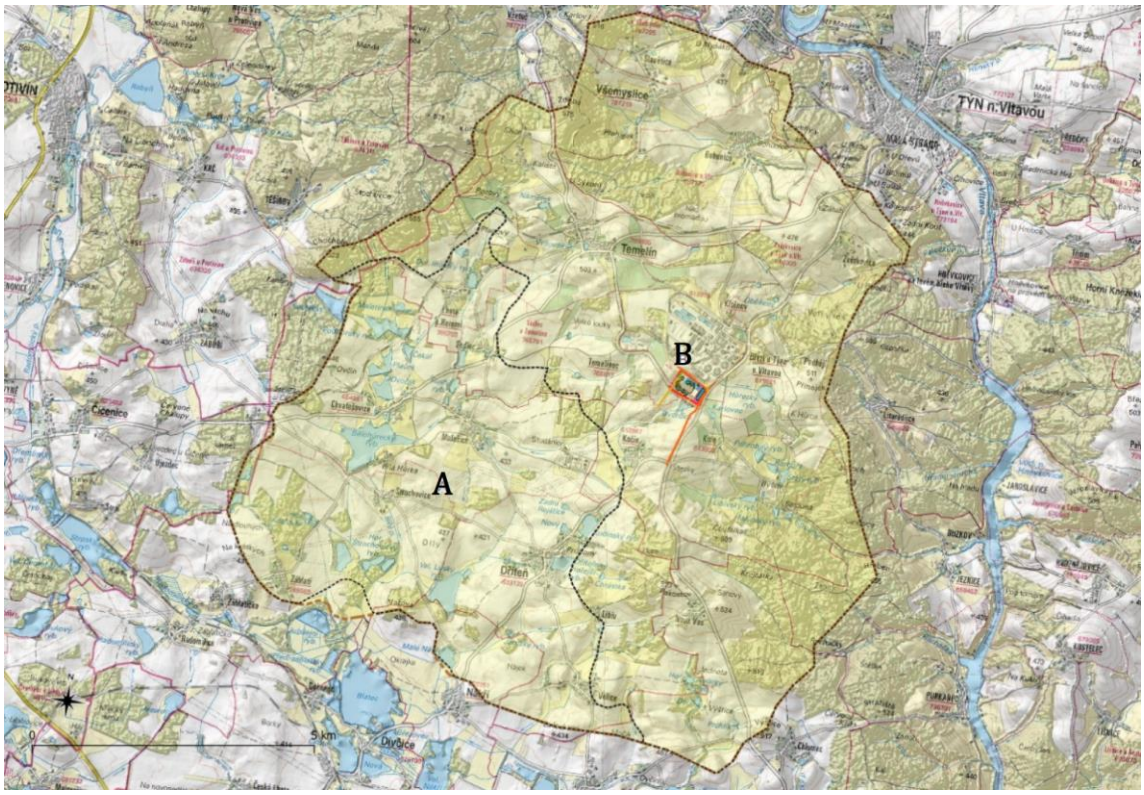
The southern part of the DOKP comprises a characteristic agricultural landscape with large blocks of land, supplemented by typical historic fishpond systems. The villages of various sizes in this subarea retain their South Bohemian character. The visual character of the southern part of the DOKP is locally strongly accentuated by local landmarks formed by rural churches. The entire space is clearly defined on the northern and eastern sides by the forested edges of the Vltava valley, on the north-western side by the forested hills of the Mehelnice Highland, and in the southern part by subtle divides in the landscape.

Because of the difference between the two parts, the affected landscape area is divided into two subareas with different characters:

- A - Dříteň-Chvalešovice,
- B - Temelín area.

This is shown in the following figure.

Fig. C.29: Definition of subareas of the affected landscape area



C.II.8.1.4.2. Characteristics of affected landscape subarea A - Dříteň-Chvalešovice

The area is located at the junction of the Zliv and Vodňany Basins and the adjoining Chvalešovice Uplands, on the watershed between the Blanice River and Bezdrevský Stream. The basin area is composed predominantly of kaolinitic sandstones and conglomerates, claystones and siltstones, and to a lesser extent of clays and sands with deposits of ceramic clays, lignite, and diatomite. The upland part of the area at the boundary with the Temelín area is formed predominantly by migmatites and paragneisses, with smaller occurrences of granite and quartz syenite (in the northwest), and by Miocene sands, sandstones, and clays of the Mydlovary Formation. A flat to gently hilly, predominantly erosional-denudational surface prevails on the floor of the tectonic depression, bounded by pronounced fault slopes, with Middle and Late Pleistocene terraces of the Vltava and Malše Rivers in its eastern part. The northeastern edge of the area comprises a less subsided block with low, flat hills, plateaus, and shallow Tertiary valley depressions. Anthropogenic landforms (lignite and kaolin quarries and spoil heaps) occur frequently in the area.

The area's visual character is fundamentally determined by the agricultural landscape in the flat relief of the depression, which comprises large consolidated blocks. The original field system of croft strips, furlongs, or irregular strip fields has been completely erased or substantially suppressed. The area's visual character is also determined by small, predominantly spruce or pine "farm woods", with an admixture, and only locally a predominance, of oak. A locally dominant accentuating landscape element comprises fishpond systems, often with valuable, near-natural shoreline areas containing mature alder, willow, and poplar vegetation; wetlands and peatlands; and waterlogged, marshy areas with remnants of wet meadows. The numerous preserved abandoned stream meanders, forming waterlogged places or pools, should be regarded as specific features. Mature landscape vegetation is concentrated in lines accompanying technically modified watercourses, in the riparian zones of fishponds, and along roads, and only locally completes the edges of forest stands. Characteristic elements of the area include structures associated with fishpond management, such as ditches and channels. The settlement structure is relatively dense and lacks any clear concentration around centers; smaller villages in medieval formations that remain clearly legible predominate. The characteristic South Bohemian architecture in the area is relatively austere; traditional structures have often been damaged by insensitive modernization. More valuable groups have survived only locally, complemented by typical rural Baroque houses, for example in Olešník, Záblatíčko, and Malešice. Settlements are predominantly supplemented by chapels; only locally is there a church that dominates the settlement's landscape framework (Nákří, Zahájí, and Záblatíčko). The landscape's most significant and valuable features include the neo-Gothic Church of Our Lady near Záblatíčko, on a low hill at the edge of the village, together with the adjoining rural composition of the road leading to the cemetery and bounded by a masonry wall; and the Church of St. Stephen with its tomb at Bílá hůrka above Bělohůrecký Pond, which dominates the fishpond landscape around Chvalešovice. The Church of St. Dismas in Dříteň and the chateau complex are located at the boundary of the area, but the visual and spatial character of both structures has been damaged by the village's development. The area is characterized by smaller roads aligned with landownership patterns and the landscape relief and predominantly following historic routes.

The Temelín NPP site appears in many views across the area and locally has a pronounced influence on the visual character of many locations when looking north. The unmistakable cooling towers dominate the horizon from numerous viewpoints and open areas, particularly around Chvalešovice, Záblatí, and Nákří.

The characteristic features of affected landscape subarea A - Dříteň-Chvalešovice are as follows:

Attributes of the natural characteristic

- The relatively flat basins bounded by flat uplands at the interface of the Zliv and Vodňany basins and the adjoining Chvalešovice Uplands, with characteristic relief containing numerous depressions and valley lows.
- Predominantly small spruce or pine forests, with an admixture and only locally a predominance of oak, forming a mosaic in the agricultural landscape.
- Near-natural areas with riparian stands of alder, willow, and poplar, together with adjoining waterlogged meadow and wetland areas around fishponds and fishpond systems.
- Locally preserved wetlands with remnants of wet meadows and preserved abandoned stream meanders forming specific waterlogged locations.
- Mature landscape vegetation concentrated in lines accompanying technically modified watercourses and roads.
- Settlement vegetation co-determining the image of villages and their edges.
- Small fragments of near-natural meadows and pastures in the northern part of the area.
- Managed grasslands accompanying anthropogenic structures and areas (roads, field edges, etc.).

Attributes of the cultural and historical characteristics

- Large consolidated blocks of agricultural land with typical elements of intensified agricultural production (drainage, engineering modifications of watercourses, geometric field boundaries, and the absence of mature landscape greenery and grassland).
- A discernible underlying framework of the landscape's original division, with small fragments of elements of its historical division.
- Production-forest character of forest stands with regular edges.
- Fishponds and fishpond systems with typical accompanying elements and structures associated with fishpond management, such as ditches, channels, and similar features.
- A dense, stratified rural settlement structure of medieval villages, dominated by small settlements with no discernible central orientation.
- A predominantly clearly legible historical spatial organization of the villages that helps determine their visual character in the landscape.
- Preserved groups of rural houses and cottages of varying historical quality, documenting the image of the characteristic architecture of South Bohemia in the Vodňany Area (for example Olešník, Záblatíčko, Malešice, and others).
- Insensitively modernized traditional historic structures in settlements, with inappropriate additions of modern houses lacking context and degrading the settlements' visual character in the landscape.
- Small-scale religious architecture comprising wayside shrines and chapels in settlements and the landscape.
- Churches dominating settlements and their landscape framework in Nákří, Zahájí, and Dříteň, and churches forming valuable rural religious landscape compositions (the neo-Gothic Church of Our Lady on a low hill at the edge of Záblatíčko, together with the adjoining rural composition of the road leading to the cemetery and bounded by a masonry wall; and the Church of St. Stephen with its tomb at Bílá hůrka above Bělohůrecký Pond, which dominates the fishpond landscape around Chvalešovice).
- Small, unobtrusive roads, predominantly of a smaller scale, connecting settlements and following historic routes.
- Numerous technical-infrastructure elements visible in the landscape, particularly the pylons of several transmission lines leading to or from the nearby Kočín substation.
- The visual presence of the Temelín NPP site in numerous scenes, enclosing or affecting their visual character primarily when looking north, with the cooling towers as landmarks.

Attributes of the spatial characteristic

- A moderately open, locally only weakly articulated landscape scene of medium scale, with numerous views lacking prominent bounding horizons.
- A mosaic of large areas of consolidated arable land, supplemented by fishponds and small forests of a different scale.
- Numerous semi-open, picturesque spaces created by forests and fishponds.
- Cultural landmarks comprising churches with characteristic towers that are locally prominent within the landscape framework of a settlement.
- Churches locally forming significant and valuable rural religious landscape compositions.

- Intrusive elements of a technical/industrial nature disturbing the image of the landscape (Temelín NPP and numerous VVN and ZVN pylons).

C.II.8.1.4.3. Characteristics of affected landscape subarea B - Temelín area

The Temelín area comprises a landscape enclosed by the forested areas of the flat Mehelnice Highlands, dominated by the forested Vysoký Kamýk hill, and by the deeply incised Vltava valley. This part of the DOKP consists of dissected uplands lying predominantly in the Vltava basin. The geological structure of the area consists of paragneisses and, to a lesser extent, migmatites, sandstones, conglomerates, and claystones. The area's surface comprises gently dissected erosion-denudation relief, bounded to the west and east by fault lines, in the form of a horst between the Blata Basin to the west and the Lomnice Basin to the east, with remnants of Neogene planation surfaces and structural ridges and monadnocks. The area is clearly bounded to the east and north by the deeply incised Vltava valleys, to the west by the forested hills of the Mehelnice Highlands, and to the south by the margins of the Blata Basin. Typical features include tributaries of the Vltava River, fringed near the main river by Pleistocene river terraces in some places, with traces of an old valley network in downfaulted blocks of Neogene sediments.

The area has moderate forest cover, but the forests are concentrated along its eastern and western margins, where they form a continuous accompaniment to the Vltava valley and, on the opposite side, occupy the defining highland areas. Spruce and pine stands predominate, with beech, fir, and oak in the southern part and oak and beech stands in the southern part. The defining area of the Mehelnice Highlands comprises a continuous complex of mixed forests dominated by spruce with admixtures of pine, fir, beech, ash, sessile and English oak, sycamore maple, lime, and larch, together with remnants of beech forests.

Landscape greenery comprises small, regular "farm woods" and greenery accompanying linear features in the landscape (modified watercourses, roads, and, locally, field margins). The most prominent features are consolidated and, in places, extensive blocks of arable land characterized by typical signs of agricultural intensification (arable blocks, technically modified watercourses, and, in places, visible landscape drainage). Small fishponds, which locally form systems (for example Býšov), are a specific landscape element, accompanied by characteristic riparian stands of mature vegetation and, only locally, by waterlogged meadows.

The settlement structure is formed primarily by a system of smaller rural settlements interconnected by roads, most of which follow historic routes. The settlements are small villages formed by compact village-green layouts. Settlement greenery helps determine the visual character of most villages; crofts with orchards occur locally along village margins (particularly the area with orchards near Temelín). Most settlements have chapels; church landmarks are rare, the main example being Dříteň, with its prominent church and chateau building, followed by the area of the former park, damaged by an agricultural complex and terminating at Dříteňský Pond. A significant landscape landmark of the area is formed by the preserved composition of the Church of St Procopius and the Vysoký Hrádek Chateau near the former village of Březí u Týna nad Vltavou. The visual character of the site is, however, substantially degraded by the immediately adjoining Temelín NPP site, which is currently a major landmark of the area and of the adjoining extensive landscape at the boundary between the South Bohemian basins, the Vltava valley areas, and the adjacent hills of the Tábor Uplands. Because of the power plant and associated Kočín substation, the landscape contains prominent technical-infrastructure elements comprising overhead ZVN and VVN lines with characteristic pylons. A relatively significant road from Týn nad Vltavou to Hluboká nad Vltavou traverses the area along the axis of the Vltava valley, following the valley and forming the cultural axis of the eastern part of the DOKP.

The characteristic features of affected landscape subarea B - Temelín area are as follows:

Attributes of the natural characteristic

- The characteristically formed upland relief of the Týn Uplands, separating the Vltava valley, the highland areas at the edge of the Písek Uplands, and the České Budějovice Basin, forms a local watershed.
- The dominant forested area containing the summit areas of Vysoký Kamýk, which bounds the area to the west.
- Deeply incised Vltava Valley with forested edges defining the area.
- A transitional area at the edge of the South Bohemian basins, with characteristic fishponds near Dříteň, Malešice, and Lhotka pod Horami.
- Network of small tributaries of the Vltava River and Bílý Stream, radiating in all directions and accompanied by vegetation.
- Continuous forest stands forming the northern, western, and eastern edges of the area.
- Regular "farm woods".
- Landscape greenery accompanying linear features in the landscape (modified watercourses, roads, and, locally, field margins).
- Characteristic riparian vegetation accompanying fishpond areas.
- Small waterlogged meadows adjoining fishponds and streams.
- Settlement greenery completing the visual character of most villages, locally forming croft areas with orchards (orchards near Temelín), and landscape greenery accompanying historic parts of the landscape with fortresses (Býšov) and religious compositions (Křtěnov).

Attributes of the cultural and historical characteristics

- Consolidated and, in places, extensive blocks of arable land characterized by typical signs of agricultural intensification (arable blocks, technically modified watercourses, and, in places, visible landscape drainage).

- Small fishponds which locally form systems (for example Býšov).
- A settlement structure consisting of a system of smaller rural settlements irregularly connected by roads, without any clear orientation toward centers.
- Characteristic medieval villages comprising compact village-green formations with preserved historic cottages and houses and a legible historic form of spatial organization in the original layout.
- Inappropriate modernization of historic houses and cottages and insensitive additions to settlements that degrade their visual character in the landscape.
- Agricultural complexes that locally substantially degrade valuable parts of settlements and their visual character in the landscape (Dříteň, Chvalešovice, Malešice, and Kočín).
- Preserved fortresses or their remains in the landscape and at the edges of settlements.
- Small religious structures in settlements and the landscape, particularly village-green chapels that complement the interior visual character of numerous villages.
- Isolated church landmarks complementing the image of settlements (Dříteň).
- The landscape landmark of the Church of St. Procopius with the associated religious composition and cemetery, and the area of Vysoký Hrádek Chateau near the former village of Březí u Týna nad Vltavou, a memorial site.
- Small, unobtrusive roads, predominantly of a smaller scale, connecting settlements and following historic routes.
- The Temelín NPP site, with its characteristic reactor-unit buildings and cooling towers, dominating the entire area.
- The Kočín substation, with associated prominent technical-infrastructure elements comprising overhead ZVN and VVN lines with characteristic pylons.

Attributes of the spatial characteristic

- A landscape scene that is moderately open, particularly to the south, and locally only weakly articulated, with numerous views bounded by the prominent forested horizon of the Mehelnice Highlands and the low horizon of forested hills at the edge of the Vltava valley.
- A mosaic of large areas of consolidated arable land, supplemented by small forests of a different scale and, locally, fishponds.
- Disruptive technical-infrastructure elements (the Kočín substation and numerous VVN and ZVN pylons).
- The distinctive visual character of the Temelín NPP site, dominating the entire area and appearing in the visual character of numerous locations and scenes, with the cooling towers as landmarks, characterized by its disruptive presence and conspicuously different scale.

C.II.9. Material assets and cultural heritage

C.II.9.1. Tangible assets

The areas for siting the Project contain no tangible immovable property (houses or other structures) owned by third parties that would spatially conflict with the Project. Most parcels for the construction of SMR ETE are owned by the developer; some parcels in the construction-site facility areas are owned by third parties. The surrounding roads are owned by the South Bohemian Region.

C.II.9.2. Architectural and historical monuments

At the Project site, there are no architectural or historical monuments or areas under area-based heritage protection recorded by the National Heritage Institute in the Central List of Immovable Cultural Monuments.

The immovable cultural monument nearest to the area designated for siting and construction of SMR ETE is a rural homestead in the historic part of Kočín (Central List No. 16875/3-192), approximately 1.4 km from the boundary of the SMR construction area and approximately 450 m from the power evacuation corridor.

North of the existing power plant site, approximately 1.8 km from the SMR ETE siting area, is a prismatic bell tower forming part of the cemetery within the Church of St. Procopius complex in Křtěnov and incorporated into its perimeter wall (Central List No. 16338/3-212). The Church of St. Procopius complex in Křtěnov is also situated near construction site facility area C and the construction-site power-supply corridor. To the south, without direct contact with the Project, the rural homestead at Kočín No. 13 is located in the village of Kočín (Central List No. 16875/3-192).

The monuments of local significance in the affected territory and its immediate vicinity comprise, in addition to the power plant information center housed in Vysoký Hrádek Chateau-Březí immediately adjoining the existing nuclear power plant site to the north, principally chapels at the sites of the former villages of Knín, Březí u Týna nad Vltavou, and Podhájí; the Chapel of St. Procopius in Křtěnov; crosses and wayside shrines in the

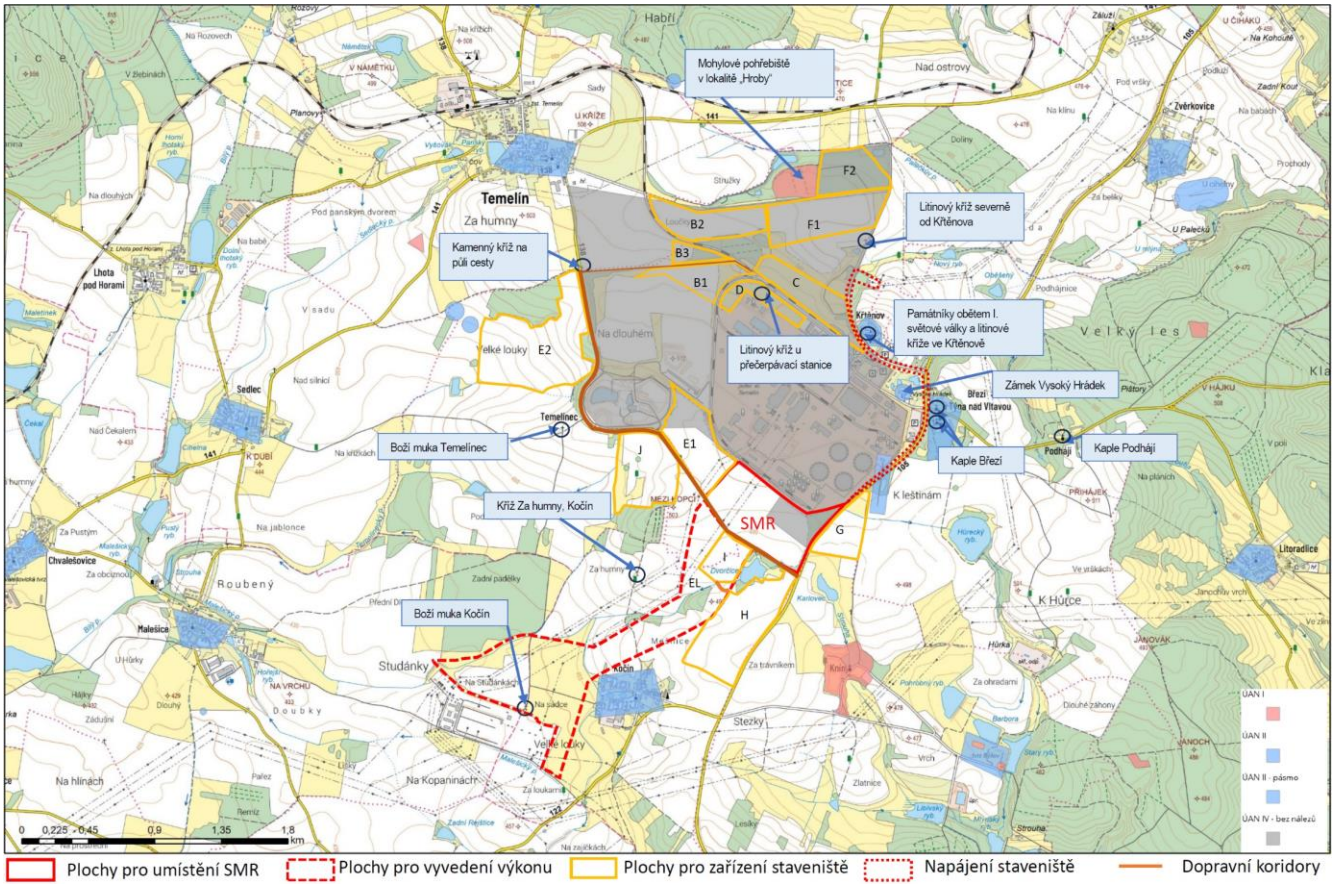
agricultural landscape between Kočín and the existing ETE site (a cross at Za humny in the cadastral area of Kočín); and a wayside shrine at the site of the former village of Temelínec. A wayside shrine at Na Studánkách, on the northern boundary of the existing Kočín substation, is located directly within the power evacuation corridor. This wayside shrine is already located within the power evacuation corridor from the existing nuclear power plant, and it is not expected to be affected during installation of the power line.

A cast-iron cross near the pumping station is located within construction site facility area D. A cast-iron cross is located near area F2, north of Křtěnov along the road to Palečkův Stream; monuments to the victims of the First World War and cast-iron crosses are located on the village green in Křtěnov near construction site facility area C and the construction-site power-supply corridor. These monuments of local significance are not expected to be affected by Project construction.

In the immediate vicinity of the Road II/138 widening corridor, where the ETE service-road corridor connects, and also near area E2, a stone cross with a silver-painted cast-iron figure of Christ, dated 1881, is located on the right side of Road II/138 north of the intersection with the ETE service road, halfway between Temelín and the former village of Temelínec. The cross stands beneath an old copper beech outside the designated transport corridor.

The locations of monuments of local significance and archaeological sites in relation to the areas for siting and construction of SMR ETE are shown in the following figure.

Fig. C.30: Locations of monuments of local significance and archaeological sites



Mohylové pohřebiště v lokalitě „Hroby"	Barrow cemetery at "Hroby"
Kamenný kříž na půl cesty	Stone cross halfway along the road
Boží muka Temelínec	Wayside shrine at Temelínec
Kříž Za humny, Kočín	Cross at Za humny, Kočín
Boží muka Kočín	Wayside shrine at Kočín
Litinový kříž u přečerpávací stanice	Cast-iron cross near the pumping station
Litinový kříž severně od Křtěnova	Cast-iron cross north of Křtěnov
Památníky obětem I. světové války a litinové kříže ve Křtěnově	Monuments to the victims of the First World War and cast-iron crosses in Křtěnov
Zámek Vysoký Hrádek	Vysoký Hrádek Chateau
Kaple Březí	Chapel at Březí
Kaple Podhájí	Chapel at Podhájí

ÚAN I	ÚAN I
ÚAN II	ÚAN II
ÚAN III - pásmo	ÚAN III - zone
ÚAN IV - bez nálezů	ÚAN IV - no finds
Plochy pro umístění SMR	SMR siting areas
Plochy pro vedení výkonu	Power evacuation areas
Plochy pro zařízení staveniště	Construction-site facility areas
Napájení staveniště	Construction-site power supply
Dopravní koridory	Transport corridors

No direct spatial contact has been identified between the SMR siting area and any immovable cultural monument or recorded archaeological site.

C.II.9.3. Archaeological sites

The Project site lies within a category ÚAN III area, where archaeological finds are not currently expected but cannot be definitively excluded. At the time this Documentation is being prepared, an advance archaeological survey is in progress in the Project areas (the SMR siting area and construction-site facility areas), performed by the South Bohemian Museum in České Budějovice and expected to be completed in April 2027.

Before construction of the existing Temelín power plant (ETE1,2) began, an advance rescue archaeological excavation was performed; it also partially covered the SMR ETE Project areas (northwestern quadrant). This survey also covered construction site facility areas F1, F2, B1–B3, C, and D. No archaeological finds were demonstrated in the survey areas, which are therefore classified as ÚAN IV. Part of the SMR ETE siting area, construction site facility areas J, H, G, I, and E2, and part of area E1 lie in an area where no archaeological survey has yet been performed. These are therefore category ÚAN III areas, i.e., areas where, based on currently available information, the occurrence of archaeological finds cannot be excluded. In accordance with the applicable legislation, the Archaeological Institute of the Czech Academy of Sciences must therefore be notified of the intention to perform construction or other activities in this area that could endanger archaeological finds, and a rescue archaeological survey must be secured in the form of archaeological supervision during earthwork and construction work in the affected territory.

With respect to archaeological monuments, the feature nearest to the affected areas is a barrow cemetery at Hroby in the cadastral areas of Křtěnov and Březí u Týna nad Vltavou, immediately adjoining the areas designated as reserves for construction site facility areas F1 and F2. This is an extensive barrow cemetery (Central List No. 31285/3-214); a higher probability of archaeological finds can be expected in its vicinity. The remains of a barrow cemetery (Central List No. 31864/3-5588) are located west of the ETE site.

According to the available source materials, a large Prussian army field camp was located between Temelín and Dříteň in 1744 during the War of the Austrian Succession; its precise location is not clear from the available sources. Based on the terrain configuration, waterlogging, and the historical existence of small fishponds documented on historical maps, a higher probability of archaeological finds can consequently be expected in construction site facility area E2 at Velké louky.

C.II.10. Transport and other infrastructure

C.II.10.1. Transport infrastructure

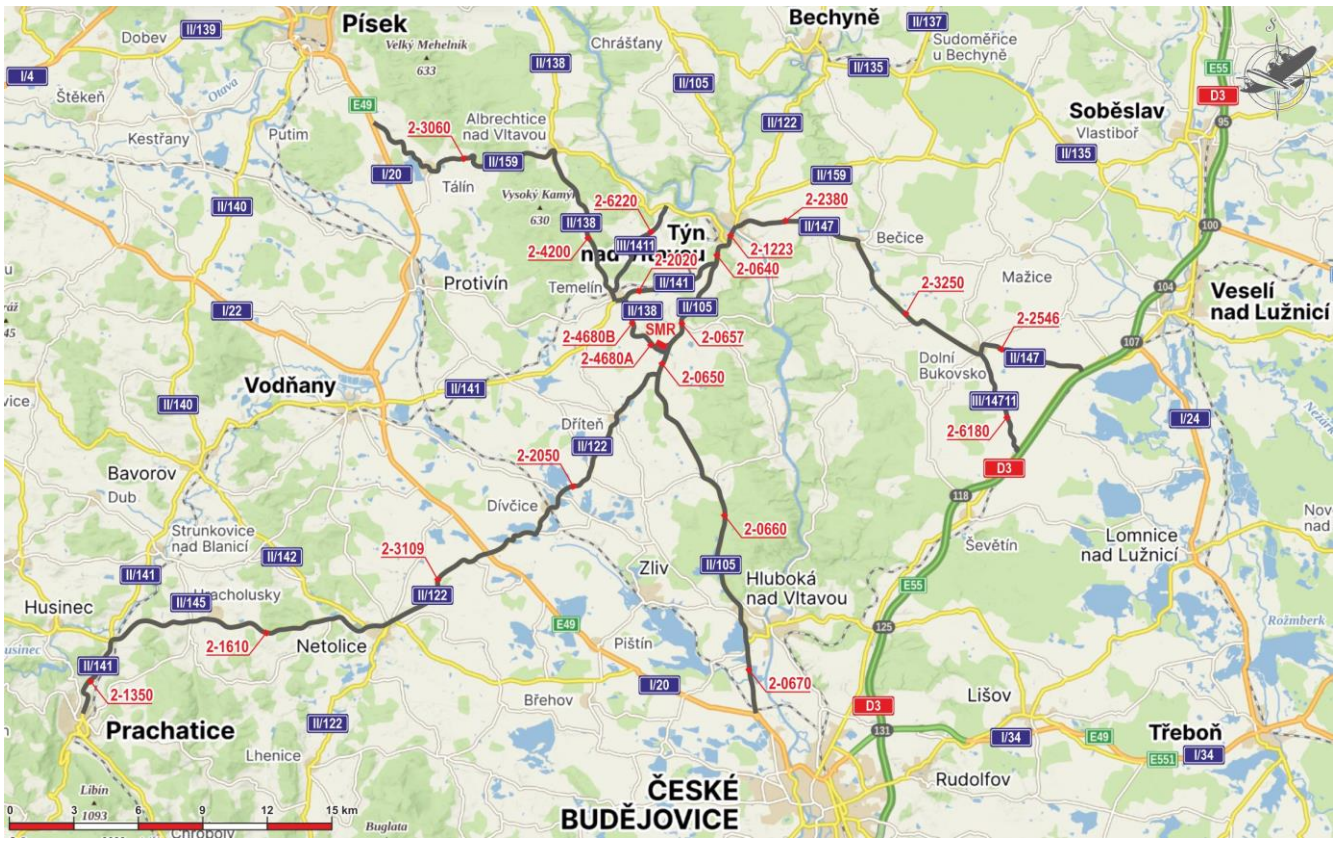
C.II.10.1.1. Road transport

The Project is being sited at the Temelín site, immediately adjacent to the existing Temelín power plant. Road access to the site is provided by Road II/105, which runs immediately alongside the ETE site; a section of Road II/138 will also be used for access to the SMR site. These roads and their connecting roads form part of the regional transport infrastructure and have satisfactory capacity and construction and winter maintenance, including planned bypass construction in municipalities on the potentially most affected sections. They therefore ensure trouble-free connections for the Project at the local, regional, and national levels, particularly connections to the D3 motorway and Class I roads.

All roads used for motor-vehicle traffic associated with the operation or construction of SMR ETE have sufficient capacity and are appropriately equipped for the anticipated traffic load. In the area of interest, in both the regional and national contexts, road-infrastructure modifications for the transport of oversized and heavy components are also continuing in accordance with Government Resolution No. 806 of October 22, 2025, on securing financing for transport-infrastructure modifications for the transport of oversized and heavy components in connection with the construction of new nuclear sources (including small modular reactors) at the Temelín site. These modifications were originally initiated by the New NPP ETE project but will also be used for the SMR ETE Project.

A diagram of the road network in the affected territory, identifying the significantly affected road network,[1] is shown in the following figure.

Fig. C.31: Diagram of the road network in the affected territory, road numbers, traffic-count profile numbers, and identification of the affected road network



Traffic volumes on the affected road network (according to the latest available 2020 traffic count by the Road and Motorway Directorate of the Czech Republic) are presented in the following table.

Table C.53: Baseline traffic volumes on the affected road network, 2020

Road	Profile	Annual average daily traffic volumes [vehicles/24 h]			
		OV	LNV	TV	SV
II/105	2-1223	11,922	716	624	13,262
	2-0640	6,943	624	563	8130
	2-0657	5,488	422	435	6,345
	2-0650	5,488	422	435	6,345
	2-0660	6,517	586	697	7,800
	2-0670	8,104	541	743	9,388
II/122	2-2050	1,566	104	224	1,894
	2-3109	1,170	80	130	1,380
II/138	2-4200	508	60	82	650
	2-4680A	790	80	226	1,096
	2-4680B	790	80	226	1,096
II/141	2-2020	1316	212	249	1,777
	2-1350	5,238	564	409	6,211
II/145	2-1610	4,440	721	565	5,726
II/147	2-2380	1,437	172	257	1,866
	2-3250	1,437	172	257	1,866
	2-2546	1,006	135	214	1,355
II/159	2-3060	1,546	124	154	1,824
III/1411	2-6220	267	25	117	409
III/14711	2-6180	546	60	39	645

Source: Road and Motorway Directorate of the Czech Republic, 2020

[1] Given their location and traffic importance, and the correspondingly higher baseline traffic volumes, roads in the broader area of interest (D3, D4, I/3, I/19, I/20, I/23, I/24, I/29, and I/34) will be affected only marginally by traffic generated by SMR ETE. They are therefore not presented here; they are available in the detailed traffic study.

Traffic volumes are trending upward. The traffic-volume forecast for the road network in the affected territory, based on the natural development of baseline traffic volumes (i.e., without the impact of the Project), was prepared for the 2034, 2040, and 2042 reference-year horizons using the current traffic-volume growth factors (Ministry of Transport Technical Conditions TP 225, Road Traffic Volume Forecast, Correction No. 1, Ministry of Transport, October 2018) and is presented in the following table.

Table C.54: Traffic-volume forecast for the affected road network, reference years 2034, 2040, and 2042 (without the Project)

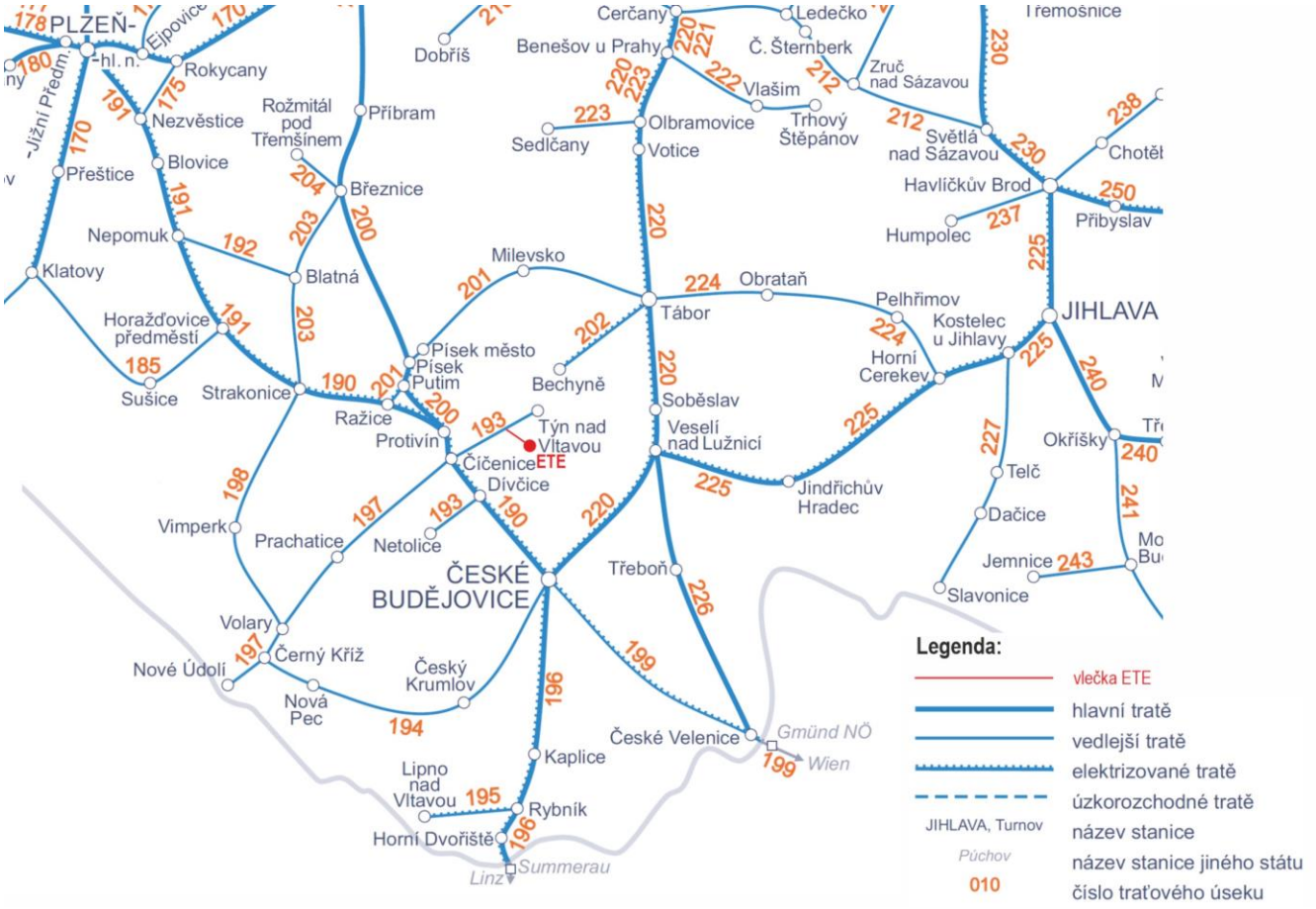
Road	Profile	Annual average daily traffic volumes [vehicles/24 h]											
		Reference year 2034				Reference year 2040				Reference year 2042			
		OV	LNV	TV	SV	OV	LNV	TV	SV	OV	LNV	TV	SV
II/105	2-1223	12,808	898	681	14,387	12,830	939	697	14,466	12,785	947	702	14,433
	2-0640	7,459	783	614	8,856	7,472	818	629	8,919	7,446	825	633	8,904
	2-0657	5,896	529	475	6,900	5,906	553	486	6,945	5,885	558	489	6,932
	2-0650	5,896	529	475	6,900	5,906	553	486	6,945	5,885	558	489	6,932
	2-0660	7,051	723	753	8,527	7,076	756	777	8,609	7,051	762	783	8,596
	2-0670	8,768	667	803	10,238	8,799	698	829	10,325	8,768	704	834	10,306
II/122	2-2050	1,694	128	242	2,065	1,700	134	250	2084	1,694	135	252	2,081
	2-3109	1,257	100	142	1,499	1,259	105	145	1,509	1,255	106	146	1,507
II/138	2-4200	546	75	89	711	547	79	92	717	545	79	92	716
	2-4680A	849	100	247	1,196	850	105	252	1,207	847	106	254	1,207
	2-4680B	849	100	247	1,196	850	105	252	1,207	847	106	254	1,207
II/141	2-2020	1,415	265	271	1,951	1,416	278	278	1,972	1,411	280	280	1,971
	2-1350	5,627	708	446	6,781	5,637	740	457	6,833	5,617	746	460	6,823
II/145	2-1610	4,770	905	617	6,291	4,778	945	631	6,355	4,761	954	635	6,350
II/147	2-2380	1,544	216	280	2,040	1,546	226	287	2,059	1,541	227	289	2,057
	2-3250	1,544	216	280	2,040	1,546	226	287	2,059	1,541	227	289	2,057
	2-2546	1,081	169	234	1,484	1,083	177	239	1,499	1,079	179	241	1,498
II/159	2-3060	1,661	156	168	1,984	1,664	163	172	1,998	1,658	164	173	1,995
III/1411	2-6220	287	31	127	445	287	33	131	451	286	33	132	451
III/14711	2-6180	587	75	42	704	588	79	44	710	586	79	44	709

C.II.10.1.2. Rail transport

The Temelín power plant site is connected to the national rail network by a siding branching from the Čížčenice-Týn nad Vltavou line at Temelín station. This siding may also be used for the SMR ETE Project.

The rail-network diagram is shown in the following figure.

Fig. C.32: Diagram of the rail network in the affected territory and line-section numbers



Legenda:	**Legend:**
vlečka ETE	ETE siding
hlavní tratě	main lines
vedlejší tratě	branch lines
elektrizované tratě	electrified lines
úzkorozchodné tratě	narrow-gauge lines
název stanice	station name
název stanice jiného státu	station name in another country
číslo traťového úseku	line-section number

According to information from ČD Cargo, there are no restrictions on using the siding for the construction and operation of SMR ETE (including ETE1,2 and New NPP ETE). The capacity of the rail network to Temelín is sufficient and fully adequate for the contemplated transport. No regular passenger service operates on the line from Čížkovice to Temelín, so the line can be used entirely for freight traffic. The capacity of the Temelín rail connection station is sufficient for transporting construction materials (gravel, sand, cement, bricks and blocks, reinforcement, sewer and water-supply piping, cables, and potentially parts of technological equipment such as structural assemblies, valves, and similar items).

Temelín railway station has four running tracks, each approximately 400 m long, and two shunting tracks 49 and 61 m long.

The Křtěnov siding (Temelín Power Plant) currently has three tracks. Tracks No. 1 and No. 3 are intended for train arrivals and departures and are each 454 m long; shunting Track No. 2 is 497 m long. A capacity of 25 cars per track can be assumed. If the original tracks are restored, unloading capacity will increase severalfold. The time required to shunt a 25-car block train from Temelín station is approximately 180 minutes. Operating hours are not restricted by the siding rules; the siding can potentially be served 24 hours a day, 7 days a week.

C.II.10.1.3. Air transport

There is no general aviation airport in the affected territory.

The Temelín site is continuously protected by a prohibited airspace designated LKP2 TEMELÍN in the Aeronautical Information Publication of Air Navigation Services of the Czech Republic. This prohibited airspace is cylindrical, with a radius of 1.1 nautical miles (approximately 2.04 km) and a height of 5,000 feet (approximately 1.52 km) above mean sea level, centered above the existing generating units of ETE1,2. All air traffic is prohibited within this airspace except flights authorized in justified cases by the Civil Aviation Authority of the Czech Republic and life-saving flights or flights conducted by the police and armed forces.

No military training or operational area is located above the power plant site; the prohibited airspace described above is respected. Military operating directives contain special measures and traffic regulations relating to the Temelín Nuclear Power Plant facility.

C.II.10.1.4. Water transport

The Vltava waterway is used for navigation in the affected territory. To ensure navigability, the hydraulic structures on the Vltava (Hněvkovice and Kořensko hydraulic structures) are equipped with navigation facilities (locks) for vessels with a displacement of up to 300 t.

In connection with preparation of New NPP ETE, measures for transporting oversized and heavy components by water are gradually being prepared and implemented on the Vltava River (and subsequently the Elbe), in accordance with Government Resolution No. 806/2025 on securing financing for transport-infrastructure modifications for the transport of oversized and heavy components in connection with the construction of new nuclear sources (including small modular reactors) at the Temelín site. These measures consist principally of providing for transshipment of the components both to cross transverse obstructions in the watercourse (hydraulic-structure dams) and between water and road transport. These measures will also be used to transport oversized and heavy components for SMR ETE.

C.II.10.1.5. Other transport systems

A number of hiking and cycling routes pass through the broader area around the power plant. Pedestrian and bicycle traffic uses the existing roads and tracks in the area, including a network of marked and equipped routes located outside both the power plant site and the SMR Project construction area.

C.II.10.2. Other infrastructure

All standard technical infrastructure is available in the affected territory, comprising:

- the electricity transmission and distribution system,
- water-management systems,
- gas pipelines and product pipelines,
- other networks.

Electricity transmission and distribution system: Because of its electric-power function, the affected territory is characterized by a large number of transmission and distribution lines (including the associated substations) intended for power evacuation from power facilities to the electricity system (Kočín transformer station), interconnection with other transmission-system elements, and connection of distribution networks supplying electricity to towns and villages. Measures are also being prepared to increase their transmission capacity and reliability. These systems will also be used for the SMR ETE Project.

Water-management systems: An independent water-management system has been constructed in the area for operation of the Temelín Nuclear Power Plant. It comprises the raw-water pumping station at Hněvkovice Reservoir and the raw-water rising mains to the existing power plant's service reservoir, as well as gravity wastewater mains to the Kořensko hydraulic structure and stormwater mains to Strouha Stream and onward to the Vltava River. Following any necessary retrofitting/capacity expansion, these systems will also be used for the SMR ETE Project.

Gas pipelines and product pipelines: Both distribution gas pipelines supplying municipalities and a high-pressure transit-system gas pipeline pass through the affected territory. They are not expected to be used for the SMR Project. An auxiliary boiler plant equipped with electric steam boilers is contemplated to produce steam for the startup and operation of SMR ETE (startup and shutdown), with no gas-supply requirement.

Heat is supplied from ETE1,2 to České Budějovice and Týn nad Vltavou through hot-water pipelines.

Other networks: Wired and wireless telecommunications networks (including radio and television signal transmission), systems for transmitting information for the power plant's emergency preparedness system, and other infrastructure are available in the area. These systems will also be adapted and used for the SMR ETE Project.

C.II.11. Other characteristics of the environment

C.II.11.1. Geological environment and seismicity of the area

C.II.11.1.1. Geological environment

C.II.11.1.1.1. Geomorphological characteristics of the area

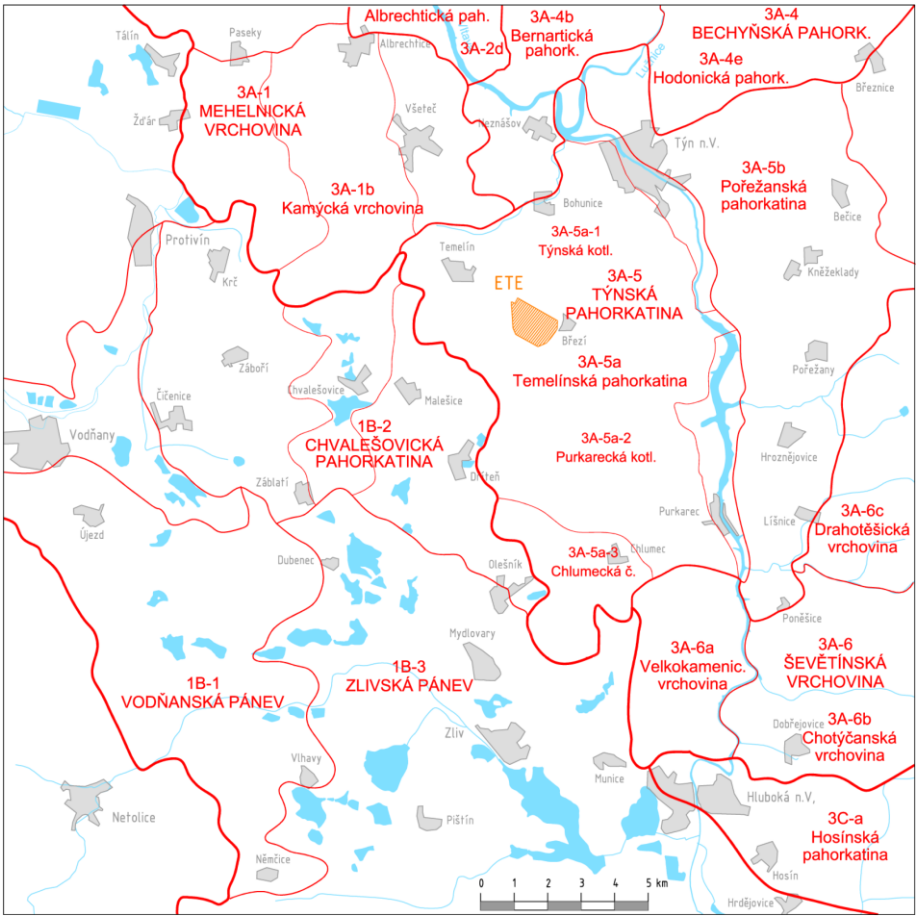
Under the geomorphological classification (Demek, Mackovič et al. 2006), the Temelín area belongs to the following units:

Province: Bohemian Highlands
Subprovince: Bohemian-Moravian System
Area: Central Bohemian Uplands
Unit: Tábor Uplands
Subunit: Písek Uplands
District: Týn Uplands

The Project is being sited in the Týn Uplands geomorphological district. Under the regional classification of current relief, the Týn Uplands district is divided into two subdistricts: the Temelín Uplands and Pořežany Uplands.

The geomorphological classification of the area of interest is shown in the following figure.

Fig. C.33: Regional classification of relief at the Temelín NPP site



The Temelín Uplands are characterized by predominantly continuous erosion-denudation relief, more strongly dissected in a belt along the Vltava, with extensive planation surfaces in watershed areas (mostly at elevations of 480–510 m above sea level). The SMR ETE Project lies on one of these plateaus at an elevation of approximately 497 m above sea level.

C.II.11.1.1.2. Geological conditions

Geological conditions in the broader area

The existing Temelín Nuclear Power Plant, including the contemplated New NPP ETE and the SMR Project, is situated in the southern part of the Bohemian Massif, in an area belonging to the Moldanubian complex. Since the Mesozoic, the geological and tectonic development of this area has been influenced by the adjacent Alpine orogen. Its individual phases were reflected in tectonic activity along major fault systems at the platform margin and thus influenced the formation and development of basin structures in South Bohemia. The basins formed in an area where two fault systems significant to the Moldanubian region intersect: the Blanice system, trending NNE-SSW, and the Jáchymov system, trending NW-SE. Activity along these systems conditioned the formation of major basin structures and thus enabled the paleogeographical spread of Cretaceous and Tertiary sedimentation.

The crystalline basement of this area is the Moldanubian complex, represented here by both of its lithofacial units, the monotonous and varied series. The structure of the Moldanubian crystalline complex was shaped by ductile and brittle deformation in several phases through the end of the Paleozoic, with older structures repeatedly reactivated and reworked.

The most widespread rocks are biotite, biotite-sillimanite, and biotite-cordierite paragneisses and migmatites, locally containing intercalations of quartzite, amphibolite, granulite, and orthogneiss. These metamorphic rocks are the product of complex multiphase nappe-type deformation during both the Cadomian and Hercynian metamorphic and deformation cycles.

The present morphology of the South Bohemian area in which the SMR ETE Project site is located is the result of long-term geological development involving tectonic, sedimentary, and erosional processes. The Alpine orogeny fundamentally affected the development of the South Bohemian area; its individual phases were reflected in tectonic activity along the Hercynian and older fault systems at the margin of the Bohemian Massif. The individual phases of renewed activity along these faults, manifested by inverse, predominantly vertical movements, resulted in Senonian, Paleogene, Miocene, and Pliocene sedimentation. Whereas the Senonian sediments were tectonically disrupted by vertical fault movements on the order of hundreds of meters (up to 300 m), Miocene and Pliocene sedimentation developed under conditions of regional tectonic activity without significant vertical fault movements. During the Pleistocene, weakening tectonic activity occurred primarily in the south (in the border mountains) and gradually diminished northward.

Geological conditions at and immediately around the construction site

From a geological-structure perspective, the bedrock in and immediately around the area addressed consists principally of Moldanubian metamorphic rocks of the monotonous series, comprising a complex of sillimanite-biotite paragneisses and migmatites. This complex is locally penetrated by veins or irregular bodies of granitoid rocks oriented predominantly northeast-southwest. Leucocratic vein granites are the predominant rock type; pegmatites and quartz veins are also abundant.

The rock mass of the "Vltava-Týn crystalline complex" is a tectonically very weakly disturbed block composed of paragneisses with varying degrees of isochemical migmatization, with heterogeneity essentially limited to alternation between finely banded and massive zones. Relatively intensive silicification is a significant stabilizing element.

A thin layer of Quaternary cover overlies the heavily weathered crystalline basement. The Quaternary cover consists predominantly of loamy-sandy sediments, with a small proportion of clayey loams or loamy gravels at the base of the cover sequence.

C.II.11.1.2. Seismicity of the area

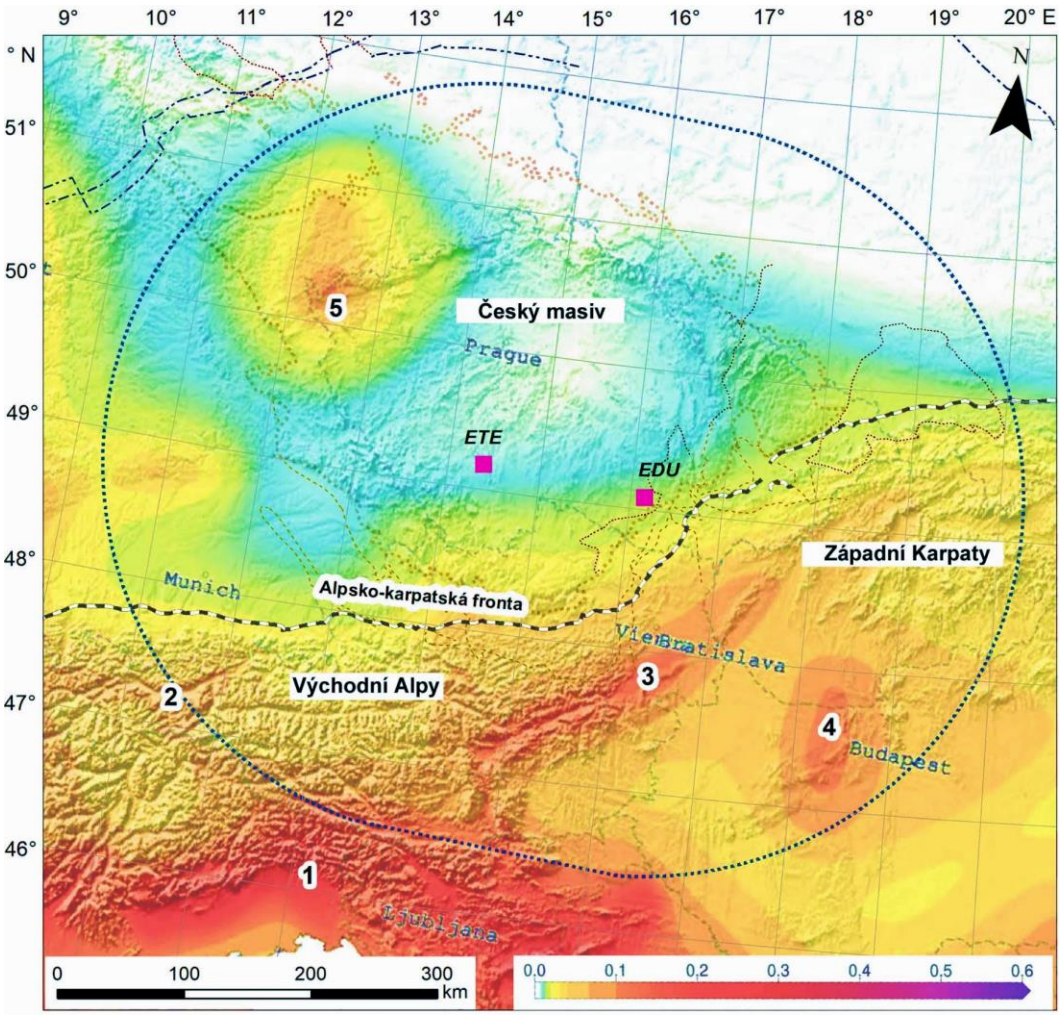
C.II.11.1.2.1. Seismic conditions

The territory of the Czech Republic lies within a seismotectonic domain characterized by low to medium seismicity. Most of the territory of the Czech Republic lies in an area with macroseismic intensities of V° to VI° on the MSK-64 scale[1]. This effect is caused by the low attenuation with which these earthquakes propagate into the Bohemian Massif.

The seismic-hazard map for the SMR ETE region (the area within 300 km of SMR ETE) is shown in the following figure (taken from the European Seismic Hazard Map prepared under the SHARE project). The map shows the distribution of peak ground acceleration (PGA) values with a 10 % probability of exceedance over a 50-year period.

[1] MSK-64 is the Medvedev-Sponheuer-Kárník scale used in seismology to express earthquake macroseismic intensity without instruments.

Fig. C.34: Excerpt from the seismic-load map identifying areas of high and medium seismic risk



Legend: 1 - Friuli area and Idrija fault; 2 - Loisach-Fernpass fault system; 3 - Mur-Mürz fault system; 4 - Komárno area; 5 - Western Bohemia

Český masiv	Bohemian Massif
Západní Karpaty	Western Carpathians
Alpsko-karpatská fronta	Alpine-Carpathian front
Východní Alpy	Eastern Alps

C.II.11.1.2.2. Seismic-hazard calculation

The most recent calculation of seismic hazard at the Temelín site using current data was performed in 2022 and was successfully reviewed during an IAEA SEED Mission in May 2022. The assessment used a probabilistic approach (PSHA, Probabilistic Seismic Hazard Assessment) and state-of-the-art procedures recommended by the IAEA. Although the key IAEA standard, SSG-9, was revised in 2022, the calculation performed under the PSHA already took the changes to this standard into account because a draft was available when the PSHA was being prepared.

A logic tree containing four alternative seismic-source models was developed as part of the PSHA. Three branches of the logic tree represented traditional seismic-source models: the small-area source-zone model (SASZ), large-area source-zone model (LASZ), and fault-source-zone model (F1). Bayesian statistics (model SV1.0) were used to create the fourth branch of the logic tree, covering both area and fault sources. Zones of diffuse seismicity were also included in the models under both approaches.

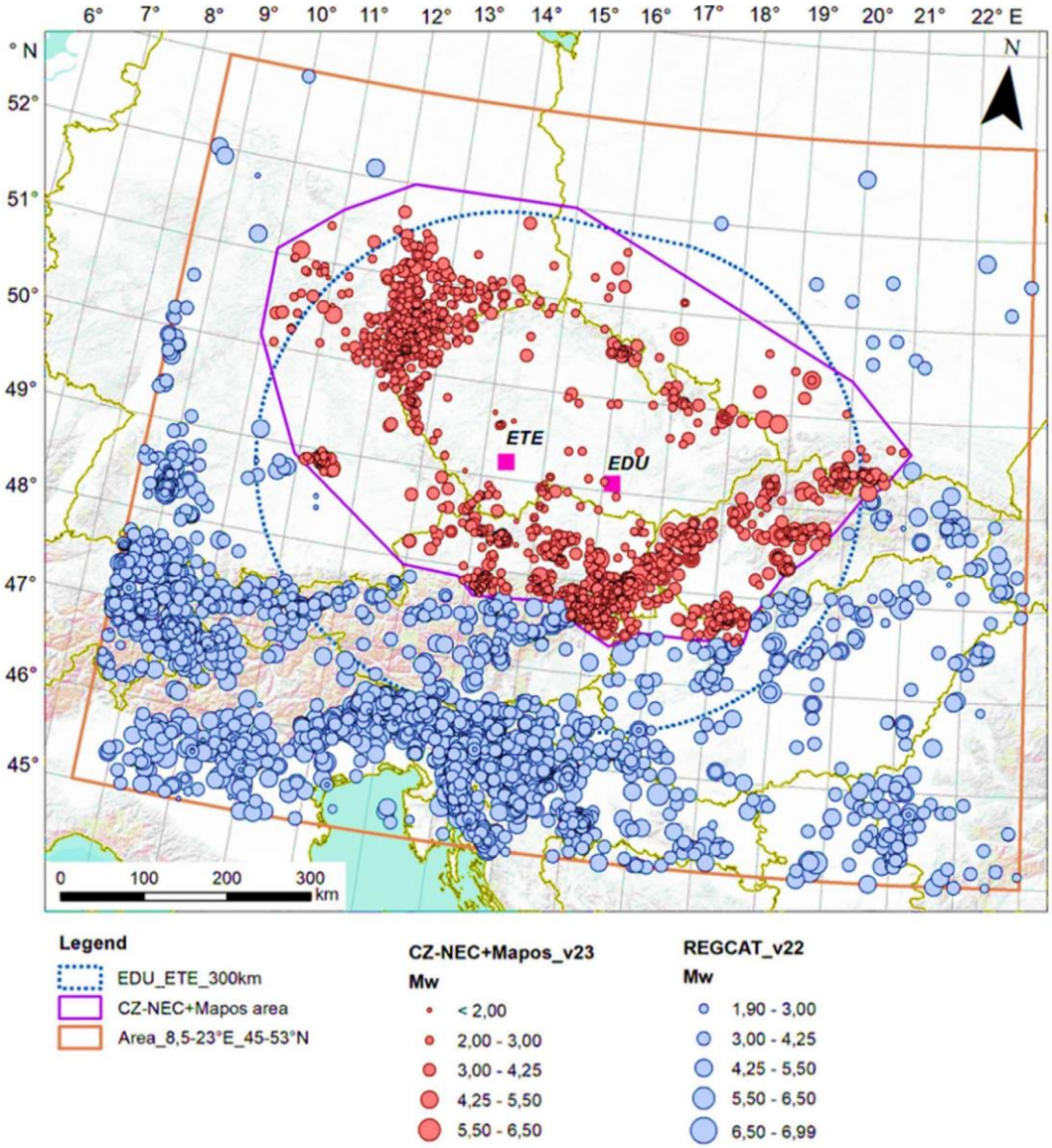
The models were developed from a newly compiled project catalog comprising three independently compiled catalogs with different minimum-magnitude thresholds. These are the CZ-NEC-II catalog (covering the Bohemian Massif, including parts of the Bohemian Massif in Poland, Germany, and Austria), the MAPOS_v2023 catalog (covering selected source zones in Austria and western Slovakia), and the REGCAT_v2022 catalog (including the pan-European EPICA 1.1 earthquake catalog (1000–1899), supplemented by the Europe-wide SHARE project catalog

(1900–2006). Earthquakes with epicenters within the polygons of the CZ-NEC-II and MAPOS catalogs were removed from the REGCAT_v2022 catalog.

Prehistoric earthquakes were also included in the record of past earthquakes, i.e., earthquakes documented by a geological record of a strong earthquake that could have been causally related to displacement on a specific fault and for which a moment magnitude could be derived.

The project earthquake catalog is shown in the following figure.

Fig. C.35: Project earthquake catalog showing the principal input catalogs



Legend: Mw = moment magnitude [-]

The catalogs cover the area bounded by 8.5–23°E and 45–53°N. The boundary between the more detailed CZ-NEC + MAPOS catalog and the regional REGCAT catalog is shown in purple.
Source: ETE/EDU regional database

Six ground-motion models (GMMs) were also used. Use of input data from the newly compiled catalog described above refined the seismic-hazard estimate and reduced epistemic uncertainties.

The probabilistic seismic-hazard calculation was performed using the standard, internationally recognized OpenQuake program, version 3.8.1. The calculation produced probabilistic seismic-hazard curves for the Temelín site and the SL-1 and SL-2 values derived from them[1]:

[1] SL-1 is the mean value of peak surface horizontal acceleration during an earthquake that occurs on average once every 100 years. This value is therefore highly likely to occur during the power plant's operating life.

SL-2 is the median peak surface horizontal acceleration during an earthquake that occurs on average once every 10,000 years. The power plant is therefore highly unlikely to encounter this value during its operating life but must be prepared for it.

- SL-1 = 0.004 g (where g is gravitational acceleration, 9.81 m/s^2),
- SL-2 = 0.038 g.

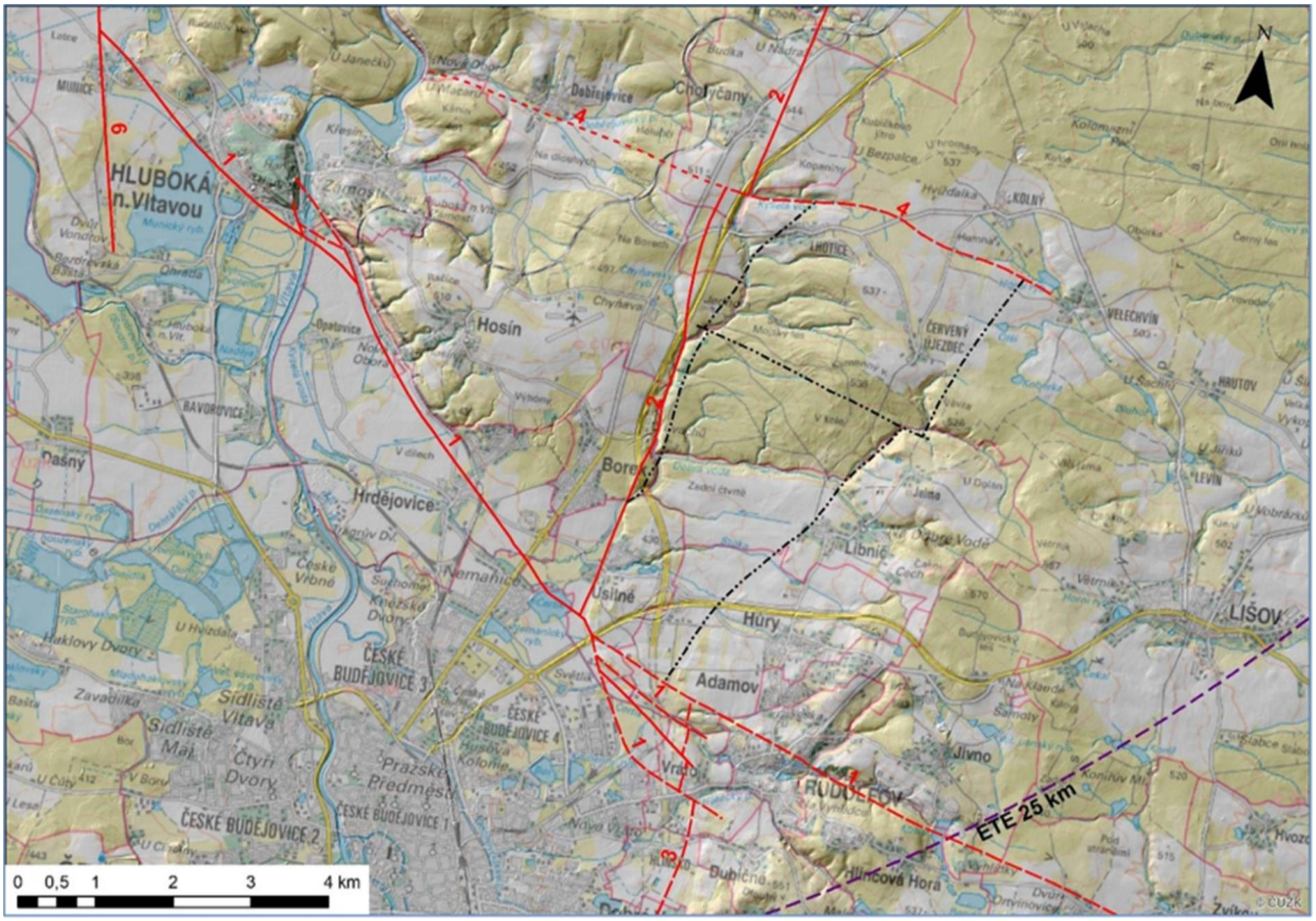
Disaggregation of seismic hazard showed which modeled seismic sources contribute most to the seismic hazard at the Temelín site. The assessment shows that the greatest hazard to SMR ETE is posed by earthquakes with epicenters within 25 km of SMR ETE; the second most hazardous are earthquakes from the Vienna Basin (approximately 200 km), followed by Western Bohemia around Cheb (approximately 170 km). Disaggregation by distance and magnitude shows that the greatest hazard comes from small earthquakes of intensity 3.0–3.5° MSK-64 within 20 km of SMR ETE. The second greatest hazard comprises earthquakes of intensity 6.5° MSK-64 at a distance of approximately 200 km.

The calculated values of SL-1 = 0.004 g and SL-2 = 0.038 g are consistent with previous studies and the results of the international SHARE project, which, however, calculated seismic hazard only for a 10 % exceedance over 50 years (a return period of 475 years).

The current seismic-hazard calculations for the Temelín site therefore confirm the accuracy of the original seismic-hazard estimate and the sufficient margin in the adopted SL-2 value of 0.1 g used as the design basis for the existing nuclear facilities at the Temelín site (the operating ETE1,2 units and the spent nuclear fuel storage facility). Similarly, the required minimum seismic resistance for the SMR ETE Project, represented by the postulated peak horizontal ground acceleration (PGAH) of the nuclear-facility subsoil, will be 0.1 g in accordance with SÚJB Decree No. 329/2017 Coll. and international recommendations for sites with low seismic hazard, and will therefore include a margin above the SL-2 seismic-hazard value specifically determined for the Temelín site.

Specifically in response to Requirement 11(a) of the Conclusion of the screening and scoping procedure, it must be added that the seismic-hazard values for the Temelín site also include the effect of the Hluboká fault. It represents one of the highly significant fault structures in the South Bohemian area. It is a system of faults generally trending northwest-southeast along the northeastern margin of the České Budějovice Basin; see the following figure.

Fig. C.36: Outline of the Hluboká fault



Legend: 1 - Hluboká fault (between Munice and Dubičné); other faults: 2 - Drahotěšice fault; 3 - Rudolfov fault; 4 - Dobřejovice fault; 6 - Munice fault

The Hluboká fault has long been included in assessments of seismic hazard at the Temelín site. Thorough investigations of the Hluboká fault did not demonstrate Quaternary displacement activity within the meaning of Section 6 of SÚJB Decree No. 378/2016 Coll. (otherwise, if the fault were located within 5 km of a nuclear facility, which is not the case for the Hluboká fault, the fault's displacement and seismic activity would be a

characteristic whose presence prohibits siting a nuclear facility). Furthermore, seismic monitoring around the Temelín Nuclear Power Plant, conducted since 1991, has not observed any seismic event in the Hluboká fault zone.

Although the Hluboká fault was not found to be a capable fault within the meaning of IAEA Standard SSG-9, IAEA reviewers recommended during an IAEA Mission as early as 2013 that the Hluboká fault be included in the fault seismic-source model. Based on this recommendation, the Hluboká fault was included in the fault seismic-source models under the 2014 ETE PSHA and the 2022 ETE/EDU PSHA. A separate model with different estimates of maximum magnitude (M_{MAX}), to which weights were assigned, was created in the logic tree. This model also considered the possibility that the Hluboká fault is a seismic source, to which a maximum magnitude of M_W = 6.67 was assigned. A very low probability of such an earthquake occurring was calculated for this scenario, based on long-term observations of seismic activity at the local, regional, and global levels.

The evaluation of faults in the ETE siting area (within 25 km) and the determination of seismic hazard were reviewed during the IAEA SEED Mission described above in May 2022. In connection with the Temelín site assessment, the IAEA reviewers concluded that all requirements of the newly issued SSG-9 standard (Rev. 1) had been met and that the issue of seismic hazard at ETE was closed.

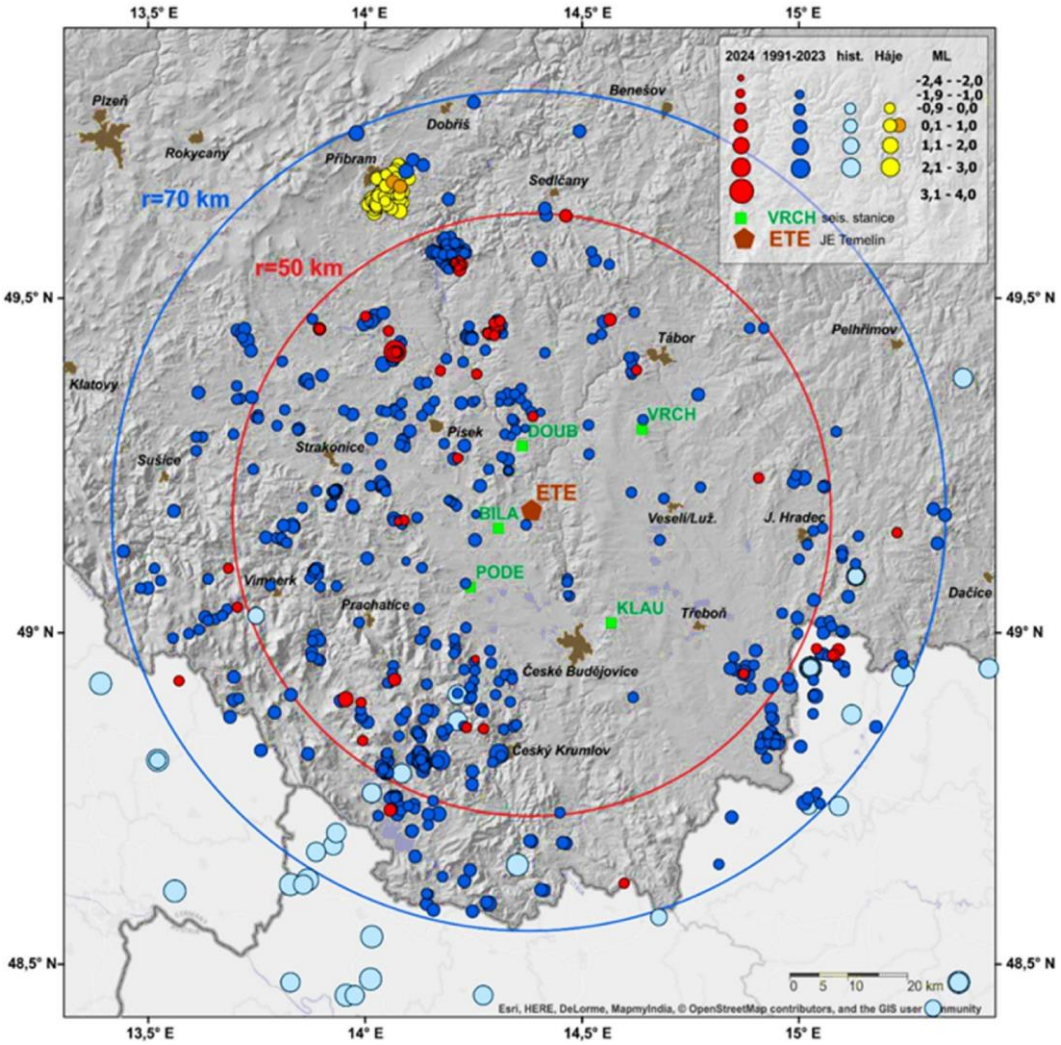
C.II.11.1.2.3. Seismicity monitoring

Seismicity has been monitored at the Temelín site over the long term. The local seismological network at the SMR ETE siting location (DSR ETE, Detailed Seismic Zoning) has operated since 1991. The principal task of DSR ETE is to record local earthquakes and microtremors. Teleseismic events more than 2,000 km away, regional events (300–2,000 km), and near events (50–300 km) are also recorded. In addition to tectonic earthquakes, the station network records induced tremors (rockbursts) and industrial blasting. The local monitoring network at the Temelín site consists of five stations whose instrumentation was completely replaced in 2015–2016:

- Bílá Hůrka (BILA),
- Doubravka (DOUB),
- Klauda (KLAU),
- Podeřiště (PODE),
- Vrchy (VRCH).

The locations of stations and of earthquake and induced-tremor epicenters within 70 km of ETE from 1991 to 2024, supplemented by the locations of known historical earthquakes, are shown in the following figure.

Fig. C.37: Schematic map of earthquake and induced-tremor epicenters from 1991 to 2024, supplemented by the locations of known historical earthquakes



hist.	hist.
Háje	Háje
VRCH sois. stanice	VRCH seismological station
ETE JE Temelín	ETE Temelín NPP

The strongest local earthquake recorded by the Temelín network since measurements began in 1991 was local earthquake T662. It was recorded on March 7, 2024, at 10:41 UTC (11:41 CET), southeast of Mirotice in the Strakonice area, approximately 36 km northwest of the Temelín site, at a depth of approximately 23 km, and had a magnitude of 3.5. At the accelerometer at the PODE station, 40 km south of the epicenter, it caused maximum acceleration of 3.0 mm/s^2 (0.00031 g) in the vertical direction and 6.6 mm/s^2 (0.00067 g) in the horizontal direction. Several earlier earthquakes had already been recorded nearby; the strongest to that point was event T241 in 2012, with a magnitude of 1.7. Five weak aftershocks were also recorded on March 7, 2024. The first four, with magnitudes of 0.4 to 0.6, were recorded within one hour after the main shock; another very weak aftershock with a magnitude of -0.1 was recorded shortly before midnight. The final aftershock in the sequence, with a magnitude of 0.4, was recorded more than three weeks later.

Although the Mirotice earthquake makes a new contribution to knowledge of seismic hazard in South Bohemia, no change in the existing seismic-hazard assessment for the Temelín site is expected as a result of this event because of the robustness of the maximum-magnitude M_{MAX} estimates for diffuse seismic source area B22D in the central part of the Bohemian Massif (M_{MAX} = 4.25)[1].

[1] The value of 4.25 was determined by expert judgment because the number of recorded events with magnitudes above the minimum magnitude M_{MIN} threshold of the catalog used is so low that applying statistical methods would involve unacceptable aleatory uncertainty. The estimate therefore uses the maximum observed magnitude in the relevant source area plus a safety margin. For the Stable Continental Region (SCR), of which the Bohemian Massif forms part, a value of 0.75 magnitude units was used (0.5 plus an SCR-specific value of 0.25). For diffuse seismic source areas in which only very weak earthquakes have been recorded, a minimum value of M_{MAX} = 4.25 was used regardless of the maximum observed magnitude (if it was below Mw = 3.5). It follows that the M_{MAX} used for source area B22D containing the Mirotice earthquake covered the newly recorded maximum observed magnitude in this area.

C.II.11.2 Legacy environmental contamination

The surveys performed have not demonstrated the existence of environmental contamination in the area designated for Project construction.

According to the SEKM database, neither the Temelín power plant site and its surroundings nor the SMR Project site is recorded as a site with suspected and/or verified environmental contamination.

C.II.11.3. Undermined areas

According to the Czech Geological Survey database, no old mine workings or undermined areas occur at or immediately around the Project site, and no areal or point landslides are recorded there.

C.II.11.4. Other environmental characteristics

No other characteristics relevant to the Project are specified.

C.III.
OVERALL ASSESSMENT OF THE STATE OF THE ENVIRONMENT IN THE AFFECTED TERRITORY

3. Overall assessment of the state of the environment in the affected territory in terms of its carrying capacity and an estimate of its likely development if the Project is not implemented, where this can be assessed based on available environmental information and scientific knowledge

The affected territory immediately adjoins the existing ETE industrial site and its external infrastructure (particularly power evacuation, raw-water supply, and wastewater and stormwater drainage). The affected territory is used intensively for agriculture but also has natural-science value; it contains transport and technical-infrastructure elements, with development in towns and villages in the broader area. The state of the environment in the affected territory is therefore determined by four factors: agricultural, industrial, natural, and residential functions. These four functions have long been consolidated in the area, with clearly defined relationships. Therefore, they are not a source of significant conflicts. The area around the power plant is diverse and valuable in terms of nature and landscape, with a relatively high proportion of natural and near-natural ecosystems. The health, social, and economic conditions of the population are favorable, meet public-health requirements, and are in many respects better than in other areas of the Czech Republic. The results of monitoring the state of the individual environmental components indicate predominantly good environmental quality overall, with favorable trends. It is desirable to preserve and further develop this condition in the future in accordance with sustainable-development principles. This is also a principle of the applicable spatial plan.

A balance between nature-conservation interests and economic and social interests is therefore effectively maintained in the area. This is also confirmed by the analysis of the balance of territorial conditions and the potential of the individual pillars of sustainable development (Planning Analytical Materials for the Týn nad Vltavou ORP Administrative District, sixth complete update, 2024).

Operation of the existing power plant (ETE1,2) and its associated infrastructure (including the existing spent nuclear fuel storage facility) does not damage the environment or public health. All outputs are monitored and have remained within the required limits established by the competent authorities over the long term. The authorized effective-dose limits are reliably complied with in the radiological area. The power plant and its facilities therefore do not significantly affect environmental quality in the area.

As shown by the data presented, the overall environmental quality in the affected territory, in relation to its existing state and development (i.e., without the Project), is predominantly favorable in all respects and has remained stable over the long term. The area is not subject to an unsustainable load that could affect Project feasibility. Based on the available information on the state of the environment and its development trends, it can therefore be concluded that favorable environmental conditions will be maintained in the affected territory.

PART D
(COMPREHENSIVE DESCRIPTION AND ASSESSMENT OF THE IMPACTS OF THE PROJECT ON THE ENVIRONMENT AND PUBLIC HEALTH)

PART D COMPREHENSIVE DESCRIPTION AND ASSESSMENT OF THE PROJECT'S POTENTIALLY SIGNIFICANT IMPACTS ON THE ENVIRONMENT AND PUBLIC HEALTH

D.I.
DESCRIPTION OF THE ANTICIPATED IMPACTS OF THE PROJECT ON THE POPULATION AND THE ENVIRONMENT

I. Description and assessment of the magnitude and significance of the anticipated direct, indirect, secondary, cumulative, transboundary, short-term, medium-term, long-term, permanent and temporary, beneficial and adverse impacts of the Project resulting from the construction and existence of the Project (including any demolition work necessary for its implementation), the technologies and substances used, pollutant emissions and waste management, and the cumulation of the Project with other existing or permitted projects (taking into account the current state of areas protected under the Nature and Landscape Conservation Act and the use of natural resources with regard to their sustainable availability), considering the environmental-protection requirements of other legislation:

D.I.1. Impacts on the population and public health

1. Impacts on the population and public health

D.I.1.1. Health impacts and risks

For the assessment of impacts on the population, an authorized assessment of public-health impacts and health risks has been prepared and is provided in full in Annex 2.1 (Public Health Impact Assessment) to this Documentation. The assessment uses additional expert source materials in the area of health impacts and risks, which are provided in full in Annexes 2.2 (Radiological Impact Assessment) and 2.3 (Assessment of the Impacts of Air Pollution and Noise Exposure). These appendices are referenced for details, and their results are summarized below.

D.I.1.1.1. Assessment methodology

The Health Risk Assessment method is used worldwide to prevent and minimize health risks arising from a broad range of chemical, physical, and/or biological factors. This method is used in establishing permissible limits for harmful factors in the human environment, but it also represents essentially the only means of assessing human exposure to factors for which no health-protection limits have been established. Even for factors subject to binding statutory limits, however, this method provides substantially more information on potential health effects than a simple comparison with the applicable statutory limits.

The health-risk assessment method is based on the assumption that some risk of harm to health always exists and cannot be avoided. Risk can be minimized but not eliminated. Achieving zero health risk is therefore virtually impossible from a methodological perspective and is not necessarily an attainable objective. Risk must, however, be minimized to a tolerable level.

The assessment methodology is based on the fundamental methodological procedures for public-health impact assessment and health-risk assessment developed by the World Health Organization (WHO) and the U.S. Environmental Protection Agency (U.S. EPA), and uses the authorization guidance of the National Institute of Public Health (SZÚ) for health-risk assessment and the scientific literature.

Overall, the assessment considers the following impacts that may potentially be associated with the implementation of the Project:

Radiological impacts:

- radiological impacts (impacts of ionizing radiation).

Non-radiological impacts:

- impacts of electromagnetic fields (impacts of non-ionizing radiation),
- impacts of air pollution,
- impacts of noise.

Other impacts:

- psychological impacts,
- social and economic impacts.

For radiological impacts, electromagnetic-field impacts, air pollution, and noise, a quantitative and qualitative assessment is performed using a health-risk assessment procedure comprising four consecutive steps:

Hazard identification: This involves identifying the factors to be assessed and describing their properties, with a focus on their hazards to humans and the conditions under which they may manifest.

Dose-response assessment: This step determines quantitative relationships between the exposure level and the magnitude of risk. Multiple effects with different dose-response relationships may be associated with a single factor. The basic concept divides the factors into two groups:

For factors with a threshold effect, it is assumed that exposure up to a certain level (the threshold) has no adverse effect. Above the threshold level, the severity of the effect increases with increasing exposure. Most toxic substances, as well as the deterministic effects of ionizing radiation, fall into this group.

For factors with a non-threshold effect, some adverse effect is assumed even at the lowest exposures. Risk therefore increases with exposure from zero upwards. This group includes most carcinogens and the stochastic effects of ionizing radiation. The dose-response relationship then expresses not the severity of the effect but the probability of a health effect occurring. The relevant relationships are usually obtained from studies involving much higher doses than can be expected in the normally exposed population. Linear extrapolation is then usually used to assess the dose dependence of the response (i.e. the probability of an effect occurring) in the low-dose range.

Exposure assessment: It includes a qualitative expression of contact between the factor assessed and the boundaries of the organism and a quantitative expression of the intensity of that contact. The objective is to obtain information on the pathways, extent, and quantity in which a particular population is exposed to the factor assessed (ionizing radiation, a chemical substance, etc.).

The population group most affected by the factor assessed is referred to as the selected group of persons or critical population group. A representative person is an individual from the population representing the selected group of natural persons who are most exposed by the source and exposure pathway concerned.

Risk characterization: This stage expresses the degree of health risk to the exposed population based on knowledge of the hazard posed by the factor and an estimate of the specific exposure level. It comprises a qualitative and quantitative description of the estimated health risk to the population studied, i.e., a list of all possible adverse health outcomes in the population studied and the probability of their occurrence. All initial conditions and facts included in the risk-assessment procedure must be described, as must all simplifications and uncertainties reflected in it. Risks assessed in this manner must always be regarded as potential, but sufficiently probable for the population in the area of interest.

Given the nature and location of the Project, the assessment covers not only the potential impacts of the Project itself on human health but also other interacting (cumulative) impacts of other existing or planned nuclear facilities at the Temelín site.

For electromagnetic-field impacts, given the threshold effect and in accordance with the applicable legislation, the assessment is performed by verifying compliance with the applicable limits.

Given the nature of their effects, psychological and socioeconomic factors are assessed qualitatively based on scientific studies.

D.I.1.1.2 Radiological impacts

D.I.1.1.2.1. Radiological impacts (impacts of ionizing radiation)

D.I.1.1.2.1.1. Hazard identification

Radioactivity is the natural or artificially induced ability of certain unstable atomic nuclei to transform spontaneously while emitting energy in the form of radiation (electromagnetic or particulate), thereby transitioning to a lower-energy, more stable state. The primary event in the interaction of radiation with matter is the absorption of a quantity of emitted energy by an atom or molecule and its use to ionize the same or another atom or molecule (hence the term ionizing radiation). This results in the formation of free electrons and charged ions. Charged ions are unstable and more reactive and may cause chemical or electrostatic changes when interacting with other substances. This can have serious consequences in living-tissue cells, where the production of ions and free radicals disrupts chemical bonds and thereby damages the cells.

The fundamental quantity used to describe radiation exposure is *absorbed dose*. It is defined as the quotient of the radiation energy absorbed and the mass of the matter in which this energy is absorbed. The unit of absorbed dose is the gray (Gy), dimensionally J/kg. The response of living

tissues exposed to different types of radiation is not directly proportional to the physical dose: the effect depends on the type of radiation (α, β, γ, or neutron)[1], and thus on the energy, mass, and charge of the particles or photons. At the same absorbed dose, densely ionizing corpuscular radiation has substantially greater effects than sparsely ionizing radiation.

Differences in relative biological effectiveness between the individual types of radiation are expressed by the *quality factor*. It is then used to determine the *dose equivalent* (for a point in tissue) or the *equivalent dose* (for an entire organ or tissue). The unit of dose equivalent and equivalent dose is the sievert (Sv), again dimensionally J/kg. Different organs and tissues in the human body, however, have different susceptibilities to health effects from ionizing radiation. The equivalent dose therefore provides no information about the overall risk that may result from radiation exposure. For this reason, the assessment includes a *tissue weighting factor*, which expresses the sensitivity of individual organs to radiation exposure; the sum of all weighting factors for all organs in the entire body equals one. *Effective dose* is then used to calculate the risk. It is defined as the weighted sum of the equivalent doses to all irradiated tissues and organs. The unit of effective dose is the sievert (Sv). In the case of uniform whole-body exposure to a particular type of radiation, the effective dose is equal to the equivalent dose.

The total effective dose received, or effective-dose commitment (committed dose resulting from the intake of radionuclides into the body), is the time integral of its rate over a specified period (e.g., annual effective dose in Sv/year). For lifetime exposure, a period of 50 years is usually used for adults and 70 years for children.

The adverse effects of ionizing radiation on humans are divided into two groups:

Deterministic effects: They are characterized by direct tissue damage (e.g., skin inflammation, cataracts, acute radiation sickness, and similar effects). They occur after high doses of radiation. According to the SÚJB summary publication,[2] these effects result from the death of part of the irradiated cell population; their severity increases with dose above a certain dose threshold (below which the effect does not manifest) and they have a characteristic clinical presentation. This group includes, in particular, acute radiation syndrome, acute skin damage (radiation dermatitis), impaired fertility following exposure of the gonads, and, among late effects, chronic skin inflammation and opacity of the ocular lens.

Stochastic effects: They are characterized by the development of malignant tumors and hereditary damage. According to the SÚJB summary publication cited above, the clinical presentation of these effects is not typical and does not differ from "spontaneously" occurring cases. They can occur not only at high but also at low radiation doses. These effects are caused by changes in a cell's genetic information (mutations), and a non-threshold, linearly increasing dose-response relationship is assumed for them. In this case, dose does not increase the severity of harm but the probability of malignant neoplasms and hereditary damage occurring. However, once an effect occurs, it has the same clinical severity regardless of the magnitude of the dose that caused it.

According to the SÚJB summary publication, the process of tumor development is multicomponent in nature. One component is the existence of cells carrying modified (mutated) information and transmitting this atypicality to their progeny (genomic instability and the development of a genetically unstable phenotype); the second component is a set of conditions that counteract the tendency to eliminate atypical cells or suppress their growth. A number of factors act in both components, including ionizing radiation, which, based on current knowledge, can act at different stages of the cancer-development process. The assumption that malignant tumors are also caused by low doses of ionizing radiation is derived from numerous observations, among which the study of survivors of the atomic bombings of Hiroshima and Nagasaki, observations of patients treated with X-rays, and an analysis of the causes of death of U.S. radiologists exposed from 1900 to 1950 are particularly significant. The various organs and tissues of the human body differ in their radiosensitivity in terms of the probability of occurrence of health effects. The most susceptible organs include the bone marrow, stomach, colon, lungs, and female mammary glands.

Given the nature of the Project and the very low potential radiation doses associated with its implementation (including interacting/cumulative impacts), the quantitative analysis in this assessment is performed for stochastic effects of ionizing radiation. Deterministic effects will reliably not occur. Stochastic effects are delayed and do not manifest until after a certain period, often many years. According to the SÚJB summary publication, the latency period is 5–20 years for leukemia and 10–40 years for lung tumors. Genetic changes in the offspring of exposed persons constitute an important group of late effects. Such genetic changes are caused by a gametic mutation in the nucleus of the germ cells (ova or sperm) of the gonads. A mutated gene is capable of reproducing during cell division, and the mutation is thus transmitted to subsequent generations. An adverse genetic constitution may result in early fetal death or premature birth (miscarriage), or in the death of a newborn with a serious congenital defect soon after birth.

Epidemiological and experimental studies are the principal source of knowledge on the health effects of ionizing radiation. The ICRP publication[3] refers to these findings and uses them as a basis for formulating radiation-protection recommendations. For doses around 100 mSv and lower, estimates of health effects remain subject to significant uncertainty. No direct relationship between radiation exposure and the occurrence of

[1] Alpha (α) radiation consists of a stream of alpha particles composed of two protons and two neutrons (a helium nucleus, He^{2+}). Beta (β) radiation consists of a stream of electrons (β^-) or positrons (β^+). Gamma (γ) radiation consists of electromagnetic waves (photons). Neutron radiation consists of a stream of neutrons (n or n^0).

[2] Brief overview of the biological effects of radiation. SÚJB, 2024.

[3] Publication 103, The 2007 Recommendations of the International Commission on Radiological Protection (ICRP).

hereditary diseases has yet been demonstrated in humans, but experimental studies indicate the possibility of hereditary damage, which is therefore taken into account in the radiation-protection system.

The limits used are also derived from knowledge of the effects of ionizing radiation on humans and are specified in SÚJB Decree No. 422/2016 Coll., on radiation protection and security of a radionuclide source, as amended, which reflects ICRP recommendations and other international legislation (particularly Directive 2013/59/Euratom). Under Section 3 of the decree, the general annual limit for members of the public from all authorized or registered activities, for the sum of effective doses from external and internal exposure, is 1 mSv.

Given the nature of any limit, it may be stated that these limits represent values which, if complied with, ensure that the exposed population is protected in a socially acceptable manner. However, as stated above, assuming non-threshold effects, it is not possible to establish levels that would ensure that radiation is completely harmless (zero risk). Therefore, even at values below the limits, an assessment is performed with the aim of reducing doses to the lowest reasonably achievable level. The result should be a probability of effects that is as low as reasonably achievable in practice and, at the same time, acceptable from health and societal perspectives. For factors with a non-threshold effect, the most stringent criterion conventionally used for acceptable risk is 1×10^{-6} for the individual impact of the Project assessed (i.e., one case of harm to health per one million exposed residents), or on the order of 10^{-6} for the combined action of multiple sources. In many cases, however, less stringent criteria are used (up to 1×10^{-4}).

D.I.1.1.2.1.2. Determination of the dose-response relationship

The radiation protection system is based on the generally accepted assumption that, at low radiation doses, an increase in dose results in a directly proportional increase in the probability of radiation-induced cancer or heritable effects. This approach, generally known as the *"linear no-threshold dose-response model"*, is conservative (i.e., it tends to overestimate risk).

For assessing the health effects of low radiation doses, the ICRP[1] developed coefficients for estimating detriment and published them in Publication 103 (2007). It defines detriment as "the total harm to health experienced by an exposed group and its descendants as a result of the group's exposure to a radiation source". It is a multidimensional concept whose principal components are the following stochastic quantities: the probability of an induced fatal neoplasm, the weighted probability of an induced curable neoplasm, the weighted probability of severe heritable effects, and the shortening of life resulting from the damage. The ICRP also includes hereditary damage transmitted to descendants, even though it has not been demonstrated in humans; convincing evidence does, however, exist in experimental animals.

The assessment of stochastic effects of ionizing radiation therefore uses the most highly developed, scientifically justified, and conservative risk-estimation procedures developed by the ICRP. The coefficients used to estimate health detriment are presented in the following table.

Table D.1: Nominal risk coefficients for estimating detriment from the stochastic effects of low radiation doses (ICRP, 2007)

Exposed population	Risk coefficient [10^{-2} Sv^{-1}]		
	Neoplasms	Heritable effects	Total
Total population	5.5	0.2	5.7
Adults	4.1	0.1	4.2

Note: The risk coefficient is probabilistic in nature, and a risk-coefficient value in units of 10^{-2} Sv^{-1} means the probable number of cases of health detriment per 100 persons exposed to an individual effective dose of 1 Sv.

The total nominal risk coefficient for total detriment from stochastic effects for exposure at a low dose rate is therefore $5.7 \cdot 10^{-2}$ Sv^{-1}. Because small risks are difficult to detect in epidemiological studies, the dose-specific risk estimates in the above-mentioned ICRP report are based primarily on acute doses of 200 mSv and above. However, many of the more challenging issues in radiation protection involve continuous or fractionated exposures with individual fractions of a few mSv or less. Experimental research tends to support the finding that fractionated or protracted doses are associated with lower risk, suggesting that dose-specific estimates derived from high doses in acute exposure should be divided by a dose and dose-rate effectiveness factor (DDREF) when applied to low continuous or fractionated doses. This factor reflects the lower biological effectiveness of exposure at low doses and low dose rates compared with exposure at high doses and high dose rates. The ICRP considers that the adoption of the linear no-threshold model combined with a well-judged DDREF value provides a prudent basis for practical radiation protection purposes, i.e. for controlling the risk of radiation exposure in the low-dose range.

For induction of gene and chromosomal mutations, DDREF values usually fall within the range of 2–4. After considering all the underlying data, the ICRP recommends using a DDREF value of 2 for cancer risk at low dose rates for general radiation-protection purposes (applicable to all tumors combined). For conservative purposes, however, this assessment uses DDREF = 1 to maintain continuity with previous public-health impact assessments for projects at the Temelín site and ensure comparability of the assessment results. This is therefore a highly conservative approach, as it assumes radiation effects twice as high as under the current ICRP recommendation.

[1] The ICRP (International Commission on Radiological Protection) is an independent nongovernmental organization established in 1928. It continuously reviews new scientific knowledge in the field of radiology and uses it to update preventive recommendations for protection against the risks associated with ionizing radiation, whether artificially produced or naturally occurring. It brings together the world's leading experts in this field and enjoys high international authority in this area. All international standards and national regulatory activities in the field of radiation protection are based on ICRP recommendations.

In summary, a risk coefficient of 5.7×10^{-2} Sv^{-1} is therefore used to estimate the health effects of low radiation doses. As shown, using this risk coefficient, a value of 1 mSv (the general annual limit for members of the public from all authorized or registered activities, for the sum of effective doses from external and internal exposure) corresponds to an annual risk of 5.7×10^{-5}, i.e., one case per approximately 17,500 residents.

D.I.1.1.2.1.3. Exposure assessment

D.I.1.1.2.1.3.1. Introductory information

The assessment of radiological impacts on the population and public health caused by implementation of SMR ETE is based on the document Assessment of the radiological impacts of operation of the SMR ETE Nuclear Power Plant (Assoc. Prof. František Podzimek, CSc. (Czech Technical University in Prague, Faculty of Biomedical Engineering, Department of Health Care Disciplines and Population Protection)), which is provided in Annex 2.2 to this Documentation. Both the separate impacts of the SMR ETE Project and the cumulative exposure caused by operation of the existing power plant (ETE1,2) and other projects in the area are assessed (see below). For SMR ETE, the exposure assessment is based on an ABmerit study provided in Annex 5.1 to this Documentation, the results of which are summarized in Chapter D.I.3.2. Impacts of ionizing radiation (page 345 of this Documentation). For interacting sources, the source materials also include the 2010 EIA documentation for New NPP ETE and the 2024 EIA documentation for expansion of the spent nuclear fuel storage facility's storage capacity, each of which included a radiological impact assessment.

The calculation of the radiological consequences of SMR ETE operation determines individual effective doses and 50-year (adults) or 70-year (children) committed individual effective doses. A broad spectrum of radionuclides in potential discharges and all potential exposure pathways are assessed. For atmospheric discharges, these comprise inhalation, ingestion (e.g., of crops on which radionuclides have been deposited), external exposure from deposits, and external exposure from the plume. For discharges into a watercourse, these comprise ingestion of drinking water, irrigation, livestock watering and fish consumption, as well as external exposure while swimming, boating, and staying on the bank. Total effective doses and committed effective doses are then determined for atmospheric discharges, discharges into a watercourse, and the sum of all pathways for each age category (unborn child - fetus, child aged 0–5, child aged 6–15, and person aged over 16).

In accordance with Act No. 263/2016 Coll., the Atomic Act, as amended, the evaluation is performed for a representative person, defined as an "individual from the population representing a model group of natural persons who are most exposed from the source and by the pathway concerned". The characteristics of the representative persons identified are provided below in the exposure description.

The calculations of the radiological consequences of SMR ETE are performed for three scenarios with different meteorological conditions. Based on meteorological and hydrological data, the following are selected as representative scenarios of meteorological and hydrological conditions:

- 2018 as a dry year with lower flow in the Vltava River at the Kořensko profile,
- 2023 as an average year with values corresponding to the long-term annual average at the Kořensko profile,
- 2024 as a wet year.

D.I.1.1.2.1.3.2. Radiation exposure from SMR ETE operation

Based on the calculations performed, the underlying ABmerit study defines residential locations around SMR ETE where the potentially highest effective doses to a representative person occur:

- for atmospheric discharges, the locations are Kočín, Litoradlice, and Zvěrkovice,
- for discharges into a watercourse, the locations are Neznašov, Újezd, and the Pašovice cottage area.

The calculations show the following:

- for atmospheric discharges, the highest total annual effective dose, including the committed effective dose to a representative person, occurs at Zvěrkovice in the age group 16 years and older when the meteorologically average year 2023 is considered, where it is 0.18 µSv/year,
- for discharges into a watercourse, the strongest effect occurs at Újezd and the Pašovice cottage area for a human fetus when the dry year 2018 is considered, where it is 0.28 µSv/year[1],
- when the impacts of atmospheric discharges and discharges into a watercourse are assessed jointly, the highest annual effective dose values are observed for a representative person with the following characteristics: a fetus or child aged 0–5 living in the Neznašov locality within the cadastral area of the municipality of Všemyslice, assuming the dry year 2018; in this case, an effective dose of 0.3 µSv/year was calculated.

The following table summarizes the calculated radiation exposure from SMR ETE discharges.

[1] Meteorological conditions play a significant role in discharges into a watercourse. Effective dose values in an average or wet year, when the water level in the Vltava River is higher, are almost half those in the dry year 2018.

Table D.2: Identification of the representative person and total annual effective dose to the representative person from SMR ETE operation

Year	2018	2023	2024
	Dry year	Average year	Wet year
Impact of atmospheric discharges			
(Inhabited) location with the highest annual effective dose [Sv] to a representative person			
Site description	Cadastral area of the municipalities of Dříteň and Temelín, Kočín locality	Cadastral areas of the municipalities of Temelín and Týn nad Vltavou, Zvěrkovice and Zadní Kohout localities	Cadastral areas of the municipalities of Temelín and Týn nad Vltavou, Zvěrkovice and Zadní Kohout localities
Effective dose	1.4E-07	1.8E-07	1.6E-07
Age group	16 years and older	16 years and older	6–15 years, 16 years and older
Impact of discharges into a watercourse (Vltava River)			
(Inhabited) location with the highest annual effective dose [Sv] to a representative person			
Site description	Cadastral areas of the municipalities of Albrechtice and Chrášťany, Újezd locality and Pašovice cottage area	Cadastral areas of the municipalities of Albrechtice and Chrášťany, Újezd locality	Cadastral areas of the municipalities of Albrechtice and Chrášťany, Újezd locality
Effective dose	2.8E-07	1.5E-07	1.3E-07
Age group	Child aged 0–5 years	Child aged 0–5 years	Child aged 0–5 years
Combined impact of atmospheric discharges and discharges into a watercourse (resulting representative person)			
(Inhabited) location with the highest annual effective dose [Sv] to a representative person			
Site description	Cadastral area of the municipality of Všemyslice, Neznašov locality	Cadastral areas of the municipalities of Temelín and Týn nad Vltavou, Zvěrkovice and Zadní Kohout localities	Cadastral areas of the municipalities of Temelín and Týn nad Vltavou, Zvěrkovice and Zadní Kohout localities
Effective dose	3.0E-07	1.8E-07	1.6E-07
Age group	Fetus, child aged 0–5 years	16 years and older	6–15 years, 16 years and older

Based on the calculated maximum annual effective dose values, a conservative model can be used to calculate total radiation exposure for different durations of residence in the area of interest and subsequently determine the total health detriment. Radiation exposure is calculated using a conservative approach (favoring safety), as the product of the maximum dose for all age categories and the duration of lifetime exposure, i.e., without considering the age distribution of exposed persons. For lifetime exposure of a representative person to SMR ETE discharges, defined as 50 years for adults and 70 years for children, radiation exposure over the entire duration of residence will have the following values:

- for atmospheric discharges, it will be 9 μSv for adults and 12.6 μSv for children,
- for discharges into a watercourse, it will be no more than 14 μSv for adults and 19.6 μSv for children,
- for the combined impact of atmospheric discharges and discharges into a watercourse, it will be no more than 15 μSv for adults and 21 μSv for children.

D.I.1.1.2.1.3.3. Radiation exposure from all existing and planned operations at the Temelín site

In addition to SMR ETE, the following sources are considered in determining interacting/cumulative impacts:

- existing operation of the Temelín Nuclear Power Plant (ETE1,2),
- New NPP ETE - two new units with an electrical output of up to 2 × 1,700 MW_e,
- expansion of the capacity of the spent nuclear fuel storage facility at the Temelín site from 96 to 152 packages.

For the analysis of the combined impact of operation of SMR ETE, ETE1,2, New NPP ETE, and the spent nuclear fuel storage facility, the area of interest for atmospheric discharges is defined in the same manner as for SMR ETE, i.e., at Kočín, Zvěrkovice, and Litoradlice. In the analysis of ETE1,2 and New NPP ETE, effective dose values from atmospheric discharges were calculated for distances of 2,333 m and 3,333 m (based on the locations of nearby municipalities). For the spent nuclear fuel storage facility, effective dose values from the ambient dose equivalent rate were determined for a distance of 1,600 m, corresponding to the distance of the municipality of Kočín. Similarly, Neznašov, Újezd, and the Pašovice cottage area were selected for assessing the impacts of discharges into a watercourse.

When the impacts of the other individual facilities or projects were assessed (i.e., in the relevant EIA documentation), different age-based population categories were used due to differences between the legislation applicable previously and that applicable now. Consequently, overlap between the age groups concerned is monitored when comparing the values and, for ETE1,2 and New NPP ETE, the highest annual effective dose value is selected conservatively to avoid any potential underestimation in the calculation. Three meteorological scenarios are considered when calculating effective doses from SMR ETE discharges into a watercourse, whereas only an average year was considered in the calculations for ETE1,2 and New NPP ETE. For this reason, the cumulative annual effective dose is determined only for the average year 2023.

The population exposure values from the individual facilities were then added together to determine the cumulative maximum annual effective doses to a representative person. In reality, however, the maximum values will be lower due to the different directional distributions of the radiological impacts of the individual facilities; the calculations are therefore on the safe side.

The calculations show that:

- for atmospheric discharges, the maximum cumulative annual effective dose, including the committed effective dose to a representative person, will be 1.47 μSv/year. When the contribution of the ambient dose equivalent rate from the expanded spent nuclear fuel storage facility is considered (the facility is not a source of atmospheric discharges but also contributes to the annual effective dose in its immediate vicinity), the value is 2.05 μSv/year at Kočín for children aged 0-5 years, assuming the dry year 2018,
- for discharges into a watercourse, the maximum cumulative annual effective dose is recorded for a representative person in the fetus or child aged 0–5 group living at Újezd and in the Pašovice cottage area in the average year 2023; its value may be up to 3.89 μSv/year (given the locations of these areas, the contribution of the ambient dose equivalent rate from the spent nuclear fuel storage facility has no effect on the representative person),
- in the joint assessment of atmospheric discharges and discharges into a watercourse from ETE1,2, New NPP ETE, and SMR ETE, the maximum annual effective dose, including the committed dose to a representative person, is 4.33 μSv/year in the Pašovice cottage area.

Based on the calculated maximum annual effective dose values, a conservative model can be used to calculate total radiation exposure for different durations of residence in the area of interest. For lifetime exposure of a representative person to discharges from SMR ETE, ETE1,2, and New NPP ETE and to the ambient dose equivalent rate from the spent nuclear fuel storage facility, defined as 50 years for adults and 70 years for children, radiation exposure over the entire duration of residence will have the following values:

- for atmospheric discharges, including the contribution of the ambient dose equivalent rate from the spent nuclear fuel storage facility, it will be no more than 103 μSv for adults and 144 μSv for children at Kočín,
- for discharges into a watercourse, it will be no more than 195 μSv for adults and 272 μSv for children at Újezd and in the Pašovice cottage area,
- for the combined impact of atmospheric discharges and discharges into a watercourse, it will be no more than 217 μSv for adults and 303 μSv for children in the Pašovice cottage area.

D.I.1.1.2.1.3.4. Radiation exposure from natural sources

For comparison, radiation exposure from natural sources, which has also been identified and documented for the affected territory, may be presented (see Annex 2.2 to this Documentation). Data on external exposure from natural sources and internal contamination, associated primarily with inhalation of radon and its daughter products, are presented separately.

For external exposure, the principal source is data from Monitoring of the Radiation Situation in the Czech Republic (MonRaS), which is conducted primarily through the nationwide Radiation Monitoring Network, specifically the early-detection network and integral-measurement network. The average ambient dose equivalent rate at the Temelín monitoring point in 2025 was 121.3 nSv/h. Assuming continuous residence at the location, this value corresponds to an annual ambient dose equivalent of approximately 1.06 mSv.

Data on exposure from internal contamination are derived from the radon index. The Temelín site lies in an area with a medium radon-index value, for which average exposure from radon and its daughter products is approximately 4.57 mSv per year. The average annual effective dose per resident from inhalation and ingestion of terrestrial radionuclides other than radon can be estimated at 0.3 mSv.

The total estimated annual radiation exposure from natural sources at the Temelín site is therefore approximately 5.93 mSv per year. As is apparent, exposure to natural sources is more than one thousand times higher than the total quantified exposure to existing and planned sources at the Temelín site.

D.I.1.1.2.1.4. Risk characterization

In accordance with the ICRP, the level of health risk is expressed using health detriment, which indicates the probability of cancer developing at a given exposure. It is determined as the product of total radiation exposure, nominal risk coefficients, and the dose and dose-rate effectiveness factor (DDREF).

A risk coefficient of $5.7 \cdot 10^{-2}$ Sv^{-1} and a dose and dose-rate effectiveness factor of DDREF = 1 are considered when estimating health detriment (see Chapter D.I.1.1.2.1.2 above. Determination of the dose-response relationship). The calculations are performed very conservatively (favoring safety). In particular, DDREF = 1 is used instead of DDREF = 2 as recommended by the ICRP, and the risk coefficient is therefore twice that in the current ICRP recommendation. Other procedures are also conservative: they consider the most unfavorable meteorological and hydrological conditions, the largest number of potentially affected persons, the combination of all potential exposure pathways, and the interaction of all sources over 70 years (although it is likely that operation of at least ETE1,2 will have ended earlier).

The resulting health-detriment values for the impact of SMR ETE are presented in the following table.

Table D.3: Calculation of total health detriment - impact of the SMR ETE Project

Source	Locations	Annual effective dose [Sv]	Lifetime radiation exposure [Sv]	Total health detriment
Atmospheric discharges	Cadastral areas of the municipalities of Temelín and Týn nad Vltavou, Zvěrkovice and Zadní Kohout localities	1.8E-07	12.6E-06	7.18E-07
Discharges to the	Cadastral areas of the municipalities of Albrechtice and	2.8E-07	19.6E-06	1.12E-06

watercourse	Chrášťany, Újezd locality and Pašovice cottage area			
Combined impact of discharges into the atmosphere and a watercourse	Cadastral area of the municipality of Všemyslice, Neznašov locality	3.0E-07	21.0E-06	1.20E-06

As is apparent, the risk from SMR ETE operation is no more than 1.2×10^{-6}; the calculated value corresponds to one case per approximately 835,000 residents. The number of residents living in the area potentially affected by radiological impacts is in the order of several thousand or (if the entire population of Týn nad Vltavou is included) slightly more than 10,000. It is therefore clear that the increase in the level of health risk in the affected residential areas will be entirely insignificant in terms of any threat to health.

The calculation results for the aggregate interacting/cumulative impact of all existing and planned operations at the Temelín site are as follows.

Table D.4: Calculation of total health detriment - aggregate impact of all existing and planned operations at the Temelín site

Source	Locations	Annual effective dose [Sv]	Lifetime radiation exposure [Sv]	Total health detriment
Atmospheric discharges	Kočín	2.05E-06	144E-06	8.18E-06
Discharges to the watercourse	Újezd locality and Pašovice cottage area	3.89E-06	272E-06	1.55E-05
Combined impact of discharges into the atmosphere and a watercourse	Pašovice cottage area	4.33E-06	303E-06	1.73E-05

The results show that for the interacting/cumulative impact, when total exposure from operation of SMR ETE, ETE1,2, New NPP ETE, and the expanded spent nuclear fuel storage facility is considered, total health detriment is no more than 1.73×10^{-5}. This value may also be expressed as one case per 58,000 residents. The total population in the area addressed is approximately 10,000. However, the calculation is performed for the highest annual effective dose values, which occur in areas with populations in the hundreds; exposure will be lower in other parts of the area (moreover, even in the specified locations, this is the upper bound of the estimated potential risk).

As is apparent, for all sources at the Temelín site, total health detriment, i.e., risk to a representative person, is at the lower limit of the order of 10^{-5}. This is because, to maintain continuity with previous assessments, a risk coefficient twice that recommended by the ICRP is used. If the ICRP procedure were followed strictly (i.e., DDREF = 2), total health detriment would reliably be on the order of 10^{-6}. Given the size of the exposed population, even the aggregate impact of all sources at the Temelín site can be considered insignificant in terms of a threat to the health of the affected population.

For information, a comparison with the impacts of natural background radiation in the affected territory may also be provided. The associated risk can be quantified as follows:

5.93E-03 Sv/year x 70 years x 5.7E-02 Sv^{-1} = 2.37E-02.

As is apparent, the risk from exposure to natural sources is approximately 20,000 times higher than the effect of SMR ETE and approximately 1,300 times higher than the total exposure to all existing and planned sources at the Temelín site.

D.I.1.1.3 Non-radiological impacts

D.I.1.1.3.1. Impacts of electromagnetic fields (impacts of non-ionizing radiation)

D.I.1.1.3.1.1. Hazard identification and dose-response relationships

Electromagnetic radiation is a natural physical phenomenon that represents one of the fundamental means of energy transmission. It is emitted by various natural or human-made sources. The space into which this radiation extends is referred to as an electromagnetic field. Electromagnetic radiation occurs, among other places, in the vicinity of all power lines, cables, and electrical equipment. For the SMR ETE Project addressed, assessment of its impacts is therefore relevant in relation to the overhead and underground power lines that will connect the SMR ETE facility to the Kočín substation, including their interacting (cumulative) impact with other lines in the area.

The energy of electromagnetic radiation increases in direct proportion to its frequency. The frequency of power lines is determined by the frequency of the 50 Hz alternating current; this is therefore very-low-frequency radiation and fields with a long wavelength. The following overview therefore discusses the anticipated health effects of human exposure to low-frequency electromagnetic (or electric and magnetic) fields.

The health effects of long-term exposure to electromagnetic radiation were unknown for a long time, and greater attention was only devoted to research into them in the second half of the 20th century. Since then, however, a large body of research has been conducted and published in which possible links between exposure to electromagnetic fields and a broad spectrum of health effects have been indicated and subsequently investigated. Since 1996, the WHO has operated an ongoing project (the International EMF Project), which responds to growing concerns

associated with the fact that almost the entire global population is now exposed to some type of anthropogenic electromagnetic radiation and also to indications of certain serious health effects (specifically childhood leukemia). It has been concluded that several decades of research into electromagnetic fields have not identified any serious risks to public health, although uncertainties remain. An extensive report on the subject was also published in 2015 by the European Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR). Regarding the effects of low-frequency electromagnetic fields on human health, the committee states that studies to date provide no convincing evidence of a causal relationship between exposure to low-frequency electromagnetic fields and self-reported symptoms.

Epidemiological studies indicate an increased risk of childhood leukemia in persons with estimated average daily exposure above 0.3–0.4 μT, but no mechanisms have been identified and there is no evidence from experimental studies that could explain these findings. Given the generally recognized limitations of epidemiological studies, no causal interpretation can therefore be concluded. Studies investigating possible effects of exposure to electromagnetic fields on neurological functions (waking EEG power spectrum, behavioral outcomes, cortical excitability) are too heterogeneous for a reliable conclusion to be drawn. Epidemiological studies provide no convincing evidence of an increased risk of neurodegenerative diseases. No adverse effects on fetal development have been demonstrated. Studies concerning childhood health outcomes in relation to maternal exposure to electromagnetic fields during pregnancy are characterized by uncertainties that will need to be investigated. No effect on reproductive function has been demonstrated either.

A significant summary paper on the subject was also published in 2010 by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). It comprises the Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1 Hz to 100 kHz). The Guidelines synthesize the available scientific data on the direct and indirect effects of low-frequency electric and magnetic fields. The acute effects considered proven are direct stimulation of nerve and muscle tissue and induction of retinal phosphenes (the sensation of flashes or light on the retina associated with effects on the nervous system). There is also indirect evidence of transient effects on brain functions (visual processing and motor coordination) induced by electric fields. All these effects have threshold values below which they do not occur. The magnitude of the effect is determined by the strength of the internal electric field induced in tissues by external time-varying electric or magnetic fields. The report discusses in detail other investigated potential effects of human exposure to low-frequency electric and magnetic fields, specifically effects on the neuroendocrine system, neurodegenerative disorders, cardiovascular diseases, reproductive and developmental disorders, and cancer, and in no case finds grounds for concluding that there is a causal relationship between exposure and a health effect.

Based on the assessment performed, the ICNIRP establishes guideline values related to the field frequency. It can be concluded that, provided the guideline values for the general population are complied with, the occurrence of the health effects described can be ruled out; in the case of occupational exposure, their limited occurrence (for a defined period and under controlled conditions) is considered acceptable. European and subsequently Czech legislation is based on the ICNIRP recommendations, specifically Government Decree No. 291/2015 Coll., on protection of health against non-ionizing radiation, as amended. The fundamental quantity for population protection is the modified electric field strength induced in human tissue, E_{mod}, which is the determining factor in assessing exposure to low-frequency electromagnetic fields. Its value in the public environment must not exceed 0.2 V/m at any time. Compliance with the maximum permissible value ensures adequate protection of natural persons against all currently known direct and indirect effects of electromagnetic fields.

For overhead lines, all calculated and limit values are referenced to a height of 1.8 m above ground (i.e., the head area of a standing person); for underground lines, they are referenced to a height of 0.1 m (representing a person lying down).

D.I.1.1.3.1.2. Exposure assessment and risk characterization

The SMR ETE Project also includes, among other things, the construction of new power lines. Power will be evacuated by an aboveground 400 kV overhead line to the Kočín substation; backup power will also be supplied from the Kočín substation, either by an aboveground 110 kV overhead line or partly by a 110 kV underground line. The corridor for siting these lines is designed predominantly to avoid contact with residential development, except in its eastern part, where the corridor boundary is in contact with the edge of residential development in Kočín. However, the corridor is defined to include the line's protection zone, the width of which is specified by Energy Act No. 458/2000 Coll. For a 400 kV overhead line, the protection zone will be 20 m wide. Because no structures may be located in this zone, the distance from the outermost conductors to the roof edges of the nearest houses will be at least 20 m.

Exposure to electric and magnetic fields in connection with the siting of these power lines, including the associated calculations, was determined by EGU HV Laboratory in 2026; the results are summarized in Chapter D.I.3.3.2. Impacts of non-ionizing radiation (page 371 of this Documentation). The calculations were performed for locations where the newly proposed lines run parallel to or cross the existing transmission and distribution systems and where the potential effects of electric and magnetic fields will be highest. The following three profiles of possible proximity between the planned and existing lines are assessed:

1) parallel routing of the 400 kV single-circuit overhead line (power evacuation from SMR ETE) and 110 kV underground cable lines (backup auxiliary power supply for SMR ETE),
2) parallel routing of the 400 kV single-circuit overhead line (power evacuation from SMR ETE) and two 400 kV single-circuit overhead lines (power evacuation from ETE1,2),
3) crossing of the 110 kV underground cable lines (backup auxiliary power supply for SMR ETE) with the 400 kV and 110 kV overhead lines (power evacuation and standby auxiliary power supply for ETE1,2).

The calculations thus already take into account the impact of the SMR ETE Project cumulatively with other existing or planned projects at the ETE site.

The impacts of non-ionizing radiation occur only when equipment is energized or carrying current. The impacts therefore do not occur during construction, i.e., when the equipment is de-energized. This also applies to the backup auxiliary power supply lines for SMR ETE, which will not carry current for the vast majority of the time. For conservative reasons, however, the calculations assume the full current load.

The assessment considers the most conservative exposure scenario, in which the human body is conductively connected to ground and exposed to a homogeneous magnetic field perpendicular to the chest and a homogeneous electric field directed from the head toward the feet. The effects of electric and magnetic fields in space are relatively complex; the situation can therefore be simplified by considering the most conservative case, in which exposures are added together during simultaneous exposure to electric and magnetic fields.

The results of the assessment performed by EGU HV Laboratory are presented in the following table.

Table D.5: Human exposure to electric and magnetic fields where power lines run in parallel or cross

Profile	Height above ground	Min. height/depth of lower phase conductors above/below ground h_{min}	Limit E_{mod}	E_{mod}
			[V/m]	
Profile 1	1.8 m	12.5 m (400 kV), -1.3 m (110 kV cable)	0.2	0.047
	0.1 m			0.045
Profile 2	1.8 m	12.5 m (400 kV)		0.048
Profile 3	1.8 m	12.5 m (400 kV), 7.1 m (110 kV), -1.3 m (110 kV cable)		0.049
	0.1 m			0.052

As is apparent, the maximum permissible value of modified electric field strength E_{mod} (limit of 0.2 V/m) will not be exceeded. The maximum value of modified electric field strength E_{mod} in the individual profiles is 22.5 to 26.0 % of the maximum permissible value. For low-frequency electric and magnetic fields, there is a threshold below which adverse health effects no longer occur. The values recommended by the ICNIRP (International Commission on Non-Ionizing Radiation Protection) and, subsequently, the maximum permissible values under Czech legislation are set well below the identified threshold for observed effects. Since the maximum permissible value specified in Government Regulation No. 291/2015 Coll. is met, the occurrence of a health risk associated with the exposure of persons to electric and magnetic fields in the vicinity of the power line under assessment can therefore be ruled out.

For overhead power lines, the assessment was performed for exposure of persons standing at ground level with the conductor 12.5 m (or 7.1 m) above ground. Given that the corridor is defined parallel to residential development, the potential exposure of a person standing on a house roof, i.e., vertically closer to the conductor, must also be mentioned. In this case, the corridor also includes the protection zone, so the conductors will be no less than 20 meters from the roof edge. Therefore, even in this situation, the maximum permissible value will be met with a margin and the occurrence of a health risk can be ruled out.

D.I.1.1.3.2. Impacts of air pollution

D.I.1.1.3.2.1. Introductory information

The implementation and operation of the SMR ETE Project will be associated with a certain increase in air pollution, particularly during the construction phase. Implementation of the SMR ETE Project is expected to partially overlap with construction of New NPP ETE; the interacting (cumulative) impacts of construction of both projects are therefore also assessed. During the operational phase, impacts on air quality will be associated primarily with induced traffic.

The assessment is based on the air dispersion study (Annex 5.3 to this Documentation) and, in accordance with that study, examines the following Project implementation and operation scenarios:

- Scenario 1, 2034 - impact of SMR ETE construction, maximum possible accumulation of impacts during a possible overlap in construction of New NPP ETE and SMR ETE (expected duration of up to 1 year):
  - baseline scenario 1 = 2034 + initial phase of New NPP ETE preparation,
  - active scenario 1 = 2034 + initial phase of New NPP ETE preparation + SMR ETE construction phase.
- Scenario 2, 2040 - impact of SMR ETE operation, temporary scenario involving a possible overlap between SMR ETE operation and the most traffic-intensive stage of New NPP ETE construction (expected duration of up to 1 year):
  - baseline scenario 2 = 2040 + main phase of New NPP ETE construction,
  - active scenario 2 = 2040 + main phase of New NPP ETE construction + SMR ETE operation.
- Scenario 3, 2042 - impact of SMR ETE operation, accumulation of New NPP ETE and SMR ETE operations (permanent scenario):
  - baseline scenario 3 = 2042 + New NPP ETE operation,
  - active scenario 3 = 2042 + New NPP ETE operation + SMR ETE operation.

The calculations thus already take into account the impact of the SMR ETE Project cumulatively with other existing or planned projects at the ETE site.

The assessment covers the following relevant pollutants and their combined effects:

- particulate matter ($PM_{2.5}$, PM_{10}),
- nitrogen dioxide (NO_2),
- combined effects of particulate matter ($PM_{2.5}$) and nitrogen dioxide (NO_2),
- benzene,
- benzo[a]pyrene.

D.I.1.1.3.2.2. Hazard identification and dose-response relationships

D.I.1.1.3.2.2.1. Particulate matter

Particulate matter in ambient air is a complex mixture of organic and inorganic substances whose components have diverse chemical and physical properties. They are produced in both outdoor and indoor environments. They are therefore an important factor contributing to adverse health effects. Different characteristics of particulate matter may be associated with different health effects, depending on particle size, physical characteristics, and chemical composition. Epidemiological indicators of mortality and morbidity are therefore used for general indicative assessment.

According to the World Health Organization (WHO), exposure to particulate matter increases the risk of mortality from the following diagnoses:

- long-term $PM_{2.5}$ concentrations - with high certainty for circulatory-system diseases (particularly ischemic heart disease) and lung cancer, and with moderate certainty for nonmalignant respiratory diseases,
- long-term PM_{10} concentrations - with high certainty for nonmalignant respiratory diseases and lung cancer, and with moderate certainty for ischemic heart disease,
- short-term PM_{10} and $PM_{2.5}$ concentrations - with high certainty for cardiovascular diseases, and with moderate certainty for cerebrovascular and nonmalignant respiratory diseases.

To quantify the risk from exposure to particulate matter (and similarly to nitrogen dioxide, see below), concentration-response functions published by the World Health Organization under the Health Risks of Air Pollution in Europe project are used: The HRAPIE-2 project (HRAPIE-2) in 2025. This document thus updates the previous 2013 guidelines.

D.I.1.1.3.2.2.2. Nitrogen dioxide

Nitrogen dioxide (NO_2) is among the pollutants most frequently monitored when assessing the impacts of combustion sources (i.e., particularly motor-vehicle traffic and building heating) on ambient air quality and public health. The sources emit primarily nitric oxide (NO), which gradually oxidizes to NO_2 in the air; a small proportion is emitted directly as NO_2. When nitrogen dioxide enters the respiratory tract, the most sensitive areas are the trachea and bronchi, followed by the pulmonary alveoli, where type I alveolar epithelial cells are replaced by cells more resistant to oxidation, which also gradually undergo hypertrophy as the NO_2 concentration increases. This reduces the resistance of lung tissue to infection.

According to the WHO, exposure to nitrogen dioxide increases the risk of mortality from the following diagnoses:

- long-term NO_2 concentrations - with high certainty for chronic obstructive pulmonary disease, and moderate certainty for nonmalignant respiratory diseases and acute lower respiratory tract infections, including mortality in children,
- short-term (24-hour) NO_2 concentrations - with high certainty for all-cause mortality (excluding injuries) and also for hospital admissions due to asthma.

The HRAPIE-2 project also provides relative-risk values for the individual effects of long-term exposure to NO_2.

D.I.1.1.3.2.2.3. Combined effects of $PM_{2.5}$ and nitrogen dioxide

Assessing the combined effects of $PM_{2.5}$ and NO_2 is necessary in order to evaluate the impacts of Project construction and operation on public health. In real-world settings, particularly at locations affected by motor-vehicle traffic and emissions from combustion processes, the population is not exposed to individual pollutants in isolation. Quantifying this combined effect is a crucial step in the health risk assessment process. Since $PM_{2.5}$ and NO_2 largely share the same emission sources (e.g. exhaust emissions), their ambient air concentrations are very strongly correlated.

The HRAPIE-2 project provides relative-risk values for calculating the combined effect of $PM_{2.5}$ and NO_2. For example, when the $PM_{2.5}$ concentration increases by 5 µg/m^3 and the NO_2 concentration by 20 µg/m^3, the estimated health impacts of combined exposure are reduced by approximately 30.3 % compared with the use of single-pollutant models.

D.I.1.1.3.2.2.4. Benzene

Benzene enters ambient air in emissions from motor-vehicle traffic both as a combustion product and as a component of unburned fuel fractions (it is present in motor gasoline at approximately 0.5–2 %, while its proportion in diesel fuel is insignificant). Ambient air is the main source of human exposure to benzene. However, substantial individual differences due to smoking must be considered, as smoking can increase exposure severalfold. At high concentrations (which do not occur in ambient air), benzene has acute irritant and neurotoxic effects. At low doses (which may

occur in ambient air), long-term exposure suppresses blood-cell production and is also assumed to contribute to the initiation of leukemia. For this reason, both the U.S. EPA and IARC classify benzene as a known human carcinogen.

The World Health Organization specifies a unit cancer risk value for benzene of UCR = 6×10^{-6} $(\mu g/m^3)^{-1}$.

D.I.1.1.3.2.2.5. Benzo[a]pyrene

The group of polycyclic aromatic hydrocarbons (PAHs) comprises several hundred compounds formed primarily during the incomplete combustion of organic material. Their principal effects on human health are mutagenicity and carcinogenicity, whereas their systemic toxic effects are probably minor (based on animal testing). Mutagenicity and carcinogenicity are considered established for many PAHs with higher boiling points, and benzo[a]pyrene is one of the compounds with the highest carcinogenic potency.

According to IARC, benzo[a]pyrene is classified in Group 1 as carcinogenic to humans. Owing to its carcinogenicity, no safe threshold can be established. The WHO specifies a guideline unit cancer risk value for B[a]P of 8.7×10^{-2} $(\mu g/m^3)^{-1}$.

D.I.1.1.3.2.3. Exposure assessment and risk characterization

D.I.1.1.3.2.3.1. Particulate matter

As stated above, elevated concentrations of particulate matter in ambient air are generally associated with respiratory diseases, lung cancer, cardiovascular diseases and, for the $PM_{2.5}$ fraction, stroke. The following tables provide a summary of incremental health-effect values, i.e., changes caused by implementation of the SMR ETE Project under the individual scenarios (incremental values: scenario with the Project minus the baseline scenario).

Table D.6: Assessment of changes in the level of health risk in residential development due to changes in ambient $PM_{2.5}$ concentrations, incremental values

Health effect	Segment population	scenario 1 2034	scenario 2 2040	scenario 3 2042
adult natural-cause mortality	≥ 25 years	0.0457	0.00008	0.00059
adult mortality - circulatory-system diseases	≥ 25 years	0.0210	0.00004	0.00027
adult mortality - cerebrovascular diseases	≥ 25 years	0.0031	0.00001	0.00004
adult mortality - ischemic heart disease	≥ 25 years	0.0080	0.00001	0.00010
adult mortality - respiratory-system diseases (excluding neoplasms)	≥ 25 years	0.0055	0.00001	0.00007
adult mortality - chronic obstructive pulmonary disease (COPD)	≥ 25 years	0.0020	0.00000	0.00003
adult mortality - lower respiratory tract infections	≥ 25 years	0.0037	0.00001	0.00005
adult mortality - malignant neoplasm of the bronchus and lung	≥ 25 years	0.0020	0.00000	0.00003
morbidity - childhood asthma	0–18 years	0.0141	0.00002	0.00018
morbidity - chronic obstructive pulmonary disease (COPD)	≥ 30 years	0.0175	0.00003	0.00023
morbidity - ischemic heart disease (myocardial infarction)	≥ 30 years	0.0082	0.00001	0.00011
morbidity - stroke	≥ 30 years	0.0132	0.00002	0.00017
morbidity - high blood pressure	≥ 30 years	0.0953	0.00017	0.00124
morbidity - malignant neoplasm of the bronchus and lung	≥ 30 years	0.0041	0.00001	0.00005
morbidity - type 2 diabetes	0–18 years	0.0001	0.00000	0.00000
morbidity - dementia	≥ 19 years	0.0244	0.00004	0.00032

Table D.7: Assessment of changes in the level of health risk in residential development due to changes in ambient PM_{10} concentrations, incremental values

Health effect	Segment population	scenario 1 2034	scenario 2 2040	scenario 3 2042
adult natural-cause mortality	≥ 25 years	0.2368	0.00014	0.0045
adult mortality - circulatory-system diseases	≥ 25 years	0.0878	0.00005	0.0017
adult mortality - respiratory-system diseases (excluding neoplasms)	≥ 25 years	0.0301	0.00002	0.0006
adult mortality - neoplasms of the trachea, bronchus, and lung	≥ 25 years	0.0136	0.00001	0.0003
adult mortality - ischemic heart disease	≥ 25 years	0.0247	0.00001	0.0005
adult mortality - chronic obstructive pulmonary disease (COPD)	≥ 25 years	0.0167	0.00001	0.0003

As shown in the tables above, the assessed Project is expected to result in a slight increase in health risk from exposure to both $PM_{2.5}$ and PM_{10}:

- Under scenario 1 (2034, expected duration of up to 1 year), exposure to ambient $PM_{2.5}$ concentrations is calculated to increase natural-cause mortality among adults by hundredths of one new case and individual morbidity categories by, at most, less than one tenth of a case in the entire affected population. Exposure to ambient PM_{10} concentrations is calculated to increase natural-cause mortality by tenths of one new case in the entire affected population. The highest increase in ambient $PM_{2.5}$ concentrations in residential development is calculated at up to 0.7 $\mu g/m^3$ (affecting single-digit numbers of residents); the highest increase in ambient PM_{10} concentrations is calculated at up to 2 $\mu g/m^3$ (affecting, at most, tens of residents), and only very locally (affecting one residential building) at approximately 4 $\mu g/m^3$. Even in the residential development most affected by the Project, the increase in the level of natural-cause mortality and in the individual morbidity categories is several orders of magnitude below one case in the affected population.
- Under scenario 2 (2040, expected duration of up to 1 year), exposure to ambient $PM_{2.5}$ concentrations is calculated to increase natural-cause mortality among adults by hundred-thousandths of one new case and the individual morbidity categories also by hundred-thousandths, at most

approximately one ten-thousandth of a case in the entire affected population. Exposure to ambient PM_{10} concentrations is calculated to increase natural-cause mortality by ten-thousandths of one new case in the entire affected population. The highest increase in ambient $PM_{2.5}$ concentrations in residential development is calculated at approximately 0.003 µg/m³ (affecting single-digit to tens of residents), while the highest increase in ambient PM_{10} concentrations is calculated at up to 0.005 µg/m³. Even in the residential development most affected by the Project, the increase in the level of natural-cause mortality and in the individual morbidity categories is several orders of magnitude below one case in the affected population.

- Under scenario 3 (2042, permanent scenario), exposure to ambient $PM_{2.5}$ concentrations is calculated to increase natural-cause mortality among adults by ten-thousandths of one new case and the individual morbidity categories also by ten-thousandths of a case in the entire affected population. Exposure to ambient PM_{10} concentrations is calculated to increase natural-cause mortality by thousandths of one new case in the entire affected population. The highest increase in ambient $PM_{2.5}$ concentrations in residential development is calculated at up to 0.005 µg/m³ (affecting tens of residents), while the highest increase in ambient PM_{10} concentrations is calculated at up to 0.020 µg/m³ (affecting tens of residents). Even in the residential development most affected by the Project, the increase in the level of natural-cause mortality and in the individual morbidity categories is several orders of magnitude below one case in the affected population.

D.I.1.1.3.2.3.2. Nitrogen dioxide

The following table summarizes the incremental values of health effects from NO_2 exposure under the individual scenarios.

Table D.8: Assessment of changes in the level of health risk in residential development due to changes in ambient NO_2 concentrations, incremental values

Health effect	Segment population	scenario 1 2034	scenario 2 2040	scenario 3 2042
adult natural-cause mortality	≥ 25 years	0.0134	0.0006	0.0005
adult mortality - respiratory-system diseases (excluding neoplasms)	≥ 25 years	0.0012	0.0001	0.0000
adult mortality - chronic obstructive pulmonary disease (COPD)	≥ 25 years	0.0004	0.0000	0.0000
adult mortality - lower respiratory tract infections	≥ 25 years	0.0010	0.0000	0.0000
adult mortality - circulatory-system diseases	≥ 25 years	0.0050	0.0002	0.0002
adult mortality - ischemic heart disease	≥ 25 years	0.0018	0.0001	0.0001
adult mortality - malignant neoplasm of the bronchus and lung	≥ 25 years	0.0009	0.0000	0.0000
morbidity - childhood asthma	0–18 years	0.0031	0.0001	0.0001
morbidity - asthma in adults	≥ 19 years	0.0089	0.0004	0.0003
morbidity - lower respiratory tract infections in children	0–12 years	0.0096	0.0004	0.0004

As shown in the table, only a slight increase in health risk due to the Project assessed can also be expected for exposure to nitrogen dioxide:

- Under scenario 1 (2034, expected duration of up to 1 year), exposure to ambient nitrogen dioxide concentrations is calculated to increase natural-cause mortality among adults by hundredths of one new case and individual morbidity categories by thousandths of a case in the entire affected population. The highest increase in ambient nitrogen dioxide concentrations in residential development is calculated at less than 0.1 µg/m³ (affecting single-digit numbers of residents). Even in the residential development most affected by the Project, the increase in the level of natural-cause mortality and in the individual morbidity categories is several orders of magnitude below one case in the affected population.
- Under scenario 2 (2040, expected duration of up to 1 year), exposure to ambient nitrogen dioxide concentrations is calculated to increase natural-cause mortality among adults by ten-thousandths of one new case and the individual morbidity categories also by ten-thousandths of a case in the entire affected population. The highest increase in ambient nitrogen dioxide concentrations in residential development is calculated at approximately 0.005 µg/m³ (affecting tens of residents). Even in the residential development most affected by the Project, the increase in the level of natural-cause mortality and in the individual morbidity categories is several orders of magnitude below one case in the affected population.
- Under scenario 3 (2042, permanent scenario), exposure to ambient nitrogen dioxide concentrations is calculated to increase natural-cause mortality among adults by ten-thousandths of one new case and the individual morbidity categories also by ten-thousandths of a case in the entire affected population. The highest increase in ambient nitrogen dioxide concentrations in residential development is calculated at approximately 0.005 µg/m³ (affecting tens of residents). Even in the residential development most affected by the Project, the increase in the level of natural-cause mortality and in the individual morbidity categories is several orders of magnitude below one case in the affected population.

Health effects from acute exposure to nitrogen dioxide are likewise not expected to occur in any part of the area of interest.

D.I.1.1.3.2.3.3. Combined effects of $PM_{2.5}$ and nitrogen dioxide

$PM_{2.5}$ and NO_2 largely share the same emission sources. To ensure that the calculation is methodologically correct, a procedure is used that limits the risk of double-counting their impacts. The assessment is performed for the effect of "natural-cause mortality among adults". The assessment results show that, when the combined effect is considered, the increase in natural-cause mortality due to the SMR ETE Project is approximately one hundredth of a case in the entire affected population under scenario 1 (2034), and on the order of hundred-thousandths of a case in the entire affected population under scenarios 2 and 3 (2040 and 2042, with an expected duration of 1 year and a permanent scenario, respectively).

D.I.1.1.3.2.3.4. Benzene and benzo[a]pyrene

Benzene and benzo[a]pyrene are known human carcinogens. For benzene, the increase in the number of leukemia cases due to implementation of the Project is on the order of ten-millionths of one new case in the entire affected population. Under scenario 1 (2034, expected duration of up to 1 year), the highest increase in residential development is calculated at up to 0.004 μg/m^3 and affects several tens of residents. This value corresponds to an increase in the risk of health effects from chronic exposure to benzene of no more than 2.40×10^{-8} (1 case per more than 41.6 million residents).

For benzo[a]pyrene, the increase in the number of cancer cases is on the order of ten-millionths to hundred-thousandths of one new case in the entire affected population. The highest increase in residential development is calculated at up to 0.0005 ng/m^3 (affecting tens of residents). This value corresponds to an increase in the risk of health effects from chronic exposure to benzo[a]pyrene of no more than 4.35×10^{-7} (1 case per almost 2.3 million residents).

In view of the number of residents affected by the highest increase, it can be concluded for both pollutants that the calculated changes in health risk are entirely insignificant in terms of adverse health effects.

D.I.1.1.3.2.3.5. Impacts of short-term exposure during construction work

The impacts on human health associated with changes in short-term concentrations (daily averages) of $PM_{2.5}$, PM_{10}, and nitrogen dioxide during construction work are also evaluated. Sources of air pollution will include both the construction site itself and induced road traffic. The assessment is performed for the most affected part of the development, for the impact of SMR ETE construction and for the combined impact of construction activities under the SMR ETE and New NPP ETE projects. For construction of SMR ETE, the maximum short-term increase in daily $PM_{2.5}$ concentrations is expected to be up to 50.6 μg/m^3, in daily PM_{10} concentrations up to 168.5 μg/m^3, and in NO_2 concentrations up to 3.4 μg/m^3. In combination with construction of New NPP ETE, daily $PM_{2.5}$ concentrations increase by up to 180 μg/m^3, daily PM_{10} concentrations by up to 600 μg/m^3, and NO_2 concentrations by up to 3.5 μg/m^3. These are maximum values that could potentially occur under a concurrence of the most unfavorable meteorological and emission conditions. Changes in ambient concentrations are calculated without considering measures to reduce construction impacts on ambient air quality.

The effects are quantified for daily exposure. The results of the assessment are summarized in the following table.

Table D.9: Assessment of changes in the level of health risk in residential development due to changes in ambient $PM_{2.5}$ and NO_2 concentrations

Air quality characteristic	Health effect	Population segment	Baseline scenario	New NPP ETE construction		SMR ETE construction	
				Status with the Project	Difference	Status with the Project	Difference
$PM_{2.5}$ daily mean	adult natural-cause mortality	entire population	0.000015	0.000349	0.000334	0.000109	0.000094
$PM_{2.5}$ daily mean	morbidity - circulatory-system diseases	entire population	0.000041	0.000983	0.000942	0.000306	0.000265
PM_{10} daily mean	restricted activity days (RADs) - missed school days	5–14 years	0.014660	0.729814	0.715153	0.215499	0.200839
NO_2 daily mean	adult natural-cause mortality	entire population	0.000015	0.000024	0.000009	0.000019	0.000004
NO_2 daily mean	morbidity - respiratory-system diseases	entire population	0.000023	0.000030	0.000007	0.000030	0.000007

The table shows that each day on which the highest calculated daily values occur will result in an increase in natural-cause mortality of no more than ten-thousandths of one new case and an increase in the incidence of circulatory-system diseases of approximately one thousandth of one new case. For restricted activity days expressed as missed school days, an increase just below one case is calculated when construction of New NPP ETE and SMR ETE overlaps. The result may be interpreted as meaning that, at the maximum exposure values, no significant effect on mortality or morbidity in terms of the defined diagnoses is expected; however, health effects in the form of mild respiratory symptoms (manifested as restricted activity) may occur.

In this case, however, the calculations assume a theoretical concurrence of unfavorable circumstances both on the construction side (highest emissions) and in terms of meteorological conditions; because this involves exposure to PM_{10} (i.e., dust), this concurrence of unfavorable circumstances can essentially be eliminated by technical means. The means of achieving this are measures to minimize particulate matter emissions, as specified in the air dispersion study. Provided that these measures are complied with, the maximum increases in exposure described, and therefore the associated health effects, will not occur (or these effects will be reduced to the level of the average values described above).

D.I.1.1.3.3. Impacts of noise

D.I.1.1.3.3.1. Introductory information

The identified effects of noise on human health that are relevant to the contemplated assessment are associated exclusively with long-term (multiyear) exposure. For this reason, only the operational phase of the Project is assessed. No impacts of noise during the construction phase on the health of residents living in the vicinity of the Project are anticipated.

The assessment is based on the acoustic study (Annex 5.2 to this Documentation) and is performed for the following scenarios:

- Future scenario (2034) - traffic volumes for 2034:
  - operation of ETE1,2, without operation of SMR ETE,
  - operation of ETE1,2, with operation of SMR ETE.
- Future scenario (2034) - stationary noise sources:
  - operation of ETE1,2, with operation of SMR ETE.
- Target scenario (2042) - traffic volumes for 2042:
  - operation of ETE1,2 + operation of New NPP ETE, without operation of SMR ETE,
  - operation of ETE1,2 + operation of New NPP ETE, with operation of SMR ETE.
- Target scenario (2042) - stationary noise sources:
  - operation of ETE1,2 + operation of New NPP ETE, with operation of SMR ETE.

D.I.1.1.3.3.2. Hazard identification and dose-response relationships

Adverse effects of noise on human health are generally defined as morphological or functional changes in the organism that impair its functions, reduce its capacity to compensate for stress, or increase its susceptibility to other adverse environmental effects. With some simplification, the effects of noise on human health can be divided into specific effects, manifested as impairment of auditory-system function, and nonspecific (non-auditory) effects, which affect the functions of various body systems.

Normal exposure to traffic noise results primarily in systemic (non-specific) effects involving the functions of various systems of the body, often mediated by a stress response, sleep disturbance, and effects on higher nervous functions. Chronic stress caused by noise may contribute to triggering or accelerating the progression of diseases with multifactorial causes.

According to the current WHO guidelines, the serious effects of noise considered sufficiently proven are annoyance, sleep disturbance, cardiovascular disease, cognitive impairment, and hearing impairment. The following overview briefly characterizes these effects according to the National Institute of Public Health (SZÚ):

Noise annoyance — is the most general human response to noise exposure. Annoyance refers to a psychological state arising from the involuntary perception of effects toward which an individual has a negative attitude and to which they respond with feelings of aversion, irritation, and, in some cases, even psychosomatic disorders; for simplicity, the term annoyance also covers other negative emotions associated with noise (anger, dissatisfaction, anxiety, and agitation). Annoyance is significantly influenced by the individual characteristics of the recipient; from an individual's perspective, it is therefore considered a factor with a non-threshold effect, meaning that even the quietest sounds may annoy a sensitive person.

Adverse effects on sleep — due to noise are demonstrably manifested by changes in physiological responses (changes in heart rate, indications of awakening on an EEG, changes in the duration of sleep stages, increased movement during sleep, difficulty falling asleep, awakening, and reduced sleep duration); there is also sufficient evidence of subjectively perceived sleep disturbance, environmental insomnia, and increased use of sleeping medication. Health consequences of sleep disturbance by nighttime noise include changes in stress-hormone levels, cardiovascular diseases, mental disorders, obesity, reduced life expectancy, an increased incidence of occupational accidents, and psychological and social consequences (sleepiness and fatigue, irritability, reduced performance, impaired cognitive ability, and disruption of social contact).

The effects of noise on the cardiovascular system have been demonstrated in numerous epidemiological studies. The recognized mechanism is the body's stress response, in which the acoustic signal is subconsciously evaluated as alarming and triggers a stress response associated with activation of the autonomic nervous system and release of stress hormones, leading to a temporary increase in blood pressure and heart rate and to vasoconstriction. Following long-term exposure, sensitive individuals may develop permanent effects such as hypertension and ischemic heart disease. Other possible mechanisms by which noise affects the cardiovascular system include magnesium depletion (with magnesium being released from the body as a result of repeated nerve impulses) or long-term sleep deprivation and its consequences. According to current WHO data, the increased risk of ischemic heart disease due to road

traffic noise is considered established; by contrast, the quality of evidence for the previously reported risk of hypertension is now considered low, while the findings for stroke are inconsistent.

Noise-related cognitive impairment includes impaired speech comprehension, impaired attention, and reduced working-memory capacity. This results in reduced performance, poorer task performance, errors at work, and potentially accidents and injuries. Noise may also seriously interfere with speech communication or mask other signals containing important information. Impaired speech communication has numerous proven adverse consequences for behavior and relationships, leading to irritability, uncertainty, reduced work performance, and feelings of dissatisfaction. Field studies have confirmed an association between aircraft noise and impaired reading ability, speech comprehension, and test performance in schoolchildren; for road and rail traffic noise, the results are inconsistent and the quality of evidence is insufficient.

Damage to the auditory system essentially involves two mechanisms. Extremely high sound pressure levels may cause acoustic trauma involving injury to the eardrum, auditory ossicles, or membranous labyrinth, resulting in permanent hearing impairment. Long-term to lifetime exposure of the auditory system to noise causes hearing impairment, initially involving temporary and subsequently permanent functional and morphological changes in the sensory and nerve cells of the organ of Corti in the inner ear. These disorders initially manifest as a temporary increase in the hearing threshold; with continued noise exposure, permanent hearing impairment develops after a certain latency period. Hearing impairment has been sufficiently demonstrated for occupational noise exposure as a function of equivalent sound pressure level and years of exposure, but also occurs with noise in nonoccupational environments, e.g., in connection with noise from leisure activities. Hearing loss is then usually the result of combined exposure to noise from different sources, i.e., from occupational and living environments and leisure activities.

The effects of noise are considered non-threshold effects (i.e., no safe limit can be established below which the effect no longer occurs); in practice, however, certain threshold values are used above which the dependence of the effect on noise exposure is considered significant. The WHO provides the following recommended exposure values for road-traffic noise:

- average value, expressed by the day-evening-night noise indicator (L_{den}): 53 dB,
- nighttime noise (L_n): 45 dB.

Procedures established by the SZÚ authorization guidance and based on Annex III to Commission Directive (EU) 2020/367 are used for the quantitative evaluation of the impacts of road-traffic noise in the area addressed. The assessment covers the following effects of noise:

- high annoyance,
- high sleep disturbance,
- ischemic heart disease (ICHS).

D.I.1.1.3.3.3. Exposure assessment and risk characterization

Based on the acoustic-study results, the proportion of residents in noise-exposure zones above the recommended exposure values, the levels of noise annoyance and sleep disturbance, and the incidence of ICHS due to road-traffic noise exposure are quantified. As shown by the assessment, even under the no-project scenario, the proportion of residents in the surrounding residential areas falling within bands above the WHO guideline values for average day-evening-night noise and night-time noise will be 100 %. The Project will not result in any change. The results of the quantification of noise effects are summarized in the following table.

Table D.10: Total values for high annoyance, high sleep disturbance, and the incidence of ICHS due to road traffic noise (for a total of 350 affected residents)

	Without the Project	With the Project	Change
2034			
High annoyance	64	65	1
High sleep disturbance	19	19	0
Incidence of ICHS	0.2358	0.2381	0.0023
2042			
High annoyance	65	66	1
High sleep disturbance	19	19	0
Incidence of ICHS	0.2421	0.2443	0.0022

The assessment results show the following:

- the number of residents highly annoyed by road traffic in the surrounding existing development under the baseline scenario is 64 or 65 persons; an increase of one case is calculated due to the Project,
- the number of residents highly sleep-disturbed is 19 persons under both scenarios; no change due to the Project is recorded,
- the increase in cardiovascular risk (number of ICHS cases) is calculated at up to approximately 0.0022–0.0023 cases and is therefore entirely negligible.

Overall, it can therefore be concluded that the Project will result in a very slight increase in annoyance (by 1 case among 350 affected residents). In the case of ICHS incidence, the change is several orders of magnitude below the threshold of detectability.

The indicative assessment of stationary-source impacts shows that their operation may cause annoyance or sleep disturbance only at Kočín, affecting 2–3 % of the residents concerned; given the number of residents concerned, this represents, at most, isolated cases.

D.I.1.1.4 Other impacts

D.I.1.1.4.1. Psychological impacts

An impact on the psychological well-being of the population is a potential impact. The Project is located in an area where several nuclear facilities have operated for many years, and the affected territory's population therefore has an established relationship with nuclear power.

The population's psychological state has long been monitored under the Program for Monitoring and Assessing the Environmental Impact of the Temelín Nuclear Power Plant (ČEZ, a. s., INVESTprojekt, s.r.o., 1999), which defines a set of monitoring and evaluation activities for environmental components and status indicators beyond the power plant operator's statutory obligations. Under this program, the population's health status during the power plant's preoperational period was documented; current data for the preceding period are subsequently collected and evaluated at regular intervals both for residents living near the Temelín Nuclear Power Plant (the exposure area) and for residents living in other, more distant regions with similar natural and socioeconomic conditions but without a nuclear facility (the control areas).

The most recent study of psychological state was conducted in 2025 and followed earlier studies performed in 2000, 2002, 2004, 2011, and 2018. The survey results were then compared with a control sample of the East Bohemian population, which is not affected by the presence of a nuclear power plant nearby. The aim of the research was to determine more precisely whether psychological difficulties such as emotional instability, feelings of anxiety, stress, or concerns occur to a greater extent among residents living near the Temelín Nuclear Power Plant than among population groups unaffected by the presence of the nuclear power plant. The research was conducted using a methodology specifically developed for the purposes of this survey. The procedure was designed to enable identification of any adverse changes associated with the presence of a nuclear power plant (neuroticism, lie score, depressive symptomatology, locus of control, life satisfaction, experienced fear and concerns, and self-actualization capacity). Data were collected through structured interviews between an interviewer and a respondent using the questionnaire specified; respondents' participation in the survey was voluntary and anonymous. The research questions and statements were incorporated into a comprehensive interviewer-administered questionnaire in which respondents expressed their views on the individual statements using a seven-point scale. To eliminate a consciously negative attitude toward ETE (or SMR ETE) and avoid data bias, the questionnaire was designed so that it was not apparent that the research concerned the Temelín Nuclear Power Plant. The data obtained were processed using statistical analyses and specialized software.

The respondent sample comprised 550 persons living in the vicinity of the Temelín Nuclear Power Plant and 551 persons living in Eastern Bohemia. The structure of the respondent sample was specified on the basis of social and demographic indicators from the structure of the underlying population, e.g., sex, age (range from 15 years), and highest educational attainment (four selected levels). The assessed area in the vicinity of ETE included the following municipalities and their constituent parts: Dříteň; Nákří (Chvalešovice, Libív, Malešice, Radomilice, Strachovice, Velice, Záblatí, and Záblatíčko); Temelín (Kočín, Lhota pod Horami, Litoradice, Sedlec, and Zvěrkovice); Týn nad Vltavou (Hněvkovice on the left bank of the Vltava, Koloděje nad Lužnicí, Malá Strana, Netěchovice, Nuzice, Předčice, Vesce, and Jarošovice); and Všemyslice (Bohunice, Neznašov, Slavětice, and Všeteč). The control sample of respondents in Eastern Bohemia was selected from residents of the districts of Hradec Králové, Chrudim, Náchod, Rychnov nad Kněžnou, Pardubice, Svitavy, and Ústí nad Orlicí.

Based on the psychological-survey results, statistically significant differences between the Temelín and control samples were identified for neuroticism, lie score, depressive symptomatology, and locus of control. In all these cases, the more favorable result was consistently identified in the sample of respondents from around the Temelín Nuclear Power Plant. Based on the study results, it can therefore be concluded that proximity to the Temelín Nuclear Power Plant does not adversely affect the psychological state of the population living nearby. Moreover, none of the respondents mentioned or directly identified the power plant itself as a cause of life dissatisfaction. These results are consistent with the findings of previous surveys and confirm the long-observed trend of a higher quality of mental life among residents living near ETE. It can be assumed that most residents in the surrounding area have accepted the presence of the nuclear power plant and do not perceive it as a threat. However, the observed stable and favorable development of the psychological characteristics of the population around the Temelín Nuclear Power Plant depends on its trouble-free operation and on the safety of nuclear power in general. Local residents undoubtedly perceive the potential safety risks of power plant operation, but most apparently consider it safe, or operated in accordance with high safety standards. The existence and proximity of ETE do not adversely affect important personality traits or the psychological balance and well-being of residents in its immediate vicinity.

It can therefore be concluded that operation of ETE1,2 as a whole is not associated with adverse effects on the psychological state and mental well-being of residents living nearby. At the same time, the assumption that the impacts of ETE1,2 on the population's psychological state will not change as a result of siting the SMR ETE Project, which represents modern technology incorporating a high degree of active and passive safety features, can also be considered substantiated. The same conclusion applies to the combined impacts of SMR ETE and other existing and planned operations at the site.

D.I.1.1.4.2. Social and economic impacts

The anticipated social and economic impacts of construction and operation of the new SMR ETE nuclear power plant at the Temelín site are evaluated in a socioeconomic study that primarily assesses the impacts of the SMR ETE Project but also considers the impacts of New NPP ETE construction because the impacts of the two projects will interact. The assessment primarily focuses on impacts on the population, labor market, economy, living conditions, transport infrastructure, amenities, housing, and public administration in the area. The conclusions are summarized below.

D.I.1.1.4.2.1. Human resources

Implementation of the Project will result in an influx of new residents associated with an increase in the number of jobs. Approximately 400 workers are expected to be required for SMR ETE operation, while operation of New NPP ETE will require approximately 600 workers. Thus, approximately 1,000 persons in total will be employed in the newly implemented operations, potentially increasing the area's population by up to twice that number when the family members of new employees are also taken into account. Some of this workforce may come from the power plant's broader surroundings; however, given the specialized nature of the jobs and the high worker-qualification requirements, most can be expected to come from other, more distant regions. The arrival of new residents will benefit the region in many respects. Highly qualified workers will help raise educational attainment in the region; an increase in the proportion of persons of economically active age will mitigate the trend of demographic aging in the regional population, and this impact will be accentuated by the arrival of their family members or by the future establishment of families.

The construction phase of SMR ETE and New NPP ETE, which will require thousands of workers in total, will also be significant in terms of human resources. The number of construction workers will not remain constant but will vary depending on the particular construction stages and the demands of the work. From approximately 2030 to 2040, approximately 2,000–3,000 workers will participate in construction of the two projects each year. A large proportion of the workers constructing the two projects can be expected to come from other, more distant parts of the Czech Republic or from abroad. Given that the work will continue for several years, a large proportion will be accommodated in the immediate and broader vicinity of the Temelín site, although this will be a relatively temporary form of migration. These workers cannot be expected to purchase local real estate in order to remain in the region for the long term or to relocate together with their family members. On the contrary, increased mobility among these persons (whether regular or irregular) is expected precisely because they will be separated from their families. The vast majority of these persons are then expected to leave after construction is completed. Because the period when SMR ETE is commissioned (around 2034) overlaps with the construction period for New NPP ETE (expected to be 2032–2041), the greatest pressure from newcomers can be expected in these years. Based on geographical assumptions and experience from construction of the first two Temelín power plant units (ETE1,2), the greatest population pressure and increased demand for both short-term accommodation and long-term housing can be expected in Týn nad Vltavou. The increased population will also affect traffic volumes, requirements for public-transport services, and the cost of maintaining transport infrastructure.

D.I.1.1.4.2.2. Labor market

The presence of the Temelín Nuclear Power Plant significantly affects the labor market because it currently employs approximately 1,500 persons and is therefore a key employer throughout the area of interest. One consequence is a relatively low unemployment rate, which as of December 31, 2024, was 3.1 % in Týn nad Vltavou and 2.8 % in the 20 municipalities within 10 km of the Temelín Nuclear Power Plant, compared with a nationwide average of 4.1 %. Given the nature of operation of ETE1,2 and the high employee-qualification requirements, local jobs are stable and long-term; however, specific entry requirements limit employment opportunities for persons with lower educational attainment or disabilities. Implementation of SMR ETE and New NPP ETE will add approximately 1,000 new employees and stabilize unemployment at low levels, although employment opportunities for persons with lower educational attainment will remain limited. Given the limited availability of suitable applicants, the vast majority of the new jobs may be expected to be filled by applicants from other regions. Additional employment opportunities will be provided, for example, by contractors linked to power plant operation. The construction of SMR ETE and New NPP ETE itself will offer a specific type of employment that will provide some opportunities for people with lower levels of education, but only temporarily for the duration of construction.

Operation of ETE1,2 also affects the composition of commuting flows in the region. The Temelín site is currently one of the principal commuting destinations for municipalities in the immediate and broader vicinity. The largest commuting flows originate in Týn nad Vltavou (564 persons according to the 2021 Census) and České Budějovice (553 persons according to the 2021 Census). Commuting to the Temelín site will increase further following implementation of SMR ETE and New NPP ETE.

Cooperation between the Temelín Nuclear Power Plant and schools in the region is an important benefit. This is a mutually beneficial relationship because support for schools and specialized technical education can facilitate the future recruitment of new qualified employees, while schools can provide their students with education in close contact with practical applications and potentially also future employment. Cooperation with schools may also lead to the establishment of new specialized fields required for power plant operation.

D.I.1.1.4.2.3. Economy

The Temelín Nuclear Power Plant is a major economic entity that may be regarded as an important stabilizing element in the regional economy, and its operation influences the economic structure of the entire region. The high number of ETE employees increases the proportion of employment in industry, and implementation of SMR ETE and New NPP ETE will strengthen this further.

As already stated, implementation of the SMR ETE and New NPP ETE projects will create approximately 1,000 jobs, potentially resulting in the arrival of up to twice that number of persons. Relocation of family members of the new power plant employees will increase the economically active population, which may positively affect the structure of business activities in the region. The incoming population will also support the development of the business environment through demand for services in the area of interest. However, given the proximity of the municipalities in the area of interest to major cities, particularly České Budějovice, the impact of additional facilities at the Temelín site will not be very significant in this respect.

Power plant operation is supported, among other things, by a network of approximately 200 qualified suppliers of services and materials. However, a significant proportion of the suppliers are located near the Dukovany Nuclear Power Plant, and only one is based in the South Bohemian Region. Implementation of SMR ETE and New NPP ETE may create an opportunity for greater involvement by local suppliers. In addition to increasing efficiency, establishing supply chains with local companies should also contribute to development of the regional economy.

Neither the Temelín Nuclear Power Plant nor implementation of the SMR ETE and New NPP ETE projects will have any significant impact on the development of tourism. Tourists visiting South Bohemia for its sights, culture, or natural attractions would do so even without the existence of the power plant. The power plant itself, however, is listed among the region's tourist attractions. The Temelín Nuclear Power Plant Information Centre received almost 42,000 visitors in 2023. Following completion of SMR ETE construction, an increase in the number of visitors to the Information Centre may be expected, as this will be the first reactor of its type in the Czech Republic. Nevertheless, the Project's anticipated impact on tourism development is only very weak; therefore, no significant impact on accommodation facilities in the region is anticipated in this respect.

D.I.1.1.4.2.4. Living conditions

During construction, the number of public transport services and certain related services is likely to increase due to the greater movement of people. Project construction does not require construction of new public transport infrastructure and will make full use of existing infrastructure; necessary modifications and repairs to any construction-related damage are anticipated. Following commissioning of the SMR ETE and New NPP ETE projects, the traffic generated in serving them will increase total traffic volumes by up to approximately 11 % (on the potentially most affected section of road II/105). The traffic load generated by the projects is therefore not entirely negligible, but the existing road network has sufficient capacity for this increase and no special or additional measures are therefore required.

The presence of the Temelín Nuclear Power Plant significantly affects the provision of services in the area of interest (commercial entities, schools, health-care facilities, social services, etc.). The concentration and availability of services are above average compared with other similar rural regions, where services instead tend to decline gradually. Implementation of the SMR ETE and New NPP ETE projects will temporarily bring thousands of construction workers and permanently bring approximately 1,000 predominantly highly qualified operating personnel into the area of interest. This population increase will support demand for services, positively affecting the operation and retention of existing services and the development of new ones.

Operation of the Temelín Nuclear Power Plant also has a positive impact on the development of infrastructure in municipalities within the area of interest, which ČEZ, as the power plant operator, has supported over the long term through various sponsorship programs. This support for surrounding municipalities significantly helps improve the quality of local residents' living conditions. If the SMR ETE and New NPP ETE projects are implemented, continued support in this area may be expected.

D.I.1.1.4.2.5. Housing construction and property prices

The SMR ETE and New NPP ETE projects are located in the immediate vicinity of the existing industrial site of the Temelín Nuclear Power Plant, at a sufficient distance from the nearest populated areas or areas designated for housing in the spatial plan. The residential development nearest to the SMR ETE Project site is Temelín-Kočín, part of the municipality of Temelín, located approximately 1.1 km to the south, followed by the municipality of Temelín, approximately 2.5 km to the northwest. For New NPP ETE, the nearest settlements are the municipality of Temelín, approximately 0.9 km to the northwest, and the municipal parts of Temelín-Kočín, approximately 2 km to the south, and Sedlec, approximately 2.3 km to the west. Implementation of the projects will not result in any changes to the settlement structure of the area; it will only expand the existing power plant site. Adverse social impacts of construction associated, for example, with population resettlement are therefore ruled out.

No large-scale housing construction is envisaged in connection with implementation of the projects. Construction workers are expected to be accommodated primarily in collective accommodation facilities, rental housing, and ETE facilities built to house construction workers. Incoming operational staff are more likely to seek their own housing or rental accommodation and may be expected to concentrate primarily in nearby Týn nad Vltavou or České Budějovice.

Proximity to the Temelín Nuclear Power Plant is a factor that affects real-estate prices in the area of interest. Some people may perceive this factor negatively, but the continually increasing number of power plant employees, which is expected to grow further as a result of implementing the SMR ETE and New NPP ETE projects, leads to higher demand for real estate and therefore increases its price. A moderate increase in real-estate prices and a substantial increase in the prices of land expected to be used as building lots can therefore be anticipated when the projects are implemented. Implementation of the projects will only have a minimal impact on agricultural land prices. It should be noted that rising prices are also influenced to some extent by the proximity of larger towns and cities and by suburbanization. The price of some properties near major traffic routes may then be adversely affected in the short term during project construction, for example due to increased traffic, noise, or dust generated by construction. Overall, the adverse impacts of implementing the projects can be expected to be relatively insignificant, primarily because of the

attractiveness of the Temelín Nuclear Power Plant as a stable employer, the proximity of larger cities within commuting distance, the landscape's natural qualities, and the area's above-average amenities.

D.I.1.1.4.2.6. Local administration

The presence and operation of the Temelín Nuclear Power Plant also affect municipal administration in the area of interest. This impact is most pronounced in the municipality of Temelín, where the power plant is located. As a result, the municipality has relatively high budget revenues, derived primarily from property tax and the tax revenue-sharing system, which takes into account the large number of power plant employees. The budget of the municipality of Temelín is substantially higher than those of other, similarly sized municipalities, enabling the municipality to spend more on municipal development and improving the quality of life of local residents. ČEZ, which operates the Temelín Nuclear Power Plant, actively supports the development of the regions in which it operates, primarily by providing donations or promotional sponsorship to municipalities and legal entities. In 2023, the ČEZ Foundation provided financial support of CZK 2,135,490 to legal entities operating within 10 km of the Temelín Nuclear Power Plant and donations of CZK 2,456,389 to municipalities in the same area. If the SMR ETE and New NPP ETE projects are implemented, the financial support provided by the power plant operator to the affected municipalities and legal entities may be expected to continue. Expanded operations and an increased number of employees will also have a positive impact on the tax revenues of the municipality of Temelín. Development of the Temelín site thus makes it possible to continue stabilizing and developing the region and to maintain high-quality living conditions that are above average compared with other regions.

D.I.1.2. Number of affected residents

Based on the assessment performed, the Project will not have significant, i.e., above-limit or unacceptable, impacts on any residents.

Residents of municipalities in the affected territory, numbering no more than a few thousand, will be affected to varying degrees by Project operation and construction.

D.I.1.3. Impacts during construction

No radiological impacts arise during Project construction, and the impacts of existing nuclear facilities at the site will not be affected in any way during Project construction.

The impacts of construction activities on non-radiological factors (non-ionizing radiation, ambient air pollution, and noise) and other factors (psychological, social, and economic) are discussed above together with operational impacts. This is also due, among other things, to the fact that in the assessment of interacting/cumulative impacts, the operation and construction phases of the individual facilities at the site overlap mutually and inseparably and are therefore evaluated together for clarity.

D.I.1.4. Impacts during construction or termination of operation

No additional radiological or non-radiological impacts on the population arise during termination of operation and decommissioning. The impacts of all activities during termination of operation and decommissioning will therefore not exceed the impacts specified above for the operation and construction periods.

D.I.2. Impacts on air and climate

2. Impacts on ambient air and climate (e.g., the nature and quantity of pollutant and greenhouse-gas emissions and the Project's vulnerability to climate change)

D.I.2.1. Impacts on ambient air quality

The SMR ETE Project is not a combustion source and will therefore not be a significant source of air-pollutant emissions.

The ambient air pollution load induced by the Project from stationary and traffic sources is calculated to assess the Project's impacts on air quality. The calculation is performed using the SYMOS methodology and evaluates ambient concentrations of NO_2, PM_{10}, $PM_{2.5}$, benzene, and benzo(a)pyrene in the affected territory. The assessment also considers the interacting impact of SMR ETE with the planned New NPP ETE project, while the existing ETE1,2 units are already included in the existing background. The results are summarized below; more detailed data, including graphical presentation of the results, are provided in the air dispersion study (Annex 5.3 to this Documentation).

The Temelín concrete mixing plant and recycling facility project (JHC1253) is also being prepared in the affected territory; its operation is being sited in the existing industrial complex in the southern part of the municipality of Temelín. The impacts of this project are currently being assessed in a separate EIA process. Given its nature, its impacts are concentrated in particulate-matter (PM) emissions, while the impact of its operation on ambient air pollution from gaseous emissions is negligible. The same applies to the planned Hůrka u Temelína – composting plant project (JHC1259).

Nitrogen dioxide (NO_2)

Under the future scenario without Project implementation, a slight downward trend in average annual NO_2 concentrations is anticipated, caused by a decrease in primary emissions from fuel combustion due to fleet renewal (improved vehicle emission standards), which fully offsets the effect of the anticipated increase in traffic volumes in the area.

The highest expected contribution from SMR ETE operation to the average annual ambient NO_2 concentration is up to approximately 0.04 µg/m³, i.e., approximately 0.1 % of the air quality limit value (40 µg/m³), and its contribution to the maximum hourly ambient NO_2 concentration is approximately 4 µg/m³, i.e., approximately 2 % of the air quality limit value (200 µg/m³). With the concurrent impacts of the change in background concentration due to natural traffic growth, the increase in traffic and stationary pollution sources associated with New NPP ETE operation, and operation of SMR ETE itself, an insignificant change in ambient air quality is expected at the most affected residential development. Average annual and maximum short-term concentrations in the area can therefore be expected to remain reliably below the applicable limits.

A reliably below-limit situation for NO_2 can also be expected if air quality limit values are tightened as required to be adopted by Member States under EU Ambient Air Quality Directive (EU) 2024/2881 no later than January 1, 2030.

Particulate matter (PM_{10}, $PM_{2.5}$)

Under the future scenario without Project implementation, changes in motor-vehicle traffic volumes are anticipated to increase average annual concentrations of the PM_{10} fraction by up to 0.16 µg/m³, i.e., up to 0.4 % of the air quality limit value (40 µg/m³). This maximum is reached near the access route to the southern part of the ETE1,2 site. Conversely, in locations that already have higher traffic volumes and lower vehicle speeds under the existing condition (e.g., Týn nad Vltavou), no significant impact is observed despite the increase in traffic, primarily because of the lower effect of road resuspension (emissions of dust particles deposited on the road surface, which depend on the number of passing vehicles; as traffic volumes increase, the quantity of dust deposited on the road decreases, ultimately reducing specific particulate emissions). The impact of New NPP ETE operation must also be added to these changes. The result maps produced show that the impact of New NPP ETE operation is manifested primarily within the New NPP ETE site (hundredths of µg/m³); at the nearest residential development, the contribution may be up to 0.005 µg/m³.

The highest calculated contribution of SMR ETE operation to the average annual ambient PM_{10} concentration is approximately 0.2 µg/m³, i.e., approximately 0.5 % of the air quality limit value. With the concurrent impacts of the change in background concentration due to natural traffic growth, the increase in traffic and stationary pollution sources associated with New NPP ETE operation, and operation of SMR ETE itself, an insignificant change in ambient air quality is expected at the most affected residential development. Average annual PM_{10} concentrations at the most affected residential development can be expected to remain below the applicable limit with a large margin.

For maximum short-term concentrations, the future scenario without Project implementation is expected to increase maximum daily concentrations of the PM_{10} fraction by up to 2 µg/m³, i.e., 4 % of the air quality limit value (50 µg/m³). This maximum is reached near the access route to the southern part of the ETE1,2 site and is again due primarily to increased resuspension of dust particles from the road as a result of increased traffic on roads with lower traffic volumes. Increased ambient concentrations can be expected primarily along roads with a lower background traffic load, where greater dust loading on the road, and therefore higher emissions due to increased traffic, can be expected. The impact of New NPP ETE operation must also be added to these changes. The result maps produced show that the impact of New NPP ETE operation is manifested primarily within the New NPP ETE site (tens of µg/m³); at the nearest residential development, the contribution may be up to 25 µg/m³.

The highest calculated contributions of SMR ETE operation to the maximum daily PM_{10} concentration are up to approximately 1.2 µg/m³, i.e., approximately 2.4 % of the air quality limit value. This maximum is reached near the access route to the SMR ETE site; at the nearest residential development, the operational contribution falls to low tenths of µg/m³. These highest possible daily concentration values may occur if a combination of the most adverse meteorological conditions persists continuously throughout the day. The probability that concentrations modeled at these levels will actually occur is low; actual values will be substantially lower. With the concurrent impacts of the change in background concentration due to natural traffic growth, the increase in traffic and stationary pollution sources associated with New NPP ETE operation, and operation of SMR ETE itself, an insignificant change in ambient air quality is expected at the most affected residential development. Maximum concentrations at the most affected residential development can be expected to remain below the applicable limit with a large margin.

For average annual concentrations of the $PM_{2.5}$ fraction, the future scenario without Project implementation is expected to increase average annual $PM_{2.5}$ concentrations by up to 0.04 µg/m³, i.e., up to 0.2 % of the air quality limit value (20 µg/m³). The impact of New NPP ETE operation, which is also entirely insignificant as for the PM_{10} fraction, must also be added to these changes.

The highest calculated contribution of SMR ETE operation to the average annual ambient $PM_{2.5}$ concentration is up to approximately 0.06 µg/m³, i.e., up to 0.3 % of the air quality limit value. These maxima are confined to the SMR ETE site itself; at the nearest residential development, the contributions reach negligible values. With the concurrent impacts of the change in background concentration due to natural traffic growth, the increase in traffic and stationary pollution sources associated with New NPP ETE operation, and operation of SMR ETE itself, an insignificant change in ambient air quality is expected at the most affected residential development. Average annual concentrations at the most affected residential development can be expected to remain below the applicable limit with a large margin.

The Project is therefore not expected to result in above-limit impacts in terms of average annual particulate-matter concentrations; likewise, the number of days exceeding the 24-hour limit is not expected to increase for maximum short-term concentrations.

For exposure to particulate matter, a cumulative assessment of the Project's impact together with the planned Temelín concrete mixing plant and recycling facility project (JHC1253) is also performed. Given the siting of that project near residential development, its impact at the southern edge of the municipality of Temelín is entirely dominant, while the impact of SMR ETE is entirely marginal in terms of cumulative impacts. Moreover, for the maximum concentrations reached, their interaction is significantly limited because the relative positions of the two sources cause them to be spatially separated, and their impacts at residential development do not add together to an extent that would lead to a more significant cumulative impact. Even with the interaction between operation of the concrete batching plant and operation of SMR ETE, the future scenario can therefore be considered below the applicable limits for particulate matter. The same applies to the planned Hůrka u Temelína – composting plant project (JHC1259).

A below-limit situation for particulate matter can be expected around the Project even under the tightened air quality limit values that are to apply from January 1, 2030. For the $PM_{2.5}$ fraction, total ambient concentrations can be expected to approach the new air quality limit value; however, if the air quality improvement program[1], which contains measures for attaining air quality limit values, is properly implemented, a continuing downward trend in ambient concentrations can be expected, providing a correspondingly greater margin for attaining the air quality limit value.

Benzene (BZN)

Under the future scenario without Project implementation, changes in motor-vehicle traffic volumes near the ETE1,2 site are expected to result in an entirely minimal increase in average annual benzene concentrations, on the order of ten-thousandths of µg/m^3. At other locations, despite increased traffic volumes, stagnation or an insignificant decrease in ambient concentrations can be observed, caused by a decrease in primary emissions from fuel combustion due to fleet renewal (improved vehicle emission standards), which offsets the effect of natural traffic growth in the area. The impact of New NPP ETE operation, which can be expected to be, at most, on the order of thousandths of µg/m^3, must also be added to these changes.

The highest calculated contribution of SMR ETE operation to the average annual ambient benzene concentration is up to approximately 0.004 µg/m^3, i.e., up to 0.08 % of the air quality limit value (5 µg/m^3).

With the concurrent impacts of the change in background concentration due to natural traffic growth, the increase in traffic and stationary pollution sources associated with New NPP ETE operation, and operation of SMR ETE itself, an entirely insignificant change in ambient air quality is expected at the most affected residential development. Average annual concentrations can be expected to remain below the applicable limit with a large margin.

A reliably below-limit situation for benzene can be expected even under the tightened air quality limit value that is expected to apply from January 1, 2030.

Benzo(a)pyrene (BaP)

Under the future scenario without Project implementation, changes in motor-vehicle traffic volumes are expected to increase average annual benzo(a)pyrene concentrations by up to 0.0016 ng/m^3, i.e., up to 0.16 % of the air quality limit value (1 ng/m^3). This maximum is reached near the main access routes to the site, where the greatest increases in traffic volumes are expected. These changes are caused primarily by secondary emissions, which depend on the quantity of dust particles, and therefore associated benzo(a)pyrene, on the road surface. The impact of New NPP ETE operation, which will likewise be insignificant and, at most, on the order of thousandths of ng/m^3, must also be added to these changes.

The highest calculated contribution of SMR ETE operation to the average annual ambient benzo(a)pyrene concentration is up to approximately 0.004 ng/m^3, i.e., up to 0.4 % of the air quality limit value (1 ng/m^3). With the concurrent impacts of the change in background concentration due to natural traffic growth, the increase in traffic and stationary pollution sources associated with New NPP ETE operation, and operation of SMR ETE itself, an insignificant change in ambient air quality is expected at the most affected residential development. Average annual concentrations at the most affected residential development can be expected to remain below the applicable limit with a large margin.

For benzo(a)pyrene, the air quality limit value in effect from January 1, 2030, will be the same as under the existing condition, so the future scenario will remain reliably below the applicable limit.

D.I.2.2. Impacts on climate

D.I.2.2.1. Impacts on local climate

Heat and water emissions from Project operation through cooling towers may potentially affect local climatic characteristics (changes in humidity and air temperature in the near-surface atmospheric layer, shading impacts from cooling-tower plumes, and water deposition). During the period of overlap, these impacts will interact with the impacts of the existing power plant (ETE1,2) and New NPP ETE in the maximum-output configuration of 2 × 1,700 MW_e.

[1] Air Quality Improvement Program, Southwest Zone CZ03, 2020 Update. Ministry of the Environment of the Czech Republic, 2021

The impacts of heat generation and evaporation, particularly from cooling towers, are evaluated in the 2025 study Assessment of the Impacts of SMR ETE Cooling Towers on the Microclimate, prepared by the Institute of Atmospheric Physics of the Czech Academy of Sciences, v. v. i. (hereinafter ÚFA), which is one of the source documents used to prepare this Documentation.

Waste heat from SMR ETE released to the atmosphere through cooling towers (CHV) is expected to be up to 900 MW_t, and evaporation from the SMR ETE cooling towers is up to 1,200 m^3/h. The SMR ETE cooling towers are modeled as a cooling system consisting of 26 fan-tower cells (arranged in a block of 2 × 13 cells), each cell having plan dimensions of 16 × 16 m and a height of 14.5 m. The modeled fan-tower block has a total area of 6,656 m^2 and is located in the southeastern part of the SMR ETE siting area.

The study assesses the impact of the cooling towers on changes in selected climatic characteristics in the area (reference meteorological values obtained from ČHMÚ monitoring results for 2013–2022) within a 60 × 60 km area of interest centered on the Temelín power plant site. The following parameters are assessed:

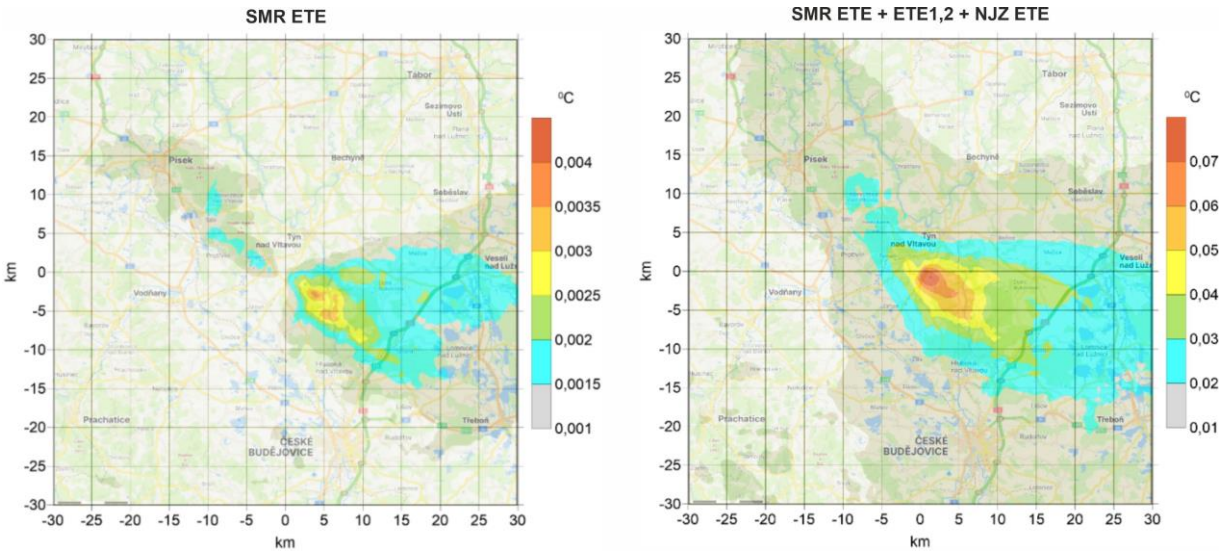
- average and short-term maximum changes in near-surface temperature and humidity,
- impact of visible CHV plumes on shading in the study area,
- mass quantity of emitted water deposited in the study area from the CHV.

The assessment is performed both separately for SMR ETE and for the interacting/cumulative impact of the entire cooling-tower system at the Temelín site, i.e., the SMR ETE Project, the existing ETE1,2 units, and the planned New NPP ETE.

The results show that SMR ETE alone has very little impact on the local microclimate. The average temperature increase in the study area is negligible, and maximum values over the entire period were below 0.5 °C. Similarly small increases were obtained for both average and maximum humidity at observation times. Deposition of emitted water is negligible in terms of its impact on the microclimate, specifically less than 1 g/m^2 per year. The only discernible impact of SMR ETE on the microclimate is shading. The study showed that even this relatively small source emits a visible plume that causes partial shading around the cooling towers, amounting to up to approximately 3 % of the time with otherwise unshaded sunlight in the nearest inhabited areas.

For the cumulative impact of SMR ETE + ETE1,2 + New NPP ETE, the average temperature increase in the surrounding area is reliably below 0.1 °C, which can be considered a very small impact on the local microclimate. The maximum temperature increase may reach up to 7 °C for short periods, which is perceptible but, on the other hand, lasts for a very short time and involves exceptional situations that would hypothetically have occurred only several times during the ten-year study period (specifically during 0.038 % of operating time, i.e., 33 hours over 10 years).

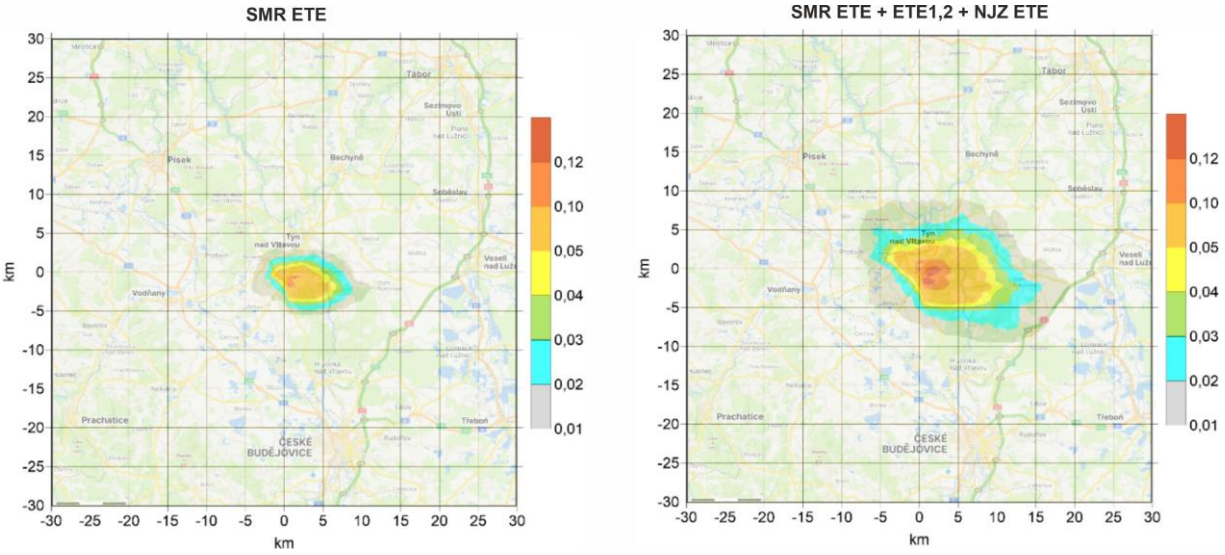
Fig. D.1: Average temperature increase during the reference period caused by operation of SMR ETE and operation of SMR ETE + ETE1,2 + New NPP ETE



Increases in near-surface humidity under cumulative impacts are small even at their observation-time maxima and do not alter the microclimate.

Cumulative shading by cooling-tower plumes at the nearest inhabited areas amounts to approximately 10 % of the time with otherwise unshaded sunlight and is practically undetectable in more distant settlements (5 km or more away).

Fig. D.2: Relative shading by a visible plume during the reference period caused by operation of SMR ETE and operation of SMR ETE + ETE1,2 + New NPP ETE



The cumulative impact of emitted-water deposition due to drift of a small proportion of water droplets from the CHV is small, practically negligible, and concentrated in the immediate vicinity of the sources. It is clear that roads immediately surrounding the assessed nuclear-facility sites will also be affected by emitted water. However, average water-deposition values are so small that they cannot affect overall traffic on these roads, particularly through the potential formation of ice. Specifically, values of up to 5 g/m^2 per year were determined (for comparison, 1 mm of precipitation per year corresponds to 1,000 g/m^2). The predicted impact on traffic safety is therefore negligible. If an exceptional increase in emitted-water deposition is nevertheless recorded following Project implementation, particularly during winter, the situation can be addressed operationally by taking anti-icing measures on the affected road sections.

The SMR ETE Project is located predominantly on agricultural land, much of which was previously used for the ETE1,2 construction site and subsequently reclaimed. It uses connections to existing infrastructure, particularly for raw-water supply and wastewater discharge. Project implementation will therefore involve only limited interventions in landscape vegetation, which will be appropriately compensated, and will not cause changes in vegetation and hydrological conditions that could affect local microclimatic conditions.

D.I.2.2.2 Impacts on global climate

Procedures recommended in Ministry of the Environment Guideline Ref. No. MŽP/2017/710/1985 of October 20, 2017, and in the document Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (EU, 2013) are used to assess the Project's impacts on climate. They generally require consideration of:

- the Project's impacts on climate change (as a result of direct and indirect greenhouse-gas emissions),
- the Project's vulnerability to climate change (as a result of temperature changes (heat waves and cold waves), long-term changes in precipitation (drought or, conversely, extreme precipitation), floods, storms and winds, landslides, sea-level rise, and similar factors).

The decisive factor is the Project's consistency with the relevant strategic documents of the Czech Republic in the field of climate.

These areas are summarized in the following subsections.

D.I.2.2.2.1. Impacts of the Project on climate change (mitigation measures)

As a nuclear source, the SMR ETE Project is a low-emission source in terms of specific greenhouse-gas emissions. This is apparent from the following table, based on a general comparison of individual energy sources conducted under the project "Enhancing understanding of the implications and opportunities of moving to carbon neutrality in the UNECE region across the power and energy intensive industries by 2050" (United Nations Economic Commission for Europe, 2022).

Table D.11: Total specific greenhouse-gas emissions for individual energy sources according to life-cycle assessment

	Coal	Gas	Nuclear energy	Hydropower	Wind power	Photovoltaics
Greenhouse-gas emissions [g $CO_{2\,eq}$/kWh]	753–1,095 (without CCS) 149–470 (including CCS)	403–513 (without CCS) 92–221 (including CCS)	5.1–6.4	6.1–147	7.8–16 (onshore) 12–23 (offshore)	7–83

Source: Carbon Neutrality in the UNECE Region: Integrated Life-cycle Assessment of Electricity Sources. UNECE, 2022.

This basic comparison shows that, in terms of greenhouse-gas emissions, nuclear power is on par with or better than renewable sources.

As part of preparing this Documentation, an independent analysis of greenhouse-gas emissions associated with electricity generation at SMR ETE was also prepared in response to a requirement in the Conclusion of the screening and scoping procedure for the SMR ETE Project. It is based on the life-cycle assessment (LCA) methodology, which follows the framework recommended by the European Commission and international standards for calculating equivalent greenhouse-gas emissions, particularly the GHG Protocol and IPCC guidelines. LCA is governed by the following international standards:

- ISO 14040:2006 - "Environmental management - Life cycle assessment - Principles and framework", which establishes general principles and a framework for life-cycle assessment, and
- ISO 14044:2006 - "Environmental management - Life cycle assessment - Requirements and guidelines", which defines requirements for conducting analyses, collecting data, assessing impacts, and interpreting results.

The calculation of CO_2 emissions from electricity generation at SMR ETE using the LCA methodology includes the following phases:

- fuel cycle: mining, conversion, enrichment, fabrication, and fuel transport,
- construction: includes concrete, steel, other construction materials, and transport,
- operation: consumption of potable and process water and generation of wastewater,
- waste: nonradioactive (municipal, industrial, wastewater) and radioactive (radioactive waste and spent nuclear fuel),
- decommissioning,
- other operating emissions (maintenance, upgrades, and consumption of auxiliary media).

Because SMR ETE will use pressurized-water reactor technology, existing life-cycle analysis data for comparable technologies and the standard fuel cycle (mining, conversion, enrichment, fuel-assembly fabrication, transportation, use, and storage of spent fuel) can be applied. The calculation assumes a Generation III+ reactor with an operating life of 60 years, a total net electrical output of up to 500 MW_e, 90 % availability, and a standard operating time of 8,760 hours per year, corresponding to annual electricity generation of 3.55 TWh[1]. Annual consumption of UO_2 nuclear fuel is conservatively assumed to be 13.5 t (i.e., higher than expected). The calculation also includes the quantities of materials consumed in power plant construction, transportation and water consumption, and the quantities of waste from power plant operation.

The analysis results in a total SMR ETE carbon footprint of 9.2 g CO_2/kWh, which corresponds to approximately 1.96 million metric tons of CO_2 over 60 years of operation. The largest share (approximately 73 %) is accounted for by nuclear-fuel fabrication and supply (810 t of UO_2 over 60 years, enriched to 5 %). Other significant contributions are made by materials used during construction (concrete, steel, and other structural materials), transportation, maintenance and operation, decommissioning, and waste processing. The itemized analysis results are presented in the following table[2].

Table D.12: Specific CO_2 emissions for SMR ETE

Area	Specific emissions [g CO_2/kWh]	Share of total [%]
Fuel (UO_2)	6.781	73.4 %
Construction (concrete, steel, materials)	1.732	18.7 %
Operating and technical emissions	0.359	3.9 %
Radioactive waste + spent nuclear fuel	0.051	0.6 %
Other waste and water	0.082	0.9 %
Decommissioning (D&D)	0.235	2.5 %
Total	9.240	100.0 %

Even considering its conservative assumptions, the analysis results essentially confirm the above UNECE (2022) conclusions concerning the very low specific greenhouse-gas emissions of nuclear sources compared with other energy sources.

In this respect, the Project is also consistent with the sustainability criteria (EU taxonomy) under Regulation (EU) 2020/852 of the European Parliament and of the Council of June 18, 2020, on the establishment of a framework to facilitate sustainable investment (the "Taxonomy Regulation"), or with the proposed delegated act of February 2, 2022, amending Commission Delegated Regulations (EU) 2021/2139 and 2021/2178.

The data presented show that the Project is itself part of mitigation measures, i.e., measures to reduce greenhouse-gas emissions and consequently mitigate/slow climate change. In this case, the principal benefit is the Project's synergistic impact in the gradual transition of the Czech Republic's energy system from combustion sources to renewable and low-carbon sources, which can be considered a sustainable activity in accordance with the taxonomy.

[1] The calculation assumes SMR ETE auxiliary consumption of 50 MW_e, i.e., electrical output supplied to the grid of 450 MW_e.

[2] This analysis does not include CO_2 emissions associated with permanent disposal of spent nuclear fuel as nuclear waste. This is due both to the high degree of uncertainty associated with the specific future technology and deep geological repository site and to the fact that, according to international LCA studies, this process accounts for a negligible share of the total carbon footprint of the nuclear fuel cycle (typically <0.5 %). However, emissions associated with processing and interim storage of spent nuclear fuel at the power plant are included in the balance.

D.I.2.2.2.2. Vulnerability of the Project to climate change (adaptation measures)

Adaptation to climate change is defined as the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm; in some natural systems, human intervention may facilitate adjustment to the expected climate and its impacts (Intergovernmental Panel on Climate Change, IPCC, 2014). Successful adaptation to climate change reduces vulnerability and increases resilience to its impacts without compromising environmental quality or the economic and social potential for development.

The SMR ETE Project is being prepared for a long period of operation. As follows from the schedule provided in Chapter B.I.6.4.2. Schedule for operation and decommissioning of nuclear facilities at the site (page 190 of this Documentation), termination of SMR ETE operation can be expected around 2095. The impacts of climate change therefore cannot be ruled out during this period. The analyses performed in preparing this Documentation therefore also consider the impact of climate change through both a +2 °C warming scenario by 2100 and the SSP245 climate-change scenario (partial stabilization of emissions, a middle-of-the-road pathway with deteriorating environmental systems), as well as four representative climate models for the 2060 and 2080 reference periods with an outlook to 2100[1]. This applies particularly to SMR ETE water-abstraction requirements, development of the hydrological characteristics of the affected watercourses, including evaluation of water-supply reliability, and evaluation of SMR ETE impacts on the aquatic environment, which are addressed in the relevant chapters of this Documentation.

As follows from the data provided in the relevant chapters of the Documentation, the SMR ETE Project represents a robust solution that is reliably resilient to potential climate change at the Temelín site. The fundamental adaptation measures are the Project's technical design, which is resilient to anticipated climatic loads, and emergency preparedness enabling rapid recovery of the power plant following extreme events. The SMR ETE Project will be designed to ensure sufficient capacity to respond to extreme and unforeseeable external events and the resulting climatic loads and to ensure that safety-significant systems remain functional under these extreme conditions. These areas are covered both by the relevant design and construction standards and by climatic-load data derived from the characteristics of the siting area. These factors are interrelated: the Project's technical and technological systems will be designed for the climatic loads that may arise.

The issue of technical resilience therefore extends beyond environmental impact assessment in practical terms and is addressed at the design or construction level. It must be emphasized that climatic loads and their development over time are fundamental factors subject to the conditions for the use of nuclear energy in accordance with the Atomic Act (see Chapter B.I.6.2.2. Basic requirements for nuclear power plants, page 86 of this Documentation). The Project takes into account statutory requirements for periodic safety assessment in accordance with Decree No. 162/2017 Coll., on requirements for safety assessment under the Atomic Act, as amended, which includes verification that potential loads caused by climatic effects are periodically reviewed. The Project thereby respects the principles of adaptive management, i.e., preparedness to take newly acquired knowledge into account on an ongoing basis, in accordance with the above Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (EU, 2013).

D.I.2.2.2.3. Strategic documents of the Czech Republic

The Project respects all relevant strategic documents of the Czech Republic in the field of climate:

Climate Protection Policy of the Czech Republic (2017, 2024 update). This policy defines the principal climate-protection objectives and measures at the national level so as to ensure achievement of greenhouse-gas emission-reduction targets in connection with obligations arising from international agreements (the United Nations Framework Convention on Climate Change and its Kyoto Protocol, the Paris Agreement, and commitments arising from European Union legislation). This climate-protection strategy through 2030, with an outlook to 2050, should thus contribute to the long-term transition to a sustainable low-emission economy in the Czech Republic.

Climate Change Adaptation Strategy for the Czech Republic (2015, 2021 update). This strategy is the Czech Republic's national adaptation strategy and, in addition to assessing the probable impacts of climate change, contains proposals for specific adaptation measures, a legislative and partial economic analysis, etc.

National Climate Change Adaptation Action Plan (2017, first update 2021). This action plan is the implementation document for the Climate Change Adaptation Strategy for the Czech Republic (2015, 2021 update) and develops the measures specified in the Czech Republic's Adaptation Strategy into specific tasks. In accordance with the national adaptation strategy, the updated EU Strategy on Adaptation to Climate Change (2021), and the European Climate Law, the action plan's principal objective is to increase the Czech Republic's preparedness for climate change through the proposed measures and tasks, i.e., to reduce vulnerability and increase the resilience of human society and ecosystems to climate change, thereby limiting its adverse impacts. The action plan is structured according to the manifestations of climate change: long-term drought; floods and flash floods; rising temperatures; extreme meteorological events (heavy

[1] The selected SSP245 climate-change scenario is considered sufficiently conservative among the four scenarios for possible future global development trajectories in terms of emissions: SSP1-2.6 (SSP126): low emissions, sustainable development, and achievement of stringent climate-protection targets; SSP2-4.5 (SSP245): partial stabilization of emissions, a middle-of-the-road pathway with deteriorating environmental systems; SSP3-7.0 (SSP370): high emissions, regional rivalry, and limited economic development; and SSP5-8.5 (SSP585): extreme emissions and fossil-fuel-based development. The three global climate models used (GCM: EC-EARTH3, MPI-ESM1-2-HR, and TAIESM1) are selected conservatively with regard to appropriate simulation of the Central European climate and are supplemented by one regional climate model (RCM: ALADIN-CLIMATE/CZ), which has high spatial resolution and covers almost all of Europe, with the Czech Republic at its center.

precipitation, extremely high temperatures or heat waves, and extreme winds); and wildfires. The individual chapters identify the key sectors affected by each manifestation of climate change and describe the principal impacts, vulnerabilities, and risks. At the time this Documentation was prepared, the second update of the national action plan was being prepared/approved.

National Energy and Climate Plan of the Czech Republic (2019, 2023 update). The obligation to prepare the National Energy and Climate Plan arises from Article 3 of the EU Regulation on the Governance of the Energy Union and Climate Action, which entered into force on December 24, 2018. The document contains objectives and principal policies in all five dimensions of the Energy Union. Through this document, Member States are required, among other things, to inform the European Commission of their national contribution to the approved European targets for greenhouse-gas emissions, renewable energy sources, energy efficiency, and interconnectivity of the electricity or transmission system. On October 18, 2023, the Government of the Czech Republic acknowledged the draft update of the National Energy and Climate Plan of the Czech Republic, which outlines how the Czech economy will undergo decarbonization and meet its European climate and energy commitments through 2030.

D.I.2.3. Impacts during construction or termination of operation

The impact of SMR ETE construction is evaluated in the air dispersion study (see Annex 5.3 to this Documentation), which is referenced for details. Its conclusions are summarized below.

Emission sources during the construction phase will include bulk earthworks, activities during New NPP construction itself, and traffic on surrounding roads. Based on the equipment-deployment schedule for the individual activities, including estimated distances traveled by construction machinery, the construction phase during which a very substantial proportion of transportation occurs (particularly transportation of materials for concrete production and prefabricated modules from area C to area J and then from area J to the SMR area) is quantified as the period with the highest emissions. In terms of emissions of the pollutants monitored, this stage will exceed even the bulk earthworks phase, particularly because of the substantial distance traveled between the contemplated remote areas. In addition, a potential overlap with the initial phase of New NPP ETE preparation (an interacting/cumulative impact) is considered during the main phases of SMR ETE construction; selection of this temporal overlap therefore represents the worst possible situation that may arise in the monitored area in terms of ambient concentrations. This phase is therefore selected as the reference for a conservative assessment of impacts on ambient air during construction.

Particulate matter is the principal substance determining health impact assessment during construction. Its principal source is secondary dust generated by the movement of trucks and construction machinery over the main construction-site and construction-facility areas. Construction machinery and vehicles moving around the construction site will also be emission sources, producing emissions from fuel combustion.

For nitrogen dioxide, benzene, and benzo(a)pyrene, the impact during the overlap in SMR ETE and New NPP ETE construction is due to traffic volumes associated with transporting persons and materials, including transportation of materials between the individual construction areas. Higher SMR ETE contributions can be expected predominantly in the main construction-site area, where changes in average annual concentrations will reach up to 1 % of the applicable air quality limit values. For short-term nitrogen dioxide concentrations, a short-term impact of approximately 4 % of the statutory limit can be expected. This situation will be limited in time and can only occur under the worst dispersion conditions. Given the substantial margin below the air quality limit values, the ambient air quality situation during construction can be considered below the applicable limits for these pollutants, both at the nearest residential development in the surrounding municipalities and, in practice, even in the immediate vicinity of the construction site.

Conversely, for particulate matter, secondary emissions of dust particles from the activities performed and vehicle movement on the construction areas will be entirely dominant. For average annual particulate-matter concentrations (PM_{10}, $PM_{2.5}$), concentrations can be expected to increase by up to tens of percent of the air quality limit values at the boundary of the SMR ETE construction site, while a contribution of up to single-digit percentages of the air quality limit values is expected at the nearest residential development. With the concurrent impacts of the change in background concentration due to natural traffic growth, the increase in traffic and construction activities associated with New NPP ETE construction, and SMR ETE construction itself, a change in ambient air quality of low significance is expected at the most affected residential development; average annual concentrations are anticipated to remain below the applicable limits.

For maximum daily concentrations, the contributions from the most demanding stage (construction of the main generating unit) reach well above the air quality limit value even at substantial distances from the SMR ETE construction site, at the nearest residential development. These highest possible daily concentration values may occur provided that the combination of the most unfavorable meteorological conditions continues uninterrupted throughout the day and during the period when these activities are performed. According to the wind-rose data, such unfavorable conditions can be expected during only a limited period of the year. The probability of the actual occurrence of the concentrations modeled in this way is low. In reality, values half as high or even lower can be expected. Under the existing condition, exceedances can be expected approximately once per year in the nearest municipalities; during a possible overlap in construction of New NPP ETE and SMR ETE, the number of days exceeding the daily maximum may increase by approximately 5 days per year, so the resulting ambient air quality situation will remain below the applicable limit.

More detailed data, graphical presentation of the results, and a set of possible measures to minimize the impacts of activities during SMR ETE construction are provided in the air dispersion study (see Annex 5.3 to this Documentation).

For exposure to particulate matter, potential cumulative impacts with the planned Temelín concrete mixing plant and recycling facility project (JHC1253) must also be assessed. Here again, for the concentrations reached, their interaction is limited because the relative positions of the two sources cause them to be spatially separated, and their impacts at residential development do not add together to an extent that would lead to a more significant cumulative impact (the maximum impact of each project can be expected under different meteorological conditions). Even with the interaction between operation of the concrete batching plant and SMR ETE construction, the future scenario can therefore be considered below the applicable limits for particulate matter. The same applies to the planned Hůrka u Temelína – composting plant project (JHC1259).

A below-limit situation for the pollutants assessed can be expected at the nearest residential development even under the tightened air quality limit values that are to take effect on January 1, 2030. For maximum daily PM_{10} concentrations, total ambient concentrations theoretically may approach the permitted number of exceedances. Nevertheless, provided that the generally applicable statutory measures for preventing and limiting dust during construction are implemented, below-limit impacts can be expected even during maximum construction activity. For the $PM_{2.5}$ fraction, total ambient concentrations can likewise be expected to approach the air quality limit value; however, if the air quality improvement program containing measures for attaining air quality limit values is properly implemented, the continuing trend of declining ambient concentrations and therefore more reliable compliance with the air quality limit value can be expected.

Given that emissions from transportation and ancillary activities at the site during termination of operation will not exceed emissions during construction, similarly insignificant impacts are also expected during the termination-of-operation phase.

No impacts on climate are expected during construction or termination of operation.

D.I.3. Impacts on the noise environment and other physical and biological characteristics

3. Impacts on the noise environment and any other physical and biological characteristics (e.g., vibration, radiation, and generation of nuisance impacts)

D.I.3.1. Impacts of noise

D.I.3.1.1. Noise from stationary sources

The impact of SMR operation is evaluated in the acoustic study (see Annex 5.2 to this Documentation), which is referenced for details. Its results are summarized below.

All calculations for the future scenario assume maximum operating output, i.e., maximum concurrent operation of process equipment at the SMR site. The calculation also considers concurrent operation of the existing Temelín Nuclear Power Plant (ETE1,2) in 2034, including its expansion by New NPP ETE in 2042, concurrent operation of the Kočín transformer/substation, and traffic on nonpublic roads that meet the definition of a stationary source.

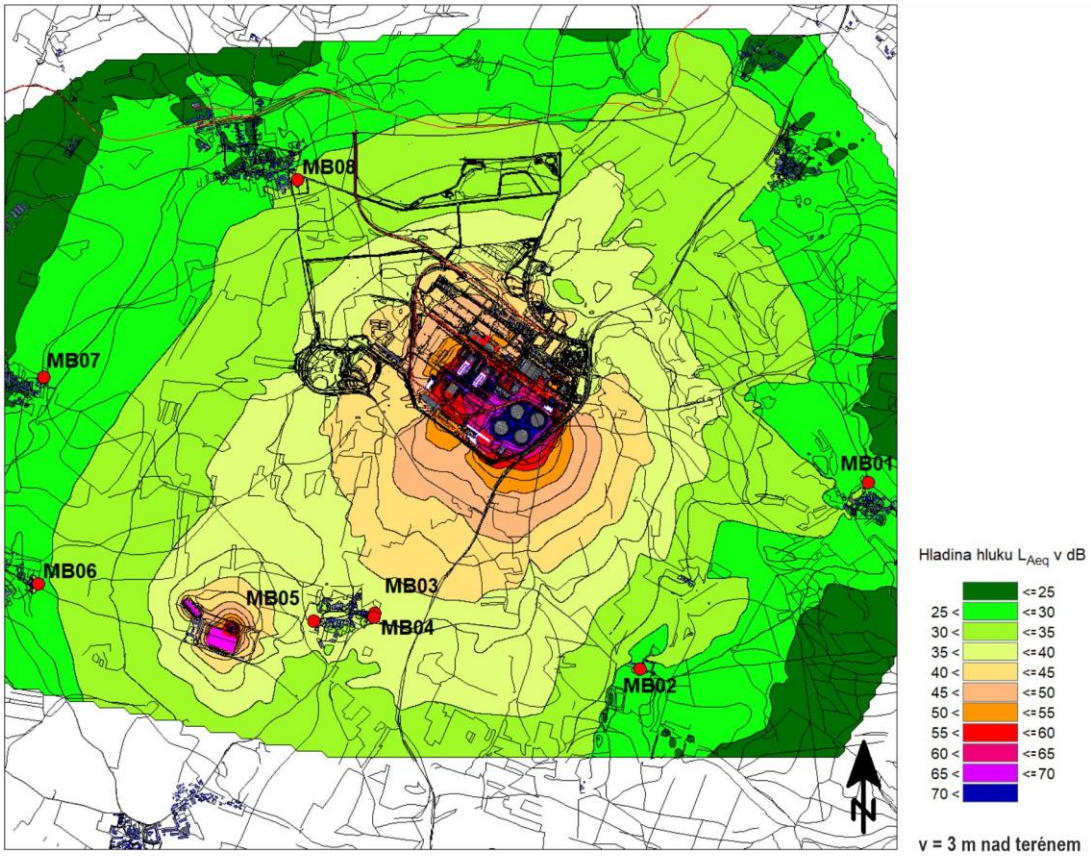
Equivalent sound pressure levels at the most affected protected outdoor spaces or protected outdoor spaces of buildings are presented in the following table.

Table D.13: Noise from operation of stationary sources - future scenario

Reference point	Location	Height	Limit	ETE1,2	ETE1,2 + SMR ETE	ETE1,2 + SMR ETE + New NPP ETE
				2025	2034	2042
		[m]	$L_{Aeq,T}$ [dB] day/night			
MB01	Edge of Litoradlice	3	50/40	29.7	30.2	30.7
		6		30.2	30.6	31.2
MB02	Near the former farmstead beyond the former village of Knín	3		31.3	32.0	33.2
		6		32.2	32.6	33.9
MB03	North-eastern edge of Kočín	3		38.4	37.8	39.6
		6		39.0	38.3	39.9
MB04	North-eastern edge of Kočín	3		38.8	38.1	39.7
		6		38.8	38.3	39.7
MB05	South-western edge of Kočín	3		36.1	36.2	36.9
		6		37.2	37.3	37.8
MB06	Edge of Malešice	3		30.5	30.8	33.3
		6		31.2	31.5	33.9
MB07	Edge of Sedlec	3		27.0	27.7	32.4
		6		27.6	28.4	32.8
MB08	Edge of Temelín	3		30.3	30.8	37.4
		6		30.6	31.1	37.5

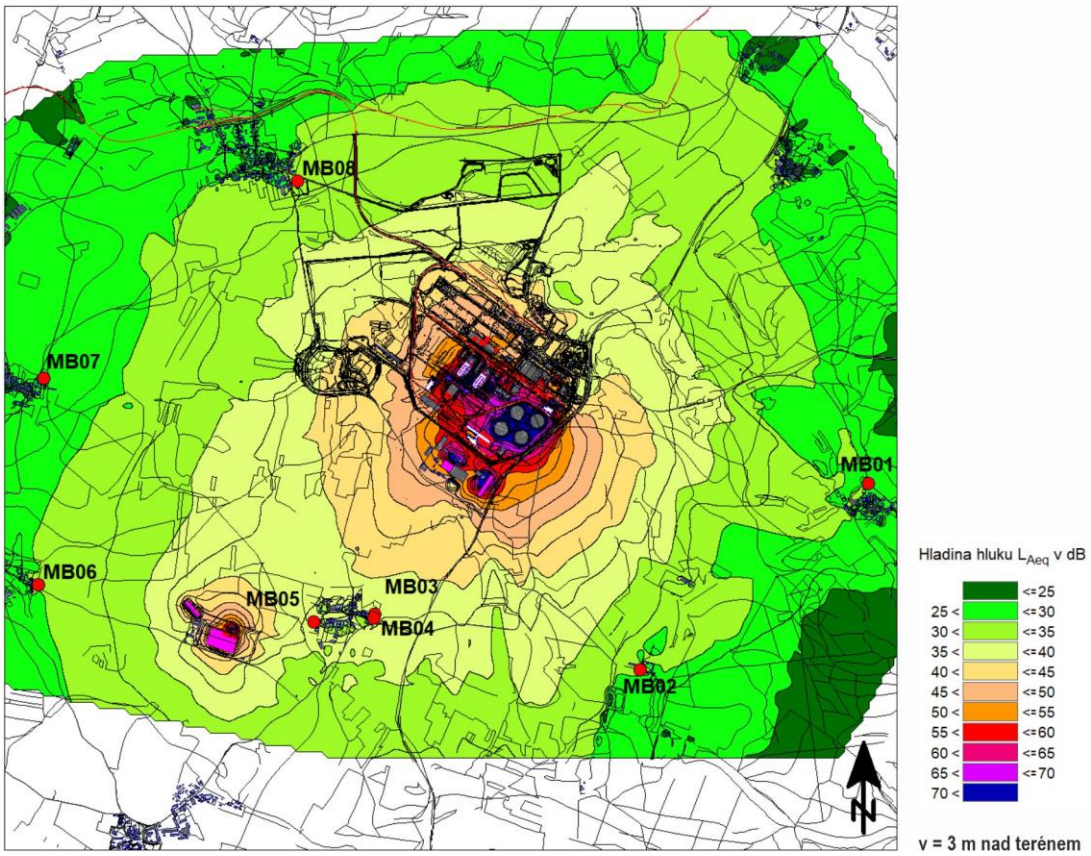
Note: For a map showing reference-point locations, see Chapter C.II.3.1. Noise (page 231 of this Documentation).

Fig. D.3: Spatial distribution of noise from operation of stationary sources - existing/future scenario, operation of ETE1,2 (2025)



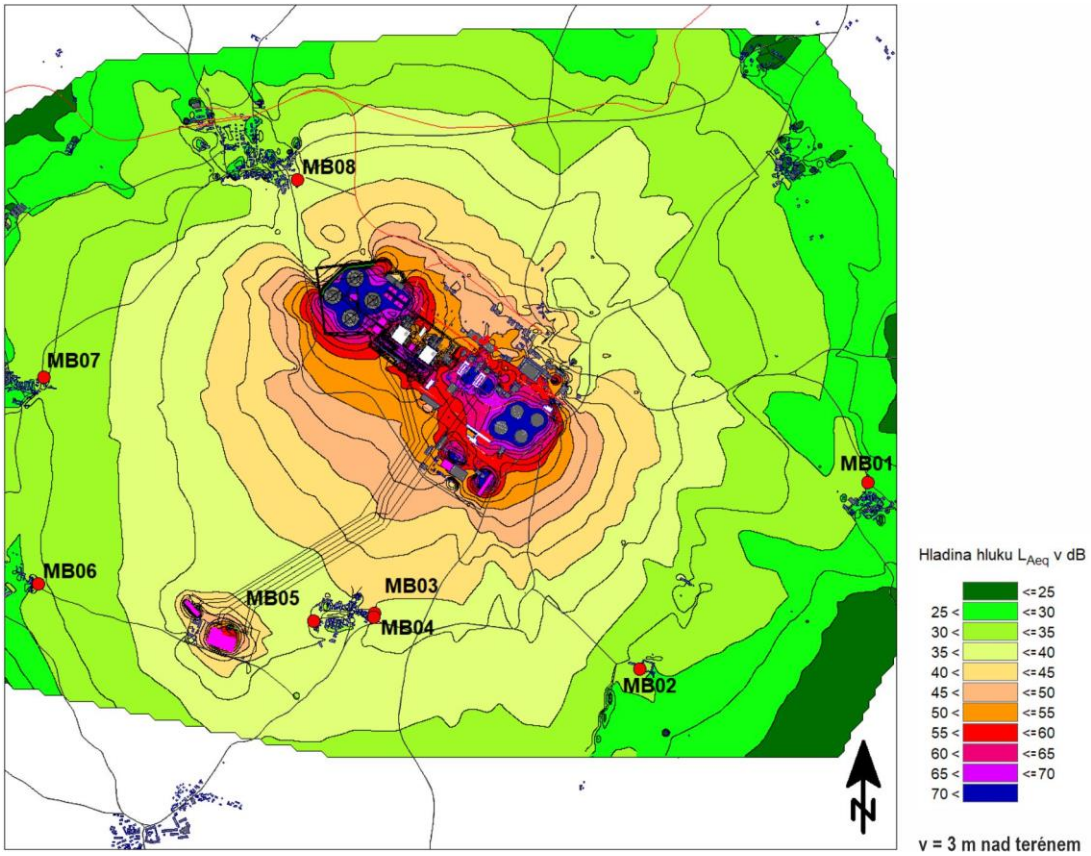
Hladina hluku L_{Aeq}v dB	Noise level L_{Aeq} in dB
v = 3 m nad terénem	h = 3 m above ground

Fig. D.4: Spatial distribution of noise from operation of stationary sources - future scenario, operation of ETE1,2 + SMR ETE (2034)



Hladina hluku L_{Aeq}v dB	Noise level L_{Aeq} in dB
v = 3 m nad terénem	h = 3 m above ground

Fig. D.5: Spatial distribution of noise from operation of stationary sources - future scenario, operation of ETE1,2 + SMR ETE + New NPP ETE (2042)



Hladina hluku L_{Aeq}v dB	Noise level L_{Aeq} in dB
v = 3 m nad terénem	h = 3 m above ground

The results show that under the individual future scenarios, defined by interacting operation of SMR ETE and the Temelín Nuclear Power Plant (ETE1,2, or ETE1,2 + New NPP ETE), the public-health noise limits for daytime and nighttime under Government Decree No. 272/2011 Coll., on protection of health against the adverse effects of noise and vibration, as amended, will be met at all reference points (protected outdoor spaces of buildings).

The Temelín concrete mixing plant and recycling facility project (JHC1253) is also being prepared in the affected territory; its operation is being sited in the existing industrial complex in the southern part of the municipality, in the part most distant from residential development. In addition, the facilities assessed are separated from the development by the existing buildings of this industrial complex. In view of these facts, above-limit impacts at the nearest residential development cannot be anticipated even when they interact with the SMR ETE Project assessed. The same applies to the planned Hůrka u Temelína – composting plant project (JHC1259).

Operation of the Project may also involve exceptional, preannounced tests of individual items of equipment. As under the existing condition, very short-term and time-limited nuisance impacts cannot be ruled out. These are exceptional conditions intended to ensure safety and therefore cannot be assessed against any public-health noise limit. During Project operation, short-term nuisance impacts can therefore be expected during these tests; however, they will be lower than under the existing condition and will not under any circumstances constitute a health risk to residents of the nearest municipalities.

D.I.3.1.2. Traffic noise

Noise from traffic on public roads is evaluated in the acoustic study (see Annex 5.2 to this Documentation), which is referenced for details. Its results are summarized below.

Traffic noise on public roads will be associated with the contribution of Project-related traffic to background road-traffic volumes on roads forming the principal access routes to the Temelín site.

The noise environment during operation is evaluated both for the future scenario in 2034 without SMR ETE operation (i.e., considering only natural traffic growth on the public-road network) and for the future scenario with SMR ETE operation (i.e., considering traffic generated following Project

implementation). The transport requirements of the planned New NPP ETE project are also considered in the more distant future scenario for 2042.

Given natural traffic growth and the traffic newly generated following implementation of SMR ETE or New NPP ETE, noise levels can be expected to increase accordingly compared with the current situation. The resulting equivalent sound pressure levels (2 m in front of the facades of the reference, i.e., potentially most affected, protected outdoor spaces of buildings) are presented in the following table.

Table D.14: Noise from traffic on public roads - future scenario

Reference point	Story	Limit	ETE1,2		ETE1,2 + SMR ETE		ETE1,2 + New NPP ETE		ETE1,2 + SMR ETE + New NPP ETE	
			2034				2042			
		day/night	day	night	day	night	day	night	day	night
			$L_{Aeq,T}$ [dB]							
KOC 1	1st	68/58	53.4	45.8	53.5	45.8	53.6	46.0	53.7	46.1
	2nd		54.1	46.5	54.2	46.5	54.3	46.7	54.4	46.8
TEM 1	1st		62.0	54.0	62.0	54.0	62.0	54.0	62.0	54.0
	2nd		62.3	54.4	62.3	54.4	62.3	54.4	62.3	54.4
TEM 2	1st		59.1	51.3	59.2	51.4	59.2	51.4	59.2	51.4
	2nd		62.4	54.6	62.4	54.7	62.5	54.7	62.5	54.7
TEM 3	1st		63.7	56.2	63.7	56.3	63.9	56.3	63.9	56.3
	2nd		64.3	56.9	64.4	56.9	64.6	57.0	64.6	57.0
TEM 4	1st		64.5	57.0	64.5	57.1	64.8	57.1	64.8	57.2
	2nd		64.9	57.4	64.9	57.4	65.1	57.5	65.1	57.5
TEM 5	1st		63.4	55.8	63.4	55.8	63.7	55.9	63.7	55.9
	2nd		64.8	57.1	64.8	57.2	65.1	57.2	65.1	57.2
TEM 6	1st		56.1	47.9	56.1	47.9	56.2	48.3	56.6	48.3
	2nd		57.4	49.2	57.5	49.3	57.5	49.6	58.0	49.6
TEM 7	1st		59.0	50.8	59.0	50.8	59.1	51.1	59.5	51.1
	2nd		60.3	52.1	60.4	52.1	60.4	52.5	60.9	52.5
TYN 1	1st		61.8	53.8	61.9	54.0	62.1	54.2	62.2	54.6
	2nd		63.5	55.5	63.6	55.7	63.8	55.9	63.9	56.3
TYN 2	1st		56.5	48.3	56.6	48.6	56.7	48.9	56.8	49.1
	2nd		57.3	49.2	57.4	49.5	57.6	49.7	57.6	49.9
	3rd		58.1	50.0	58.2	50.3	58.3	50.5	58.4	50.7
	4th		58.8	50.7	58.9	51.0	59.1	51.2	59.2	51.4
	5th		59.5	51.3	59.5	51.6	59.7	51.9	59.8	52.1
	6th		60.1	52.0	60.2	52.3	60.4	52.5	60.4	52.7
TYN 3	1st		58.4	50.2	58.5	50.6	58.7	50.8	58.8	50.9
	2nd		59.5	51.3	59.6	51.7	59.8	51.9	59.8	52.0
	3rd		60.6	52.3	60.7	52.7	60.8	52.9	60.9	53.0
	4th		61.5	53.3	61.6	53.7	61.8	53.9	61.9	54.0
	5th		62.0	53.8	62.1	54.2	62.3	54.4	62.3	54.5
	6th		62.2	54.0	62.3	54.4	62.5	54.6	62.5	54.7
TYN 4	1st		62.5	54.3	62.6	54.5	62.8	54.7	62.8	54.8
	2nd		65.4	57.3	65.5	57.4	65.7	57.6	65.8	57.7
TYN 5	1st		57.9	50.7	57.9	50.7	58.1	51.0	58.2	50.9
	2nd		62.9	55.6	62.9	55.6	63.1	55.9	63.1	55.8
TYN 6	1st		62.9	55.6	62.9	55.7	63.1	55.8	63.3	55.8
	2nd		64.1	56.8	64.1	56.8	64.3	57.0	64.4	57.0
ZVER 1	1st		58.1	50.6	58.3	50.8	58.4	51.2	58.6	51.4
	2nd		58.9	51.5	59.2	51.7	59.3	52.1	59.5	52.3
ZVER 2	1st		61.9	54.4	62.0	54.6	62.2	55.0	62.3	55.2
	2nd		63.2	55.7	63.4	55.9	63.5	56.4	63.7	56.5

Note: For a map showing reference-point locations, see Chapter C.II.3.1. Noise (page 231 of this Documentation).

The results show that under the individual future scenarios, defined by interacting operation of SMR ETE and the Temelín Nuclear Power Plant (ETE1,2, or ETE1,2 + New NPP ETE), the public-health noise limits for daytime and nighttime under Government Decree No. 272/2011 Coll., on protection of health against the adverse effects of noise and vibration, as amended, will be met at all reference points (protected outdoor spaces of buildings).

The data further show that the greatest increases caused by SMR ETE operation can be expected on access routes in the municipalities of Temelín or Týn nad Vltavou; these are increases on the order of low tenths of a dB, which can be considered an unassessable change. At other locations, the contributions are practically negligible.

These conclusions can also be applied to interaction with the planned Temelín concrete mixing plant and recycling facility project (JHC1253), which is advantageously located in a complex at the edge of the municipality with a direct connection to a class II road; given the volume of traffic generated in connection with this project, no significant impact on the noise environment at the nearest residential development can be expected. The same applies to the planned Hůrka u Temelína – composting plant project (JHC1259).

In view of the above facts, no additional noise-control measures are proposed for traffic noise.

D.I.3.2. Impacts of ionizing radiation

D.I.3.2.1. Methodological information

This chapter evaluates the radiological impacts of operational states. More detailed data are provided in Annex 5.1 to this Documentation (Radiological Impact Assessment), which is referenced for details. The procedures and results are summarized below.

Radiological impacts in the event of radiation extraordinary events are not addressed in this chapter. They are evaluated in Chapter D.II. CHARACTERISTICS OF RISKS TO PUBLIC HEALTH, CULTURAL HERITAGE, AND THE ENVIRONMENT (page 429 of this Documentation).

During normal and abnormal operation of a nuclear power plant, the impacts of ionizing radiation may be manifested through small, controlled, and monitored quantities of radioactive substances released into the environment as atmospheric discharges (from the ventilation stack) and discharges into watercourses (from monitoring tanks).

The assessment of impacts of ionizing radiation determines whether the specified limits or generally binding limit values are met. Act No. 263/2016 Coll., the Atomic Act, as amended, and implementing Decree No. 422/2016 Coll., on radiation protection and security of a radionuclide source, as amended, establish a general public-exposure limit and dose constraints for radiation workers. The general exposure limit from all authorized or registered activities (excluding medical applications) for an individual member of the public is 1 mSv/year for the sum of effective doses from external exposure and committed effective doses from internal exposure. The nuclear-facility operator must ensure that releases of radioactive substances into the environment do not result in the dose constraint of 0.25 mSv (250 μSv) per year for a representative person being exceeded. In addition, the total individual effective dose, comprising the sum of effective doses from external exposure and committed effective doses from internal exposure, will not exceed 0.2 mSv (200 μSv) per year for atmospheric discharges and 0.05 mSv (50 μSv) per year for discharges into surface water. If multiple nuclear facilities are located at a site (as at the Temelín site), the aggregate impacts of ionizing radiation from all nuclear facilities at the site are assessed in relation to a representative person.

Under Section 2(3)(j) of Act No. 263/2016 Coll., the Atomic Act, as amended, a representative person is defined as an individual from the population representing a model group of natural persons who are most exposed from the source and by the pathway concerned. This is a person usually living in a municipality near the power plant whose lifestyle habits (consumption of water and local foods and time spent outdoors) are defined so as to maximize the dose received.

The ionizing-radiation impact assessment performed therefore assesses the impact of SMR ETE both separately and, in particular, in interaction with the currently operating ETE1,2 units, the planned New NPP ETE, and the existing ETE1,2 spent nuclear fuel storage facility[1]. Bounding cases of maximum impacts are identified and evaluated in detail for the assessment of interacting impacts. The assessment consists of computational determination of the maximum annual and lifetime individual effective dose to a representative person and other residents, performed conservatively (on a bounding basis) for SMR ETE and all relevant and reasonably foreseeable interacting impacts (ETE1,2, New NPP ETE, and the spent nuclear fuel storage facility). These doses are evaluated both in relation to compliance with statutory limits and dose constraints and as a basis for public health impact assessment (see Chapter D.I.1. Impacts on the population and public health, page 313 of this Documentation).

To maintain continuity of approach, the cumulative contribution of the operating ETE1,2 units and planned New NPP ETE is taken from the New NPP ETE EIA documentation[2] for the maximum contemplated New NPP ETE output configuration of 2 × 1,700 MW_e.

Doses in the more distant surroundings, including the highest doses reached for persons living in neighboring countries, collective doses, and their comparison with the natural dose rate are also evaluated.

As a final factor, doses and dose rates for the most exposed representatives of fauna and flora are evaluated and compared with the recommended reference values under IAEA Guide GSG-10: Prospective Radiological Environmental Impact Assessment for Facilities and Activities (2018).

[1] No radionuclides are released into the environment from the ETE spent nuclear fuel storage facility during operational states; its impact on the dose to a representative person is therefore manifested only through direct exposure, which is very small.

[2] https://portal.cenia.cz/eiasea/detail/EIA_MZP230

D.I.3.2.2. Input data for the assessment of impacts of ionizing radiation

The fundamental input for assessing the impacts of ionizing radiation from nuclear-facility operation is conservative determination of the source term, i.e., the maximum anticipated radioactive discharges from SMR ETE and other existing or planned nuclear facilities at the site. The contribution of direct exposure from the ETE spent nuclear fuel storage facility is considered in accordance with the EIA documentation for the planned expansion of that facility's storage capacity[1].

For SMR ETE, the source-term values are based on authorized estimates provided by the technology supplier, Rolls-Royce SMR (RR SMR). The discharge values for tritium (H-3) and the C-14 carbon isotope have been conservatively increased from the RR SMR GDA values based on comparison with long-term operation of ETE1,2 and also Dukovany Units 1–4. In general, operating experience provides a realistic basis for expecting actual discharges of all other radionuclides to be lower than the design values.

The source terms for ETE1,2 and New NPP ETE are identical to those used for the assessment in the New NPP ETE EIA documentation. For ETE1,2, they are represented by the measured bounding discharges; for New NPP ETE, they are represented by bounding design values for the reference units in the 2 × 1,700 MW_e output configuration.

The source terms for operational states of SMR ETE, ETE1,2, and New NPP ETE, summarized by individual radionuclide group, are provided in Chapter B.III.4. Other (page 203 of this Documentation), specifically in the part addressing ionizing radiation. The source term is presented divided into individual radionuclides in the following tables.

The actual composition of the source term within the individual radionuclide groups may vary depending on the method used to determine radionuclide composition and on consideration of changes over time during transformation of individual radionuclides. Under the bounding-approach principle used, total discharges should not exceed those specified in Chapter B.III.4., and the maximum individual annual doses to members of the public should not exceed the dose constraints established under the Atomic Act. The aggregate summary of the source term by group for all nuclear facilities specified above in Chapter B.III.4. (i.e., SMR ETE, ETE1,2, and New NPP ETE) must therefore be considered the assessment envelope.

Table D.15: Bounding maximum annual operational atmospheric discharges from SMR ETE

Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]
H-3	1.00E+12	Y-91	1.49E+03	Xe-133	3.67E+11
C-14 org	3.50E+10	Sr-92	2.30E+05	Cs-134	2.48E+04
C-14 inorg	8.76E+09	Y-92	2.14E+05	Te-134	3.47E+05
Na-24	2.84E+05	Nb-95	1.88E+04	Xe-135	3.02E+11
Cl-36	1.48E+03	Zr-95	2.21E+04	Cs-136	3.95E+04
Ar-41	2.40E+12	Nb-97	1.68E+04	Cs-137	1.87E+04
K-42	1.40E+07	Zr-97	2.30E+06	Cs-138	2.83E+05
Cr-51	1.48E+05	Mo-99	3.98E+04	Xe-138	2.67E+11
Mn-54	4.94E+04	Ru-103	1.15E+03	Ba-140	7.16E+03
Fe-55	5.04E+04	Ru-105	3.14E+04	La-140	4.74E+04
Mn-56	1.27E+05	Ru-106	1.63E+01	Ce-141	2.68E+03
Co-58	1.83E+06	Sb-122	5.71E+04	Ce-143	5.37E+04
Fe-59	2.14E+04	Sb-124	1.32E+05	Pr-143	6.45E+03
Ni-59	2.74E+01	Sb-125	5.99E+03	Ce-144	2.90E+02
Co-60	5.03E+04	I-131 gas	3.07E+07	Np-239	1.97E+04
Ni-63	3.80E+03	I-131 aer	3.07E+07	Ag-108m	6.91E+00
Zn-65	1.16E+04	I-132 gas	2.45E+07	Ag-110m	5.37E+04
Br-84	2.43E+08	I-132 aer	2.45E+07	Xe-131m	2.28E+09
Kr-85	4.13E+13	I-133 gas	1.32E+07	Te-133m	1.93E+05
Kr-87	5.33E+10	I-133 aer	1.32E+07	Xe-133m	5.76E+10
Kr-88	7.43E+10	I-134 gas	4.36E+07	Xe-135m	1.71E+11
Rb-88	1.31E+05	I-134 aer	4.36E+07	Kr-85m	2.79E+10
Rb-89	8.06E+04	I-135 gas	2.49E+07	Y-91m	1.65E+05
Sr-89	1.40E+03	I-135 aer	2.49E+07	Tc-99m	6.44E+04
Sr-90	8.27E+00	Te-131	1.32E+05		
Sr-91	1.29E+05	Te-132	1.83E+04		

[1] https://portal.cenia.cz/eiasea/detail/EIA_MZP518

Table D.16: Maximum annual atmospheric discharges from the two ETE1,2 units (according to the New NPP ETE EIA documentation)

Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]
H-3	3.70E+12	Kr-88	4.30E+11	Xe-135m	7.30E+10
C-14	5.60E+11	Sr-89	3.80E+05	Xe-135	1.70E+12
Ar-41	1.40E+12	Sr-90	1.70E+05	Xe-138	3.30E+10
Cr-51	6.00E+06	Zr-95	6.90E+05	Cs-134	6.10E+05
Mn-54	2.70E+05	Nb-95	1.10E+06	Cs-137	6.20E+05
Fe-59	9.80E+04	Ag-110m	6.70E+05	Ba-140	1.90E+05
Co-58	1.60E+06	Sb-124	1.50E+06	Ce-141	6.80E+04
Co-60	5.00E+05	Sb-125	2.50E+05	Ce-144	2.70E+05
Zn-65	8.80E+04	I-131	2.40E+08	Pu-238	5.20E+04
Kr-85m	2.40E+11	Te-132	4.20E+05	Pu-239	3.30E+04

Table D.17: Anticipated maximum annual atmospheric discharges from the two New NPP ETE units (according to the New NPP ETE EIA documentation, 2 × 1,700 MW_e output configuration)

Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]
H-3	1.33E+13	Kr-88	1.33E+13	Xe-133m	1.33E+13
C-14	5.40E+11	Sr-89	1.18E+07	Xe-133	6.36E+14
Ar-41	2.52E+12	Sr-90	4.66E+06	Xe-135m	1.04E+12
Cr-51	7.18E+06	Zr-95	7.40E+05	Xe-135	8.88E+13
Mn-54	4.22E+06	Nb-95	3.11E+06	Xe-137	0.00E+00
Fe-59	2.08E+06	Ru-103	1.26E+06	Xe-138	8.88E+11
Co-58	3.55E+07	Ru-106	5.77E+04	Cs-134	3.55E+06
Co-60	8.14E+06	Sb-125	4.51E+04	Cs-136	2.44E+06
Kr-85m	1.11E+13	I-131	6.51E+08	Cs-137	6.66E+06
Kr-85	2.52E+15	I-133	2.37E+09	Ba-140	3.11E+05
Kr-87	3.92E+12	Xe-131m	2.59E+14	Ce-141	9.62E+05

Table D.18: Bounding maximum annual operational discharges from SMR ETE into surface water

Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]
H-3	5.00E+12	Kr-85	3.56E+01	Xe-131m	1.31E+07
C-14 inorg	1.39E+03	Sr-89	2.33E+02	Xe-133	4.80E+07
Na-24	2.96E+03	Sr-90	2.11E+01	Xe-133m	2.81E+09
K-42	3.11E+05	Y-91	7.93E+00	Xe-135	9.81E+05
Mn-54	3.04E+02	Nb-94	3.76E+00	Cs-134	6.67E+05
Fe-55	1.68E+03	Nb-95	4.43E+02	Cs-136	7.90E+04
Co-58	7.78E+02	Zr-95	5.20E+02	Cs-137	4.26E+05
Fe-59	6.59E+01	Zr-97	1.57E+01	Ba-140	1.85E+04
Ni-59	4.36E+00	Mo-99	2.70E+01	La-140	7.95E+03
Co-60	1.15E+02	Ru-103	1.12E+04	Ce-141	2.20E+02
Ni-63	5.77E+02	I-131 aer	6.79E+02	Ce-143	6.22E+02
Zn-65	4.19E+02	I-133 aer	1.62E+02	Pr-143	6.35E+02
Kr-85m	1.56E+07	Te-132	1.17E+03	Ce-144	6.18E+03

Table D.19: Maximum annual discharges into surface water from the two ETE1,2 units (according to the New NPP ETE EIA documentation)

Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]
Cr-51	3.5E+05	Nb-95	1.9E+07	Ce-141	<DL
Mn-54	3.8E+06	Ru-103	3.4E+04	Ce-144	<DL
Fe-55	<DL	Ru-106	<DL	Pu-238	7.4E+05
Fe-59	<DL	Ag-110m	1.9E+07	Pu-239+Pu-240	5.0E+05
Co-58	9.0E+05	Sb-124	3.7E+07	Am-241	4.0E+05
Co-60	2.2E+06	Sb-125	<DL	Cm-242	<DL
Ni-63	<DL	I-131	1.8E+07	Cm-243	<DL
Zn-65	<DL	Cs-134	1.2E+08	Cm-244	<DL
Sr-89	1.5E+06	Cs-137	1.3E+08	Total discharges (excluding tritium)	3.1E+08
Sr-90	3.7E+05	Ba-140	<DL	Tritium (H-3)	5.4E+13
Zr-95	7.5E+06	La-140	<DL		

Table D.20: Anticipated maximum annual discharges into surface water from the two New NPP ETE units (according to the New NPP ETE EIA documentation, 2 × 1,700 MW_e output configuration)

Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]
Na-24	3.5E+08	Tc-99m	1.3E+08	Cs-137	1.3E+09
P-32	1.3E+07	Ru-103	2.5E+08	Ba-137m	3.4E+07
Cr-51	4.4E+08	Rh-103m	2.3E+08	Ba-140	4.3E+08
Mn-54	3.3E+08	Ru-106	3.5E+09	La-140	5.9E+08
Fe-55	5.7E+08	Rh-106	2.9E+09	Ce-141	2.1E+07
Fe-59	1.7E+08	Ag-110m	1.3E+08	Ce-143	3.7E+07
Co-58	7.3E+08	Ag-110	5.3E+06	Pr-143	5.8E+06
Co-60	1.0E+09	Sb-124	3.2E+07	Ce-144	4.1E+08
Ni-63	1.3E+08	Te-129m	5.8E+06	Pr-144	1.3E+08
Zn-65	1.6E+07	Te-129	2.3E+07	W-187	2.6E+07
Rb-88	2.1E+09	Te-131m	1.9E+07	Np-239	3.9E+07
Sr-89	1.1E+07	Te-131	5.6E+06	Other, total	8.9E+05
Sr-90	1.3E+06	I-131	1.5E+08	Total discharges (excluding tritium)	1.9E+10
Sr-91	5.0E+06	Te-132	3.5E+07	Tritium (H-3)	1.2E+14
Y-91m	3.3E+06	I-132	2.3E+07		
Y-91	6.7E+06	I-133	6.0E+07		
Y-93	2.1E+07	I-134	6.6E+06		
Zr-95	9.6E+07	Cs-134	8.9E+08		
Nb-95	1.5E+08	I-135	5.8E+07		
Mo-99	1.3E+08	Cs-136	1.6E+09		

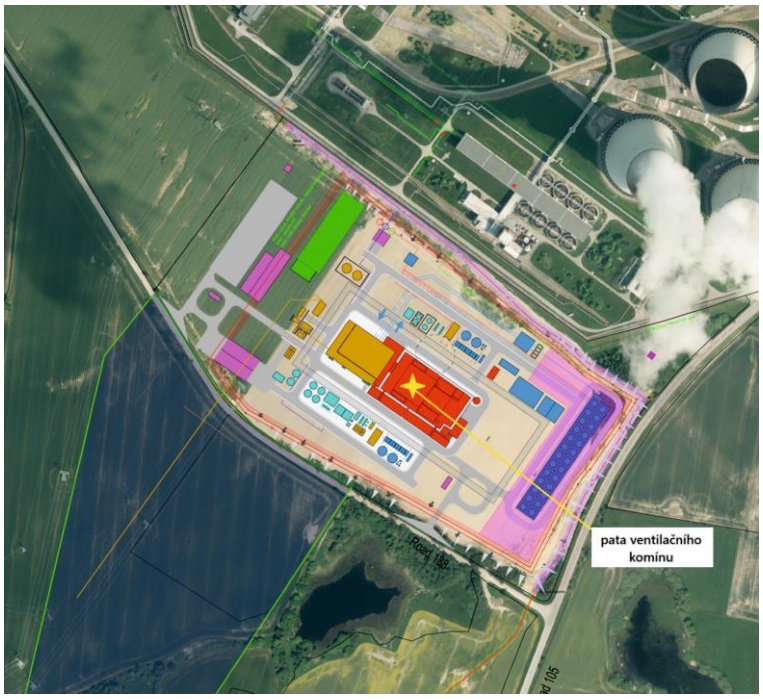
The ESTE Annual Impacts computer program (hereinafter ESTE AI), developed by ABmerit, s.r.o., is used to determine the radiological impacts of SMR ETE operation. The ESTE AI computer program is used to assess the radiological impacts of normal nuclear-facility operation on the surrounding area. SÚJB uses the program for verification calculations of the radiological impacts of nuclear-facility operation at the Dukovany and Temelín sites. The ESTE AI program is also used by the Public Health Authority of the Slovak Republic (ÚVZ SR) for verification calculations of the radiological impacts of nuclear-facility operation at the Jaslovské Bohunice and Mochovce sites (Slovakia) and is approved by ÚVZ SR as a certified tool for calculating the impacts of nuclear-facility operation at the Jaslovské Bohunice site; it is used for this purpose by SE a.s., Bohunice plant, and JAVYS a.s. Information on the scope of ESTE AI use and its verifications is provided in Annex 5.1 to this Documentation (Radiological Impact Assessment).

The program's methodology and algorithms make it possible to locate and identify the representative person (critical population group) around a nuclear facility for atmospheric discharges, discharges into watercourses, and the aggregate of all discharges. The program enables separate assessment of atmospheric discharges from individual discharge sources at the site assessed (the ventilation stack and, potentially, cooling towers, although the latter do not apply to SMR ETE) and discharges into watercourses (the outfall into Kořensko Reservoir).

The ESTE AI program makes it possible to determine and present the impacts of discharges from the Temelín site on the immediate and more distant surroundings and also impacts on neighboring countries located within the 200 × 200 km calculation zone centered on the Temelín site.

The calculated impacts are shown on a 200 × 200 km grid with a 1 km step (calculation-cell resolution). The center of the grid is placed at the base of the SMR ETE ventilation stack.

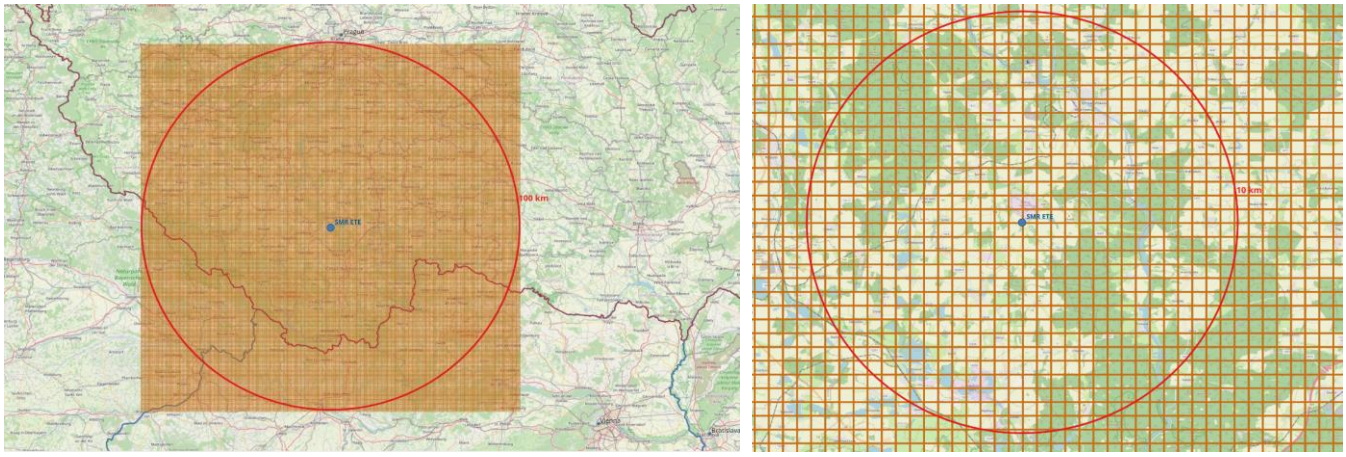
Fig. D.6: Location of the base of the SMR ETE ventilation stack at the center of the nuclear island



pata ventilačního komínu	base of the ventilation stack

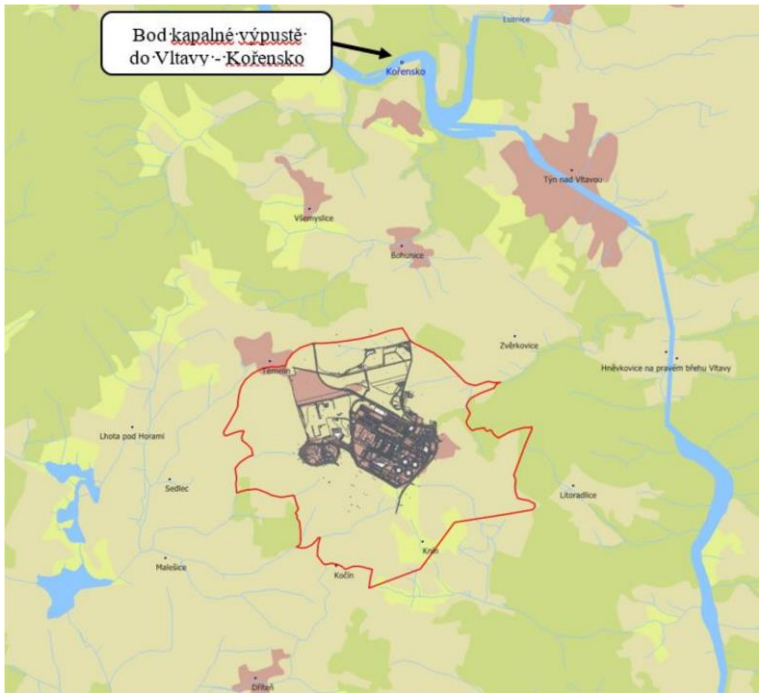
The ESTE AI program uses the Lagrangian Puff Trajectory Model (PTM) to calculate radionuclide dispersion in the atmosphere and long-term average concentrations caused by operational states of a nuclear installation. Atmospheric diffusion in the horizontal direction is modeled using a Gaussian atmospheric-dispersion model, and a numerical solution of the semi-empirical atmospheric-diffusion equation is used in the vertical direction. The mathematical model takes into account radioactive decay, washout by precipitation, and the mechanisms of dry and wet deposition. Input meteorological data for a specific period are used in the calculation. Specifically, the assessment of SMR ETE radiological impacts uses meteorological data for 2018–2024, including measurements of wind direction and speed at 10 m above ground, precipitation intensity, and Pasquill weather-stability category, processed at 1-hour intervals from 1/1 at 00:00 through 12/31 at 23:00 of each calendar year. It also uses Vltava River flows at the Kořensko profile for 2018–2024 and the average for 2004–2024. For modeling purposes, the entire annual discharge is distributed evenly among the individual hours of the year and the applicable meteorological conditions measured for each hour are applied. When H-3 (tritium) and its transfer into plants are modeled, a model of moisture (water) exchange between the surrounding atmosphere and the plant is applied. The model uses absolute air-humidity data (during the growing season) and data on the water content of individual plants. When C-14 behavior is modeled, the organic component (C_nH_{2n}) and inorganic component (CO, CO_2) of atmospheric discharges are considered in the calculation.

Fig. D.7: Schematic arrangement of the ESTE AI calculation grid for SMR ETE used to calculate radionuclide dispersion in the atmosphere (200 × 200 km, 20 × 20 km detail)



Algorithms under NRC Regulatory Guide 1.109 (Calculation of annual doses to man from routine releases of reactor effluents for the purpose of evaluating compliance with 10CFR Part 50) are used to model and calculate dispersion of discharges into watercourses and calculate activity concentrations in the water of Kořensko Reservoir and subsequently the Vltava River. The model for the Temelín site assumes a constant water volume in Kořensko Reservoir and also uses average-flow data for the Vltava River downstream of Kořensko Reservoir or at other points along the river.

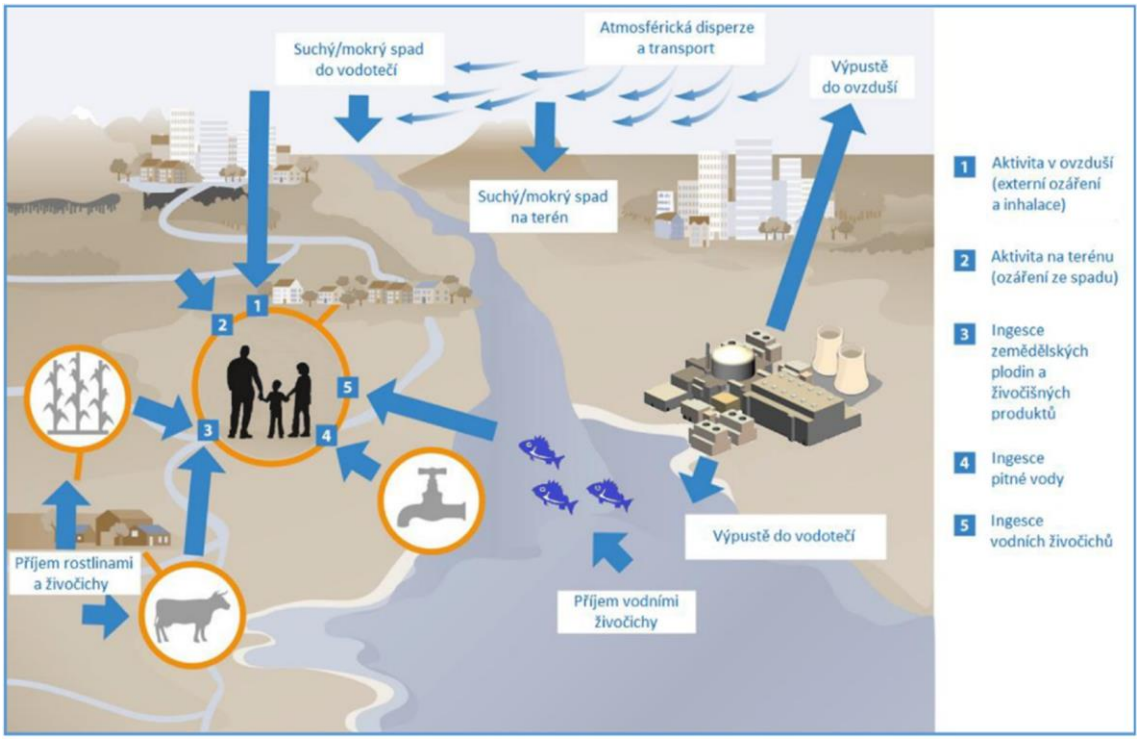
Fig. D.8: Specification of the watercourse-discharge point in the ESTE AI program



Bod kapalné výpusti do Vltavy - Kořensko	Liquid-discharge point into the Vltava River - Kořensko

All exposure pathways are considered in the model and calculation in accordance with SÚJB requirements and IAEA recommendations. These comprise exposure from the plume and deposits, inhalation of airborne activity, and ingestion of locally produced foods, considering the complete chain of possible transport pathways of radioactive substances from discharges into individual environmental media. The program considers the age distribution of the population (unborn child - fetus, child aged 0–5, child aged 6–15, and person aged over 16) and lifestyle habits represented by consumption baskets for the individual population age groups. Transfers of radioactive substances in nature are also modeled in ESTE AI to determine and evaluate radiological impacts on the biotic component (wild animals and plants). More detailed information on transport pathways and the ESTE AI computer program is provided in Annex 5.1 to this Documentation.

Fig. D.9: Exposure pathways considered by the ESTE AI program

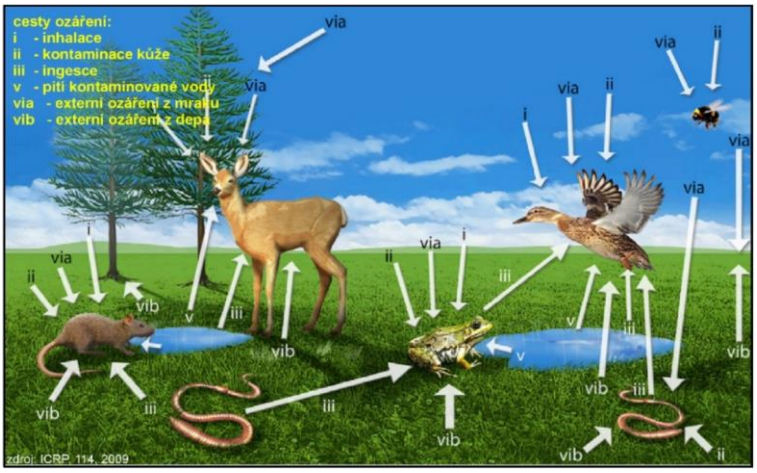


Suchý/mokrý spad do vodotečí	Dry/wet deposition into watercourses
Atmosférická disperze a transport	Atmospheric dispersion and transport
Výpustě do ovzduší	Atmospheric discharges
Suchý/mokrý spad na terén	Dry/wet deposition on the ground
Příjem rostlinami a živočichy	Uptake by plants and animals
Výpustě do vodotečí	Discharges to watercourses
Příjem vodními živočichy	Uptake by aquatic animals
1) Aktivita v ovzduší (externí ozáření a inhalace)	Airborne activity (external exposure and inhalation)
2) Aktivita v terénu (ozáření ze spadu)	Activity in the terrain (exposure from deposits)
3) Ingesce zemědělských plodin a živočišných produktů	Ingestion of agricultural crops and animal products
4) Ingesce pitné vody	Ingestion of drinking water
5) Ingesce vodních živočichů	Ingestion of aquatic animals

For assessment of impacts on the biological component, ESTE AI models exposure pathways for wild animals and plants, both terrestrial and aquatic. The concepts and procedures of the ESTE AI program are applied in accordance with the methodology and recommendations in ICRP 108, ICRP 114, and IAEA General Safety Guide GSG-10. For terrestrial reference organisms, external exposure from deposits on the terrain and internal exposure primarily due to ingestion of food in contact with deposits on the terrain or due to inhalation of airborne CO_2 and H_2O (for C-14 and tritium) are considered. The terrestrial reference fauna and flora considered are deer, rat, duck, frog, bee, earthworm, pine, and grass. For aquatic reference organisms, the following are considered: external exposure from contaminated water (presence on the surface or in the water) and internal exposure due to water intake. The aquatic reference organisms considered are trout (which lives its entire life in water), duck, and frog (both of which spend 1/2 of their lives in water and 1/2 on land).

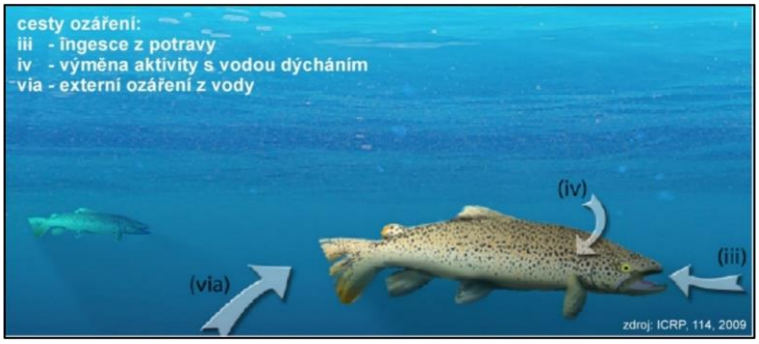
The exposure pathways for the biotic component modeled in ESTE AI are shown schematically in the following figures, with both methods applied to the frog and duck.

Fig. D.10: Exposure pathways for representatives of terrestrial biota



cesty ozáření:	exposure pathways:
i -inhalace	i - inhalation
ii -kontaminace kůže	ii - skin contamination
iii -ingesce	iii - ingestion
v -pití kontaminované vody	v - drinking contaminated water
via -externí ozáření z mraku	via - external exposure from the plume
vib -externí ozáření z depa	vib - external exposure from deposits

Fig. D.11: Exposure pathways for representatives of aquatic biota



cesty ozáření:	exposure pathways:
iii -ingesce z potravy	iii - ingestion from food
iv -výměna aktivity s vodou dýcháním	iv - activity exchange with water through respiration
via -externí ozáření z vody	via - external exposure from water

D.I.3.2.3. Assumptions for assessing the impacts of ionizing radiation

The assumptions below, based primarily on the requirements of SÚJB Decree No. 422/2016 Coll., as amended, and on ICRP 103, IAEA GSG-10, and U.S. NRC RG 1.109, are applied when calculating annual individual effective doses to a representative person and other persons living in the individual calculation sectors.

The representative person is determined based on calculation of individual doses around the nuclear facility, considering all contemplated exposure pathways, i.e., atmospheric discharges and discharges into a watercourse, and all nuclides declared in the discharges. The assumptions used for the calculation are decisive for determining individual doses in individual age categories. The representative person may differ for different discharges (atmospheric discharges and discharges into a watercourse) and for different conditions under which the discharges occur. The representative person is exposed as a result of radionuclides present in the surrounding air. Radionuclides in the air can cause a dose from external exposure and internal exposure through inhalation of airborne radionuclides.

The representative person is also exposed to radionuclides contained in deposits on the surrounding terrain. Radionuclides deposited on the terrain or in soil may cause a dose from external exposure and internal exposure through ingestion of food into which radionuclides have passed

from the surrounding soil through the root system or through the foliar system (by plant respiration or deposition of radionuclides on plant leaves/surfaces).

In addition, the representative person may be exposed through intake of radionuclides originally discharged into a watercourse (surface water) as a result of nuclear-facility operation: consumption of drinking water into which radionuclides discharged from nuclear-facility operation into the watercourse have entered; ingestion of fish meat from water receiving the discharges; ingestion of other foods irrigated with river water during the growing season; or ingestion of milk from cows watered with river water. Minor sources of exposure for the representative person may also include time spent on the riverbank (e.g., by an angler), swimming, and rowing on the river into which discharges are directed.

The following parameters are applied when calculating doses for the representative person:

- Inhalation of airborne radionuclides: The representative person's entire air intake occurs at the location concerned (the person's place of residence). The breathing rate is average and typical for the given age category.
- Exposure from the plume and from deposits on the terrain: No shielding is applied when calculating doses to the representative person (shielding factor = 1), i.e., the representative person is treated as if outdoors at all times.
- When doses from external exposure to deposits are calculated, deposits on the terrain caused by discharges during the monitored period concerned (e.g., discharges over 1 year) are assumed to cause external exposure from the terrain for an additional 15 years. That is, the dose from deposits of a nuclide in a given year includes the total dose for the following 15 years (the nuclide remains deposited on the terrain for another 15 years and causes exposure that is included in the impacts for the year in which the discharge occurred, with radioactive transformation of the nuclide considered).
- When doses from food ingestion or air inhalation by the representative person are calculated, a 50-year or 70-year committed effective dose is calculated (depending on age category). For ingestion pathways, deposits of a given nuclide occurring in a given year are assumed to continue to be taken up through plant root systems for another 15 years; the impact for the given year thus also includes the contribution of the activity already deposited for the following 15 years, considering radioactive transformation of the radionuclide, the effective half-life for removal of the nuclide from the plant, effective soil surface density, time between harvest and ingestion, and the period during which the plant grows.
- The representative person's entire (100 %) consumption of leafy vegetables consists of food produced, even hypothetically, in the sector concerned. For other agricultural products (other vegetables, meat, eggs, and cereals), the representative person is assumed to obtain 75 % of their consumption from this sector, with the remainder being a "clean", uncontaminated product. Milk: In calculating the dose to a representative person, 75 % of the representative person's total annual milk consumption is assumed to consist of cow's milk from a cow grazing in this sector and fed outside the growing season in a barn with feed grown, even hypothetically, in this sector. The program also calculates radionuclide concentrations in goat's milk and the committed effective dose from drinking goat's milk for the individual age categories.
- For ingestion of individual "irrigated" foods, the representative person is assumed to obtain no more than 50 % of their consumption of the food concerned from "irrigated" sources. This means that if the sector concerned is located in a cadastral area adjoining the river into which discharges from the nuclear facility are directed, agricultural products in that sector are assumed to be irrigated, and irrigation causes additional contamination of plants and soil (in addition to contamination caused by atmospheric discharges).
- The representative person's entire (100 %) consumption of drinking water also comes from a well or water source into which river water seeps. The ESTE AI program evaluates whether municipal development, including isolated buildings, is located near the bank of the river/reservoir (approximately within 100 m of the bank); if so, the model assumes that a representative person may live in the municipal development and obtain the person's entire annual drinking-water consumption from a well into which water from the watercourse seeps and that the river water fully replenishes the well. The transfer of individual radionuclides from river water into well water is expressed by a "river/well" transfer factor that differs among nuclides.
- The representative person's entire (100 %) consumption of fish meat comes from fish that live their entire lives in the river around the village/town (only if the village/town's cadastral area lies on the riverbank).
- A representative person (over 5 years of age) swims for 100 hours per year in the river around the village/town, spends 200 hours on the bank, and spends 100 hours per year in a boat on the river (all only if the village/town's cadastral area lies on the riverbank).

Hourly values of basic meteorological parameters measured at the ČHMÚ weather station immediately adjacent to the operating Temelín power plant are used as the source of meteorological data. The meteorological parameters input to the ESTE AI calculation model are wind direction and speed at 10 m above ground, precipitation intensity, and Pasquill weather-stability category. Hourly data are processed for 2018–2024.

Based on the 2018–2024 meteorological data, wind direction at the Temelín site is analyzed using the wind rose and data on wind speeds and weather stability, and flow through the Vltava River is also analyzed. Weather conditions did not change significantly during the selected period.

For average wind speed and the median (considering the standard deviation), all years are similar to the overall seven-year pattern. All three quantities, average speed, median, and standard deviation, show little variability over the seven years (2018–2024). The 95 % interval has slightly greater deviations (from 6.2 to 7.0 m/s), but they are not significant. Only for maximum speed are the differences more significant, but they do not play an important role in the overall impacts for the whole year.

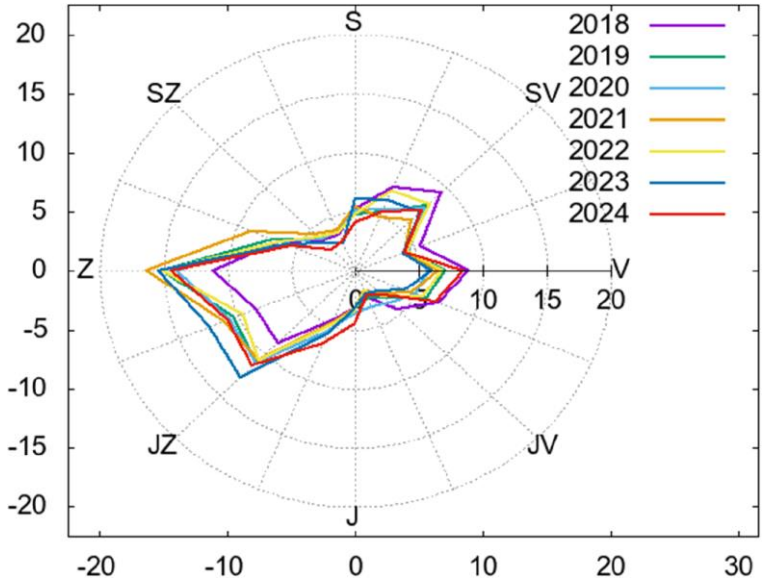
Average precipitation at the Temelín site in 2018–2024 was 592 mm ± 82 mm. Within this interval, 2021, 2022, and 2023 had average precipitation; 2020 and 2024 had above-average precipitation; and 2018 and 2019 had below-average precipitation.

The years 2022, 2023, and 2024 show the most average pattern in the occurrence of weather-stability categories around SMR ETE. For these years, the representation of almost all weather categories lies within the interval defined by the seven-year average and the applicable standard deviation. For 2018–2021, the representation of most weather categories lies outside this interval.

The ventilation stack is modeled at two possible bounding heights: 56 m and 150 m.

Local meteorological conditions from ČHMÚ data for 2018–2024 are presented in the following overview.

Fig. D.12: Wind rose, distribution of wind direction at a height of 10 m at the Temelín site in 2018–2024 [m/s]



Note: The wind-direction distribution in the rose shows the direction from which the wind blows.

Table D.21: Basic wind-speed statistics - speed at a height of 10 m above ground at the Temelín site

Year	Average speed	Median	Maximum speed	Upper 95 % interval	Standard deviation of average speed
	[m/s]				
2018	3.1	2.9	12.2	6.5	1.7
2019	3.3	3.0	14.3	6.9	1.9
2020	3.2	2.8	17.8	6.9	1.9
2021	3.0	2.7	17.3	6.2	1.7
2022	3.1	2.7	13.9	6.2	1.9
2023	3.2	3.0	11.9	6.9	1.9
2024	3.0	2.7	12.3	7.0	1.9
2018–2024	3.1	2.8	17.8	6.7	1.8

The Pasquill stability classification, which expresses the degree of turbulence and the atmosphere's ability to disperse constituents, is applied to assess weather stability. It divides the atmosphere into six basic stability classes (designated A through F), which are determined using readily measurable near-surface meteorological quantities: wind speed, solar-radiation intensity (during the day), and cloud cover (at night).

The Pasquill stability classes are summarized below:

A - Very unstable: Strong solar radiation and light wind. Intense vertical air mixing and strong vertical turbulence occur.

B - Moderately unstable: Moderate solar heating of the ground surface with weaker vertical turbulence.

C - Slightly unstable: Weaker sunlight or stronger wind suppressing thermal turbulence.

D - Neutral: Typical of overcast skies (day and night) or strong wind that disrupts thermal stratification.

E - Moderately stable: Typically occurs at night with partly cloudy skies and lighter wind.

F - Very stable: Clear night with calm or only very light wind (up to 2 m/s). Vertical air movement is suppressed to the greatest extent; near-surface temperature inversions frequently form and dispersion conditions are very poor.

Table D.22: Probability of occurrence of individual Pasquill weather-stability categories at the Temelín site

Year	Category A	Category B	Category C	Category D	Category E	Category F
	[%]					
2018	11.0	7.3	14.1	33.4	9.7	24.5
2019	6.5	6.9	11.9	6.6	27.6	40.5
2020	6.3	5.0	11.9	5.1	27.1	44.6
2021	5.9	5.7	11.6	3.8	27.4	45.6
2022	6.7	6.4	13.7	29.0	11.6	32.5
2023	5.5	5.3	13.3	25.2	14.3	36.4
2024	6.4	5.3	11.2	24.5	15.2	37.4
2018–2024	6.9 ± 1.7	6.0 ± 0.8	12.5 ± 1.1	18.2 ± 11.6	19.0 ± 7.4	37.4 ± 6.8

Table D.23: Average wind speed - speed at a height of 10 m above ground at the Temelín site

Year	Category A	Category B	Category C	Category D	Category E	Category F
	[m/s]					
2018	2.6	2.9	3.6	4.2	3.1	1.7
2019	2.3	3.1	4.0	7.0	4.3	1.9
2020	2.4	3.0	3.8	7.5	4.3	1.9
2021	2.3	2.9	3.8	6.6	4.3	1.8
2022	2.3	2.8	3.8	4.4	3.3	1.7
2023	2.4	3.0	4.1	5.1	3.3	1.8
2024	2.1	2.6	3.6	5.2	3.1	1.7
2018–2024	2.4	2.9	3.8	5.0	3.9	1.8

Based on meteorological and hydrological data, three categories are selected for analyzing the impacts of normal SMR ETE operation:

- The year 2018 is selected as the "dry year" based on meteorological data and flow measurements at the "Kořensko" profile. It is a below-average year in terms of precipitation and also the year with the lowest annual flow in the Vltava River at the Kořensko profile. Other measured parameters (occurrence of stability categories and frequencies of wind direction and speed) in 2018 were consistent with the values expected based on long-term measurements. The flow value is set at 24.4 m^3/s.
- The year 2023 is selected as the "average year" based on 2023 meteorological data and average flow in 2004–2024. It is an average year in terms of precipitation, and the long-term average flow in the Vltava River at the Kořensko profile is applied. Other meteorological parameters in 2023 (occurrence of stability categories and frequencies of wind direction and speed) were, in 2023, consistent with the values expected based on long-term measurements. The long-term average flow in the Vltava River at the Kořensko profile in 2004–2024 is set at 47.4 m^3/s.
- The year 2024 is selected as the "wet year" based on meteorological and flow data for 2024, specifically the quantity of precipitation and the fact that it was the year with the highest annual flow in the Vltava River at the Kořensko profile. The flow for the wet year is set at 63.3 m^3/s.

Geographical characteristics relevant to calculation of radiological impacts are modeled in ESTE AI using geodata describing land cover in the area analyzed (surface type: inhabited/developed area, forest, water body, agricultural land, etc.).

A wide variety of types alternate within the broader area of interest in terms of land use and current vegetation cover. Forest stands are associated predominantly with the valleys of the Vltava and Malše rivers, higher elevations on the Vysoký Kamýk ridges, and the hilly areas around Litoradlice and farther south. Arable land with numerous copses predominates on the deforested undulating plateaus. The ETE site itself lies in a deforested enclave in a slightly elevated position.

For the purposes of the program, surface-type data are prepared and processed into a form suitable for calculation using satellite-image classification methods (remote sensing methods). When calculating radiological impacts, the ESTE AI models use information on land-cover types that are static or change annually (crops sown on agricultural land). Corine Land Cover data (a European database of static land-cover types based on satellite-survey data) are used in ESTE AI as the source of underlying data for forests, reservoirs, and settlement areas (urban and village development).

Data on the distribution of agricultural crops (wheat, barley, potatoes, corn, rapeseed, and alfalfa) sown in the areas analyzed around the Temelín site are also used for radiological-impact calculations. For the ESTE AI program, the distribution of agricultural crops around the Temelín site is determined using satellite-data classification methods.

ESTE AI uses knowledge of land-cover type when calculating dispersion of radioactive gases and aerosols in the ambient atmosphere and calculating deposition on the terrain. Different land-cover types have different values of the "terrain roughness" parameter, which has a substantial effect on calculation of radioactive-aerosol deposition on the terrain. The basic land-cover types that must be known for calculations using ESTE AI are forests, agricultural crops, water bodies, and developed areas.

Data on the lifestyle habits of residents at inhabited locations where the largest radionuclide contents in environmental media are measured or calculated by a model must be examined with respect to information on location, dietary habits, and lifestyle, considering physiological factors, particularly age. Data on an individual with extreme habits must be excluded from the lifestyle-habit data for the selected group of persons. Data

on the habits and lifestyle of the selected group of persons must be valid over the long term. For the SMR ETE assessment, data on the lifestyle habits of the population assessed are taken from national statistics; the quantities of air inhaled and water ingested are based on Section 67(2) and (3) of Decree No. 422/2016 Coll., as amended, and Appendix No. 5 to that Decree.

Statistical data obtained from the statistical authorities of the Czech Republic, Austria, and Germany (Bavaria) are used to calculate ingestion doses. Consumption baskets are prepared on the basis of these data and are then used to calculate ingestion doses. Details of the consumption baskets applied are provided in Annex 5.1 to this Documentation.

Detailed data on the number and age composition of residents in the sectors assessed, areas sown with agricultural crops, agricultural-product harvests, and livestock and poultry farming are also obtained from statistical data for the Czech Republic, Austria, and Germany and implemented in the ESTE AI calculation model.

D.I.3.2.4. Results of the assessment of SMR ETE impacts of ionizing radiation on the population

Based on modeling of the radiological consequences of normal SMR ETE operation, the underlying study prepared by ABmerit s.r.o. specialists for the SMR ETE EIA Documentation identifies the inhabited locations around SMR ETE where the highest effective dose values for a representative person are found. For atmospheric discharges, three locations are identified in this manner: Kočín, Litoradlice, and Zvěrkovice. For discharges into a watercourse, the location is Neznašov, including Újezd and the Pašovice cottage area.

The following quantities are determined for the individual locations of interest:

Radiological consequences of atmospheric discharges:

- Committed (50- or 70-year) effective dose from inhalation for the (given) age category (sum across all radionuclides constituting the source term for atmospheric discharges from SMR ETE) [Sv].
- Committed (50- or 70-year) effective dose from ingestion for the (given) age category (sum across all radionuclides) [Sv].
- Effective dose from external exposure to deposits (sum across all radionuclides) [Sv].
- Effective dose from external exposure to the plume (sum across all radionuclides) [Sv].
- AIR: Total effective dose and committed effective dose for all exposure pathways considered [Sv].

Radiological consequences of discharges into a watercourse (surface water):

- Committed (50- or 70-year) effective dose from ingestion (sum across all radionuclides constituting the source term for discharges from SMR ETE into a watercourse) [Sv], consisting of partial committed doses from ingestion due to consumption of drinking water and ingestion of other dietary components:
  - Potable water. Committed (50- or 70-year) effective dose from ingestion for the (given) age category (sum across all radionuclides) [Sv].
  - Irrigation, watering of livestock, and fish meat. Committed (50- or 70-year) effective dose from ingestion for the (given) age category (sum across all radionuclides) [Sv].
- Effective dose from external exposure while swimming [Sv].
- Effective dose from external exposure while boating [Sv].
- Effective dose from external exposure while staying on the bank [Sv].
- SURFACE WATER: Total effective dose and committed effective dose for all pathways considered for the (given) age category [Sv].

The results for the radiological consequences of SMR ETE operation are summarized in the following tables. The results are presented for the age group with the highest dose value; the age group and dose for the second-most-exposed age group are shown in parentheses. Results are always presented for the representative dry year (2018), average year (2023), and wet year (2024) and for two bounding heights of the SMR ETE ventilation stack (VK), 56 m and 150 m.

Table D.24: Aggregate results, dose including the committed dose to a representative person as a consequence of bounding discharges from SMR ETE - atmosphere

Radiological impact of atmospheric discharges						
Year	2018 ("dry year")		2023 ("average year")		2024 ("wet year")	
Height of VK [m]	150	56	150	56	150	56
Location	Kočín	Kočín	Zvěrkovice, Zadní Kohout	Zvěrkovice, Zadní Kohout	Litoradlice	Zvěrkovice, Zadní Kohout
Age group	16+ years (6–15 years)	16+ years (6–15 years)	16+ years (6–15 years)	16+ years (6–15 years)	16+ years (6–15 years)	16+ years (6–15 years)
Total annual effective dose and committed effective dose via all considered pathways [Sv/year]	8.9E-08 (8.8E-08)	1.4E-07 (1.3E-07)	1.04E-07 (1.03E-07)	1.78E-07 (1.73E-07)	9.66E-08 (9.61E-08)	1.57E-07 (1.52E-07)

Analysis of the results shows that exposure from the plume is the dominant contributor to the effective dose to a representative person. At a stack height of 150 m, exposure from inhalation and ingestion accounts for no more than 12.3 % of the annual effective dose. For scenarios with a stack height of 56 m, the effective-dose contribution from exposure to the plume decreases and the committed doses from inhalation and ingestion increase to approximately 30 %. For both stack heights considered, the effect of exposure from radionuclide deposition is practically negligible. According to the study, meteorological conditions, which differ for the selected representative years 2018, 2023, and 2024, have a smaller effect on the resulting annual effective-dose value than the ventilation-stack height, but a significant (directional) effect on identification of the representative person. Ar-41 makes the largest contribution to the dose from SMR ETE atmospheric discharges (approximately 70 %), followed by C-14 (approximately 12 %) and Kr and Xe isotopes with shares in the single-digit percentages.

Overall, however, the radiological impact of atmospheric discharges from SMR ETE is very small, with maximum contributions of 0.1–0.2 µSv/year. For comparison, the ambient dose equivalent rate of gamma radiation from the natural background is slightly above 0.1 µSv/hour and is therefore almost 10,000 times higher. The Atomic Act establishes a dose constraint of 200 µSv/year for atmospheric discharges.

Table D.25: Aggregate results, dose including the committed dose to a representative person as a consequence of bounding discharges from SMR ETE - surface water

Radiological impact of discharges into a watercourse			
Year	2018 ("dry year")	2023 ("average year")	2024 ("wet year")
Location	Újezd and the Pašovice cottage area		
Age group	0–5 years (fetus)	0–5 years (fetus)	0–5 years (fetus)
Total annual effective dose and committed effective dose via all considered pathways [Sv/year]	2.80E-07 (2.05E-07)	1.48E-07 (1.09E-07)	1.31E-07 (9.60E-08)

The principal exposure pathways from discharges into a watercourse are the dose from ingestion of drinking water (approximately 57 %) and the sum of the doses from irrigation (e.g., vegetables), watering of livestock (animal meat), and fish meat (approximately 43 % in aggregate). The share of tritium from SMR ETE in the annual effective-dose contribution to a representative person from discharges into a watercourse is more than 99 %. The ventilation-stack height has no direct effect on discharges into a watercourse because watercourse discharges do not occur through the stack; nor does it have an indirect effect in terms of total exposure because, at locations with the highest doses from exposure to watercourse discharges, the effect of exposure to atmospheric discharges is practically negligible. A substantial factor for discharges into a watercourse is the flow in the Vltava River (Kořensko). For the selected representative dry year 2018 (24.4 m^3/s), annual effective-dose values for a representative person from discharges into a watercourse are almost twice those in 2023 (an average year in terms of flow, 47.4 m^3/s) and more than twice those in the wet year 2024 (flow of 63.3 m^3/s).

Overall, however, the radiological impact of discharges from SMR ETE into a watercourse is very small. For an average hydrological year, the highest annual individual effective dose, including the committed dose, is approximately 0.15 µSv/year, and for a dry year it is up to 0.3 µSv/year. This is again several orders of magnitude below the ambient dose equivalent rate of gamma radiation from the natural background. Likewise, the radiological impact of SMR ETE discharges into a watercourse is far below the dose constraint of 50 µSv/year established by the Atomic Act for discharges into a watercourse.

For the combined impact of atmospheric discharges and discharges into a watercourse from SMR ETE, the calculation identifies the resulting representative person for the "average year" at Zvěrkovice and Zadní Kohout in the age categories of children aged 6–15 and adults aged 16 and older (for a ventilation-stack height of 56 m), or at Neznašov (cadastral area of Všemyslice) in the age category of children aged 0–5 (for a ventilation-stack height of 150 m). A similar conclusion, but with lower resulting dose values, also applies to the "wet year". For the "dry year", the representative person is a child aged 0–5 at Neznašov (cadastral area of Všemyslice), irrespective of the ventilation-stack height. For the "dry year", the impact of discharges into a watercourse is approximately twice the impact of atmospheric discharges, irrespective of the stack height.

At Neznašov, discharges into a watercourse make the principal contribution to exposure of the representative person, with atmospheric discharges making a small contribution. The principal exposure pathways (making the greatest contribution to the annual effective dose) are drinking water (sourced from the Vltava River in the adjacent area), ingestion of fish meat (from fish living in the Vltava River in the adjacent area), ingestion of vegetables irrigated with Vltava River water, ingestion of other locally grown agricultural products, and external exposure from the plume. The resulting annual effective dose to a representative person will under no circumstances exceed 0.30 µSv.

At Zvěrkovice and Zadní Kohout, only atmospheric discharges contribute to exposure of the representative person. The principal exposure pathways (making the greatest contribution to the annual effective dose) are external exposure from the plume, ingestion of locally grown agricultural products, and inhalation. The resulting annual effective dose to a representative person will under no circumstances exceed 0.18 µSv.

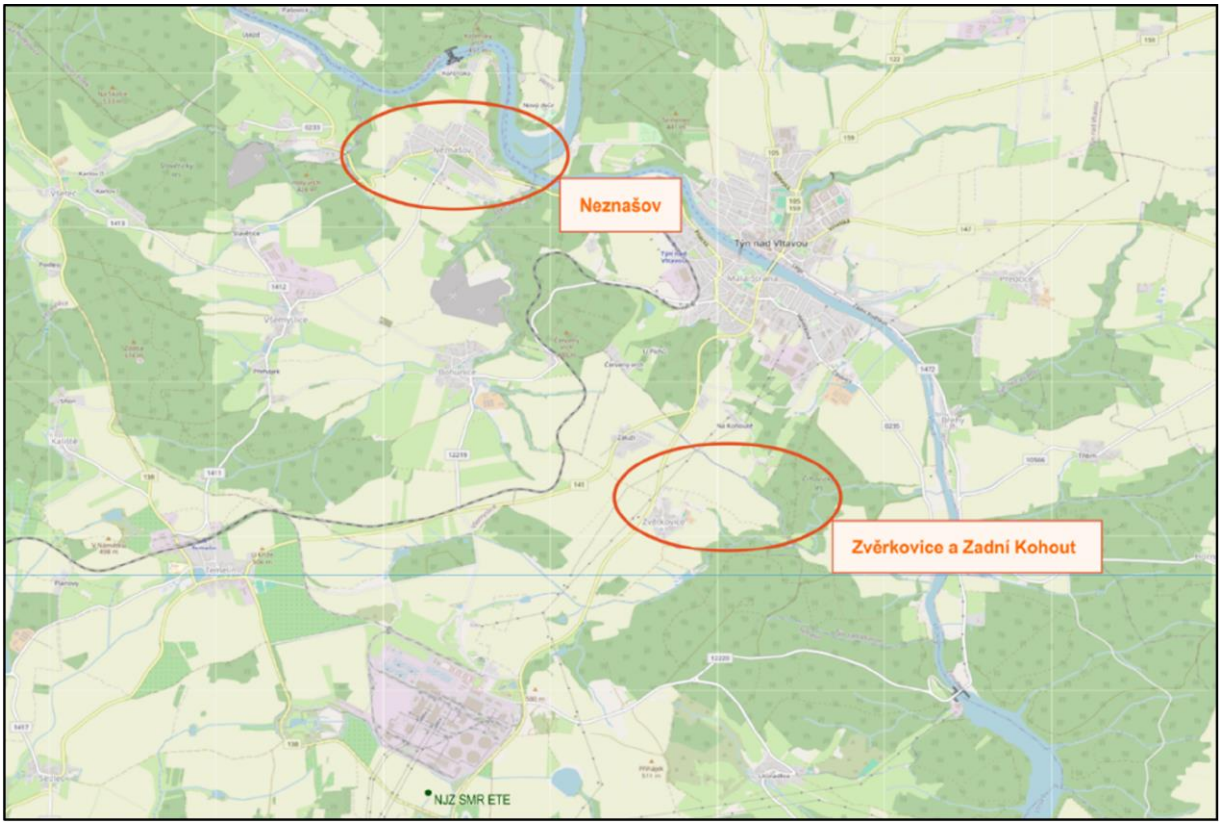
Table D.26: Combined impact of atmospheric discharges and discharges into a watercourse from SMR ETE - resulting representative person

Combined radiological impact of atmospheric discharges and discharges into the Vltava River (resulting representative person)						
Year	2018 ("dry year")		2023 ("average year")		2024 ("wet year")	
Height of VK [m]	150	56	150	56	150	56
Location	Neznašov		Neznašov	Zvěrkovice,	Neznašov	Zvěrkovice,

				Zadní Kohout		Zadní Kohout
Age group	0–5 years (fetus)	0–5 years (fetus)	0–5 years (fetus)	16+ years (6–15 years)	0–5 years (fetus)	6–15 years and 16+ years (0–5 years)
Total annual effective dose and committed effective dose via all considered pathways [Sv/year]	2.9E-07 (2.1E-07)	3.0E-07 (2.2E-07)	1.5E-07 (1.1E-07)	1.8E-07 (1.7E-07)	1.3E-07 (1.0E-07)	1.6E-07 (1.4E-07)

The Neznašov, Zvěrkovice, and Zadní Kohout locations where the resulting representative person is identified for the individual calculation configurations are shown in the following figure.

Fig. D.13: Combined impact of bounding atmospheric discharges and discharges into watercourses, locations of residence of the resulting representative person



In terms of transboundary impacts, radiological impacts at the nearest locations in Austria and Germany are assessed. Only atmospheric discharges contribute to human exposure from SMR ETE operation at these locations. The assessment is performed for the same scenarios and boundary conditions as for the surroundings of the Temelín site.

Identification of the partial representative person[1] and the total dose to the partial representative person in Austria and Germany through all exposure pathways as a result of annual bounding discharges from SMR ETE under the individual scenarios analyzed are summarized in the following tables.

Table D.27: Partial results for Austria

Radiological impact of discharges in Austria						
Year	2018 ("dry year")		2023 ("average year")		2024 ("wet year")	
Height of VK [m]	150	56	150	56	150	56
Location	Cadastral area of the municipality of Haugschlag, "Rottal" locality		Cadastral area of the municipality of Haugschlag, "Rottal" locality		Cadastral area of the municipality of Haugschlag, "Rottal" locality	
Age group	6–15 years	6–15 years	6–15 years	6–15 years	6–15 years	6–15 years
Effective dose [Sv/year]	1.5E-09	2.6E-09	1.4E-09	2.8E-09	1.9E-09	3.3E-09

[1] Here, partial representative person means the most exposed person living in Austria or Germany. The Austrian or German consumption basket (according to statistical data for the applicable calendar year) is applied when calculating the ingestion dose to identify this person.

The calculation identifies the partial representative person in Austria as a result of annual bounding discharges from SMR ETE at Rottal, in the cadastral area of the municipality of Haugschlag, in the "child aged 6–15" age group. The highest annual dose to a representative person in Austria as a result of annual bounding discharges from SMR ETE will not exceed 3.3 nSv. This is a negligibly small value.

Fig. D.14: Locations in Austria where partial representative persons are identified by calculation in terms of radiological impacts

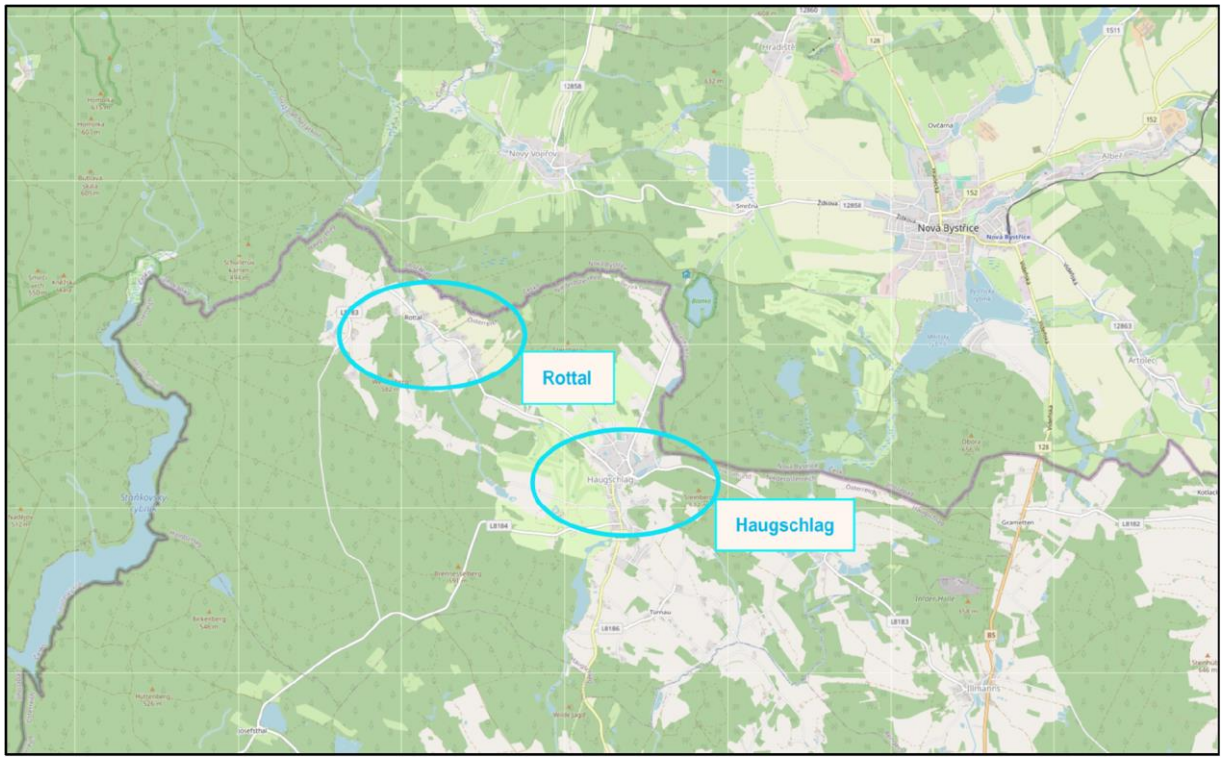


Table D.28: Partial results for Germany

Radiological impact of discharges in Germany						
Year	2018 ("dry year")		2023 ("average year")		2024 ("wet year")	
Height of VK [m]	150	56	150	56	150	56
Location	Cadastral area of the municipality of Neureichenau, Pleckensteiner Wald, locality "Schimmelbach"	Cadastral area of the municipality of Haidmühle, location "Marchhäuser"	Cadastral area of the municipality of Neureichenau, location "Lackenhauser"	Cadastral area of the municipality of Haidmühle, location "Marchhäuser"	Cadastral area of the municipality of Haidmühle, "Schnellezipf" locality	
Age group	6–15 years	6–15 years	6–15 years	6–15 years	6–15 years	6–15 years
Effective dose [Sv/year]	1.4E-09	2.2E-09	9.8E-10	2.1E-09	1.4E-09	2.3E-09

The calculation identifies the partial representative person in Germany as a result of annual bounding discharges from SMR ETE at Schnellezipf, in the cadastral area of the municipality of Haidmühle, in the "child aged 6–15" age group. The highest annual dose to a representative person in Germany as a result of annual bounding discharges from SMR ETE will not exceed 2.3 nSv. This is a negligibly small value.

Fig. D.15: Locations in Germany where partial representative persons are identified by calculation in terms of radiological impacts



As a result of annual bounding discharges from SMR ETE, annual collective doses to the population of the Czech Republic are very low, no more than 0.010 manSv, and represent an entirely negligible health risk that is unmeasurable in practice. Annual collective doses to the populations of Austria and Germany are another half order of magnitude lower, no more than 0.004 manSv.

D.I.3.2.5. Results of the assessment of SMR ETE impacts of ionizing radiation on biota

In addition to the radiological impact of SMR ETE on the population, radiological impacts on biota (terrestrial and aquatic animals, plants, and trees) are also evaluated.

The exposure pathways for terrestrial and aquatic animals, plants, and trees are described in Chapter D.I.3.2.2. Input data for the assessment of impacts of ionizing radiation (page 346 of this Documentation). For terrestrial reference organisms, external exposure from deposits on the terrain and internal exposure primarily due to food ingestion or inhalation of airborne H_2O and CO_2 (for tritium and C-14) are considered. Reference values of daily doses for the selected reference representatives of flora and fauna are established in IAEA GSG-10.

Table D.29: Reference values of daily doses for representatives of fauna and flora from IAEA GSG-10

Reference animal or plant	Derived reference value according to the IAEA [Gy/day]
Deer (large mammals)	1E-04 to 1E-03
Rat (small mammals)	1E-04 to 1E-03
Duck (waterbirds)	1E-04 to 1E-03
Frog (amphibians)	1E-03 to 1E-02
Bee (insect)	1E-02 to 1E-01
Earthworm (annelids)	1E-02 to 1E-01
Pine (large plants)	1E-04 to 1E-03
Grass (small plants)	1E-03 to 1E-02
Trout (fish)	1E-03 to 1E-02

The analysis of the radiological impact of SMR ETE determines maximum dose-rate values for biota (reference representatives of fauna and flora) and identifies the sectors with the highest dose for the individual years/scenarios. Daily dose values from SMR ETE discharges for terrestrial and aquatic representatives of fauna and flora are approximately 1E-10 Gy, at least six orders of magnitude below the derived reference values from IAEA GSG-10 specified above. The highest values are reached in a dry year (reference year 2018) for aquatic animals (fish) in the Albrechtice nad Vltavou, Chrášťany, and Všemyslice area. For trout, a value of 6.8E-10 Gy/day is reached; for other species and locations, values range from 1.0E-10 to 3.4E-10 Gy/day. The radiological impacts of normal SMR ETE operation on biota are therefore assessed as negligible. More detailed results are provided in Annex 5.1 to this Documentation.

D.I.3.2.6. Results of the assessment of cumulative impacts of ionizing radiation from all nuclear facilities at the site

To assess the interacting (cumulative) impacts of ionizing radiation from all nuclear facilities at the Temelín site, the impacts of the operating ETE1,2 units, planned New NPP ETE, and the spent nuclear fuel storage facility and its planned expansion must be added to the impacts of SMR ETE.

The impacts of the operating ETE1,2 units and planned New NPP ETE on the population and environment were evaluated in the New NPP ETE EIA documentation (https://portal.cenia.cz/eiasea/detail/EIA_MZP230); the radiological impacts of ETE1,2 and New NPP ETE were analyzed in Chapter D.I.3.3. Impacts of ionizing radiation in that documentation. The impact of the spent nuclear fuel storage facility and its planned expansion was evaluated in the EIA documentation for expansion of the storage capacity of the ETE spent nuclear fuel storage facility (https://portal.cenia.cz/eiasea/detail/EIA_MZP518); the radiological impact was analyzed in Chapter D.I.3.2. Impacts of ionizing radiation in that documentation.

The calculation of the radiological consequences (of atmospheric discharges) of normal operation of ETE1,2 (two units) and New NPP ETE (2 × 1,700 MW_e) was prepared using the NORMAL program, version 02, which was approved for use at the time by the SÚJB assessment committee. The radiological consequences of New NPP ETE and ETE1,2 were calculated by dividing the surroundings of the Temelín site into 16 directional and 20 distance bands. The program considered elevations, terrain roughness, and land-surface types based on actual conditions at the Temelín site. Conservative assumptions were used to calculate and determine near-surface activity concentrations, deposition on the ground surface, and deposition rates. The radiological impacts (annual effective doses and committed effective doses) of discharges from ETE1,2 and New NPP ETE into a watercourse (surface water) were determined using the RDETE program, which was also, and remains, approved for use by the SÚJB assessment committee. The program includes dispersion of radioactive substances and their daughter products in the aquatic environment; estimates of the effects of swimming in contaminated water, boating, staying on sediment, and staying on irrigated land; ingestion of drinking water; ingestion of fish living in contaminated water; ingestion of meat and milk from animals watered with contaminated water; and ingestion of agricultural products irrigated with contaminated water. The exposure pathways are considered for all age groups.

Given the distances of Kočín, Zvěrkovice, and Litoradlice, as determined in the study of the radiological impacts of normal SMR ETE operation in terms of atmospheric discharges, the distances of interest for assessing cumulative impacts are 2,333 m and 3,333 m from ETE1,2; closer areas are not permanently inhabited. Under the New NPP ETE project, two new units are to be located northwest of the existing ETE1,2 site. This shifts the distance of Litoradlice from New NPP ETE to 4.3 km; a distance of 3.333 km continues to be considered conservatively for further analysis.

Following issuance of the amendment to Decree No. 422/2016 Coll. in 2026, the underlying ABmerit s.r.o. report for SMR ETE determines annual effective doses and committed effective doses from SMR ETE atmospheric discharges for all age groups. Because the resulting values for atmospheric discharges are lower than those under the original wording of Decree No. 422/2016 Coll., the dose values from atmospheric discharges for ETE1,2 and New NPP ETE are conservatively not adjusted (reduced) in the cumulative-impacts analysis from the values used in the New NPP ETE EIA documentation. The original higher values are therefore considered (retained). If the annual-dose scaling factor were applied to the annual individual effective doses from ETE1,2 and New NPP ETE in accordance with the amendment to Decree No. 422/2016 Coll., these values would be lower, but by no more than approximately 10 %.

The following table presents the sums of the maximum annual effective dose and committed effective doses from the aggregate atmospheric discharges for ETE1,2 and New NPP ETE (2 × 1,700 MW_e) at the distances of interest of 2,333 m and 3,333 m from ETE1,2.

Table D.30: Sum of annual effective doses and committed effective doses through all exposure pathways considered for the individual age categories from operation of ETE1,2 and New NPP ETE (2 × 1,700 MW_e) at selected distances of interest for atmospheric discharges

Distance	Total annual effective dose and committed effective dose via all considered pathways from atmospheric discharges of ETE1,2 and New NPP ETE					
	Children aged 0–1	Children aged 1–2	Children aged 2–7	Children aged 7–12	Children aged 12–17	Adults
[m]	[Sv/year]					
2,333	1.00E-06	1.35E-06	1.11E-06	1.07E-06	1.03E-06	1.03E-06
3,333	6.31E-07	8.85E-07	7.10E-07	6.77E-07	6.48E-07	6.47E-07

Conversely, for discharges into a watercourse, the annual effective doses and committed effective doses following amendment of Decree No. 422/2016 Coll. are higher than under its original wording. For this reason, the values from the New NPP ETE EIA documentation are conservatively adjusted (increased) from the values used in that documentation by a scaling factor representing the increase in annual effective doses and committed effective doses for the individual age groups based on the change resulting from the 2026 amendment to SÚJB Decree No. 422/2016 Coll. The annual-effective-dose scaling factors are determined from SMR ETE data by computationally comparing the SMR ETE values before and after application of the new dose coefficients under the 2026 amendment to Decree No. 422/2016 Coll.

The scaling factor for the increase for each age group is shown in the following table.

Table D.31: Scaling factors for annual effective doses and committed effective doses for an average year based on SMR ETE surface-water data

Age group [years]	Total annual effective dose and committed effective dose via all considered pathways SMR ETE discharges into a watercourse [Sv/year]		Proportional coefficient for annual effective dose and committed effective dose for an average year [-]
	After update of Decree No. 422/2016 Coll.	Before update of Decree No. 422/2016 Coll.	
fetus	1.09E-07	1.10E-07	1.00
0 to 5	1.48E-07	9.90E-08	1.49
6 to 15	8.90E-08	7.60E-08	1.17
16+	8.70E-08	8.30E-08	1.05

This scaling factor for the increase is conservatively applied to effective doses and committed effective doses for ETE1,2 and New NPP ETE according to the New NPP ETE EIA documentation. Where multiple groups overlap, the higher scaling factor is considered. The factor for the 0–5 age group is applied to the 0–1, 1–2, and 2–7 age groups. The factor for the 6–15 age group is applied to the 7–12 and 12–16 age groups, and the factor for the 16+ age group is applied to adults.

The annual effective doses and committed effective doses for discharges from ETE1,2 and New NPP ETE into a watercourse, with the increase factor applied, are shown in the following table.

Table D.32: Annual effective dose and committed effective dose through all exposure pathways considered from use of water receiving discharges from ETE1,2 and New NPP ETE into a watercourse, with the increase factor applied

Age group [years]	Total annual effective dose and committed effective dose through all exposure pathways considered from operational discharges into a watercourse ETE1,2 (2 × 1,000 MW_e) [Sv/year]	Total annual effective dose and committed effective dose through all exposure pathways considered from design values of discharges into a watercourse New NPP ETE (2 × 1,700 MW_e) [Sv/year]	Sum of total annual effective dose and committed dose effective dose through all exposure pathways considered from discharges into a watercourse from ETE1,2 (2 × 1,000 MW_e) and New NPP ETE (2 × 1,700 MW_e) [Sv/year]
0 to 1	1.03E-06	2.71E-06	3.74E-06
1 to 2	8.17E-07	2.24E-06	3.05E-06
2 to 7	9.30E-07	2.49E-06	3.42E-06
7 to 12	5.71E-07	1.59E-06	2.16E-06
12 to 17	4.66E-07	1.38E-06	1.85E-06
Adults	6.03E-07	1.84E-06	2.45E-06

Discharges from ETE1,2 are directed into the Vltava River at the Kořensko profile. Both the planned New NPP ETE and SMR ETE are also designed to discharge all liquid effluents into the Vltava River at the same Kořensko profile.

The contribution of the spent nuclear fuel storage facility following its planned expansion is also considered in the complete assessment of cumulative impacts[1]. Radiation exposure from gamma radiation and neutrons from loaded packages in the spent nuclear fuel storage facility following its expansion was assessed as part of the EIA documentation for expansion of the ETE spent nuclear fuel storage facility. For the conservative target scenario for the spent nuclear fuel storage facility, the free-field ambient dose equivalent rate considering shielding by the facility building was determined for 38 packages placed in the first row along the storage-building wall. The impact was evaluated in the immediate surroundings and at the nearest permanently inhabited area, the Kočín part of the municipality of Temelín, approximately 1,600 m from the spent nuclear fuel storage facility.

Ambient dose equivalent rates according to the EIA documentation for expansion of the ETE spent nuclear fuel storage facility's storage capacity are presented in the following table.

Table D.33: Free-field ambient dose equivalent rates + shielding by the spent nuclear fuel storage facility building for 38 casks - conservative target scenario

	Ambient dose equivalent rate [Sv/h] at 2 m	Distance from cask [m]				
		2	7	100	1000	1600
		Free-field ambient dose equivalent rate considering shielding by the building [nSv/h]				
gamma radiation	3.30E-05	1.96E+04	1.60E+03	7.84E+00	7.84E-02	3.06E-02
neutrons	6.14E-05	2.30E+04	1.87E+03	9.19E+00	9.19E-02	3.59E-02
gamma radiation + neutrons	9.44E-05	4.26E+04	3.47E+03	1.70E+01	1.70E-01	6.65E-02

The table shows that even under the conservative target scenario, in which the maximum number of 38 casks in the first row was considered, the contribution to the existing radiation exposure at the nearest settlement, i.e., the Kočín part of the municipality of Temelín, represented by the annual ambient dose equivalent caused by the expanded spent nuclear fuel storage facility, will be 5.83E-07 Sv/year (0.58 µSv/year). This is only a small fraction of natural-background radiation exposure, which reaches approximately 5.65E-03 Sv per year in total at this location, while the ambient dose equivalent rate of gamma radiation from the natural background alone is slightly above 0.1 µSv/hour, i.e., approximately

[1] The planned expansion of the ETE spent nuclear fuel storage facility is unrelated to the SMR ETE Project and instead relates to the operating needs of the existing ETE1,2 units.

900 μSv/year, a level approximately 1,500 times higher. At the same time, for annual residence in Kočín, the anticipated annual ambient dose equivalent of 5.83E-07 Sv/year caused by the expanded spent nuclear fuel storage facility corresponds to 0.058 % of the annual effective-dose limit for the public, which is 1 mSv per year.

The aggregate results for the cumulative radiological impacts of ETE1,2, New NPP ETE, and SMR ETE for all scenarios assessed are summarized in the table below. A detailed description of the scenarios assessed is provided in Chapter 4 of Annex 5.1 to this Documentation.

Table D.34: Cumulative maximum annual effective doses to a representative person from ETE1,2, New NPP ETE, and SMR ETE

Scenario	Location, age group of representative persons	Maximum cumulative annual effective dose (ETE1,2 + New NPP ETE + SMR ETE) [Sv/year]
Exposure scenarios for atmospheric discharges		
Dry year, VK 150 m	Kočín, children aged 0–5	1.43E-06
Dry year, VK 56 m	Kočín, children aged 0–5	1.47E-06
Average year, VK 150 m	Zvěrkovice, children aged 0–5	9.87E-07
Average year, VK 56 m	Zvěrkovice, children aged 0–5	1.05E-06
Wet year, VK 150 m	Litoradlice, children aged 0–5	9.79E-07
Wet year, VK 56 m	Zvěrkovice, children aged 0–5	1.03E-06
Exposure scenarios for discharges into a watercourse		
Average-year scenario (2023)	Újezd and the Pašovice cottage area, fetus/children aged 0–5	3.89E-06

For atmospheric discharges, the maximum cumulative annual effective dose, including the committed effective dose to a representative person around the Temelín site, will be no more than 1.47 μSv/year at an SMR ETE ventilation-stack height of 56 meters. For a ventilation-stack height of 150 meters, the maximum cumulative annual effective dose, including the committed effective dose, is 1.43 μSv/year. SMR ETE contributes no more than 18 % of these doses for the 56 m stack and 11 % for the 150 m stack. Including the contribution of the ambient dose equivalent rate due to radiation from the expanded spent nuclear fuel storage facility, the maximum exposure values for a representative person will be 2.05 μSv/year and 2.01 μSv/year, respectively[1].

For cumulative doses to a representative person from discharges into a watercourse, the maximum cumulative annual effective dose, including the committed effective dose to a representative person, is 3.89 μSv/year when average annual flow in the Vltava River is considered. Given the location of the representative person, the contribution of the spent nuclear fuel storage facility has no effect on that person. SMR ETE contributes no more than 4.2 % of this dose.

Act No. 263/2016 Coll., as amended, establishes a dose constraint of 250 μSv per year and, for nuclear power installations, simultaneously 200 μSv per year for atmospheric discharges and 50 μSv per year for discharges into surface water. For a nuclear power installation, this dose constraint applies in aggregate to all nuclear facilities in the area for siting the nuclear facility.

For cumulative atmospheric discharges, the dose constraint (200 μSv) is met with a large margin because the annual cumulative effective doses from operation of ETE1,2, New NPP ETE, and SMR ETE are no more than 1.47 μSv/year for a representative person.

For cumulative discharges from the Temelín site into a watercourse (surface water), the dose constraint (50 μSv/year) is met with a margin both for an average year (3.89 μSv/year) and for a dry year, when the value is approximately twice that for an average year.

The conservatively determined cumulative doses will also remain valid after ETE1,2 transition to an extended fuel cycle. The annual individual effective doses and committed effective doses to a representative person determined in the annual reports of the ETE Environmental Radiation Monitoring Laboratory from operation of ETE1,2 are significantly lower, by at least tens of percent, for both doses from atmospheric discharges and doses from discharges into a watercourse than the annual individual effective doses from operation of ETE1,2 conservatively determined in the New NPP ETE EIA documentation and used for this SMR ETE Documentation to evaluate the cumulative radiological impacts of ETE1,2, New NPP ETE, and SMR ETE.

The existing ETE1,2 units must comply with the authorized limits established in the applicable SÚJB decision at 4 μSv from discharges into a watercourse for a representative person per calendar year. Historically, annual individual doses from discharges from ETE1,2 into a watercourse have remained below 1 μSv per calendar year over the long term. The authorized-limit value will therefore safely remain unexceeded even after ETE1,2 transition to an extended fuel cycle, and the modeling performed also indicates compliance when the cumulative impacts of ETE1,2, New NPP ETE, and SMR ETE are included. However, SÚJB establishes authorized limits individually for each nuclear facility.

The same applies to the authorized limit for atmospheric discharges, which is 10 μSv per calendar year under the applicable SÚJB permit for ETE1,2.

Effective doses from ETE1,2 and New NPP ETE were determined in the New NPP ETE EIA documentation for 20 distance groups and 16 directional groups. Wind-rose information is important in terms of impacts on neighboring countries (Austria and Germany). In terms of distance

[1] The resulting exposure value for a representative person determined in this manner is for information only because the contribution of the spent nuclear fuel storage facility is not included in the dose constraint, as it does not constitute an atmospheric discharge.

and the wind rose, the following representative locations are identified as nearest to the Temelín site: Rottal (51 km E-SE) in Austria and Schnellenzipf (57.5 km SW) in Germany. These locations correspond to the highest annual effective doses for Austria and Germany, shown in italics in the table below.

Table D.35: Impact of ETE1,2 and New NPP ETE at representative locations in Austria and Germany

Distance	Annual effective dose to a representative person	
	Austria - E-SE direction	Germany - SW direction
[m]	[Sv/year]	
43,333	*4.49E-08*	
53,333	3.37E-08	*6.17E-08*
66,667	2.48E-08	4.49E-08

The annual effective-dose values corresponding to the direction and representative location (the location where the representative person for the applicable country is found) are indicated. The actual distance of the respective nearest locations in Austria and Germany is always several kilometers greater than the distance presented in the table; the values presented are therefore determined conservatively.

The calculation identifies the partial representative person in Austria as a result of annual bounding discharges from SMR ETE at Rottal, in the cadastral area of the municipality of Haugschlag, in the "child aged 6–15" age group. The highest annual dose to a representative person in Austria as a result of annual bounding discharges from SMR ETE will not exceed 3.3 nSv (3.3E-09 Sv). This value corresponds to the "wet year" scenario with a ventilation-stack height of 56 m. The principal exposure pathways are determined to be the committed effective dose from ingestion (47 %) and inhalation (29 %). The effective dose from external exposure to the plume accounts for 24 %. For the cumulative impact on Austria, a representative person is identified at Rottal in the "6–15 years" age category. The maximum annual effective dose from discharges from SMR ETE, ETE1,2, and New NPP ETE to this representative person will not exceed 50 nSv (5E-08 Sv). SMR ETE accounts for less than 10 % of this value. Given the distance, the spent nuclear fuel storage facility does not contribute to exposure of the person at this location.

The calculation identifies the partial representative person in Germany for SMR ETE at Schnellenzipf, in the cadastral area of the municipality of Haidmühle, in the "child aged 6–15" age group. The highest annual dose to a representative person in Germany as a result of annual bounding discharges from SMR ETE will not exceed 2.3 nSv (2.3E-09 Sv). This value corresponds to the "wet year" scenario with a ventilation-stack height of 56 m. The most significant exposure pathways are the committed effective dose from ingestion (48 %) and inhalation (31 %). The effective dose from external exposure to the plume accounts for 21 %. For the cumulative impact on Germany, a representative person is identified at Schnellenzipf in the "6–15 years" age category. The maximum annual effective dose from discharges from SMR ETE, ETE1,2, and New NPP ETE to this representative person will not exceed 65 nSv (6.5E-08 Sv)[1]. SMR ETE accounts for less than 5 % of this value. Given the distance, the spent nuclear fuel storage facility does not contribute to exposure of the person at this location.

These annual individual effective-dose values for both Austria and Germany are negligibly small and pose no risk to representative persons in those countries. The same conclusions apply to Poland and Slovakia.

D.I.3.2.7. Other impacts of ionizing radiation

D.I.3.2.7.1. Assessment of radiological impacts on surface water

Other impacts of ionizing radiation evaluated include impacts on surface water and groundwater in terms of compliance with the guideline values for water-quality parameters established in Government Decree No. 401/2015 Coll., on indicators and values of permissible pollution of surface water and wastewater, requirements for permits to discharge wastewater into surface water and sewers, and sensitive areas, as amended, and in SÚJB Decree No. 422/2016 Coll., on radiation protection and security of a radionuclide source, as amended, for evaluation of selected radiological parameters for the acceptability of drinking-water sources for public water-supply systems.

In terms of impacts on surface water, the SMR ETE Project is assessed under two alternatives for concurrent operation with other nuclear facilities at the site:

- SMR ETE + ETE1,2,
- SMR ETE + ETE1,2 + New NPP ETE (2 × 1,700 MW_e)[2].

The assessment of radiological impacts on surface water is based on the T. G. Masaryk Water Research Institute, p.r.i., calculation model.

Statutory surface-water quality requirements, i.e., the scope and values of the parameters assessed, may vary among river reaches depending on the purpose of the assessment: general assessment of permissible surface-water pollution, assessment of the status/potential of surface-water bodies (ecological status/potential and chemical status), or use for treatment as drinking water. No other criteria concerning radioactive substances

[1] The annual effective doses for Germany are higher because of the doses from ETE1,2 and New NPP ETE presented in the New NPP ETE EIA documentation, which were determined using the meteorological data current at that time, when the wind direction and meteorological effect on Germany were more significant.

[2] The existing ETE1,2 spent nuclear fuel storage facility has no connection with wastewater discharges and is therefore not considered in modeling interacting impacts.

are relevant. Critical profiles for assessing the impact of the SMR ETE Project are selected considering the changing requirements along the reach of the Vltava River affected by SMR ETE discharges.

The first critical profile in terms of radioactivity parameters (as for non-radiological parameters) is the profile downstream of Kořensko Reservoir, located immediately downstream of the planned future SMR ETE wastewater outfall. At this profile, the impact of SMR ETE is assessed in terms of permissible surface-water pollution under Government Decree No. 401/2015 Coll.

The next critical profile downstream is Orlík Reservoir at Zvíkov Bridge, which is also assessed in terms of permissible surface-water pollution and the ecological potential of a standing-water body because it is the representative profile for water body HVL_1055 J.

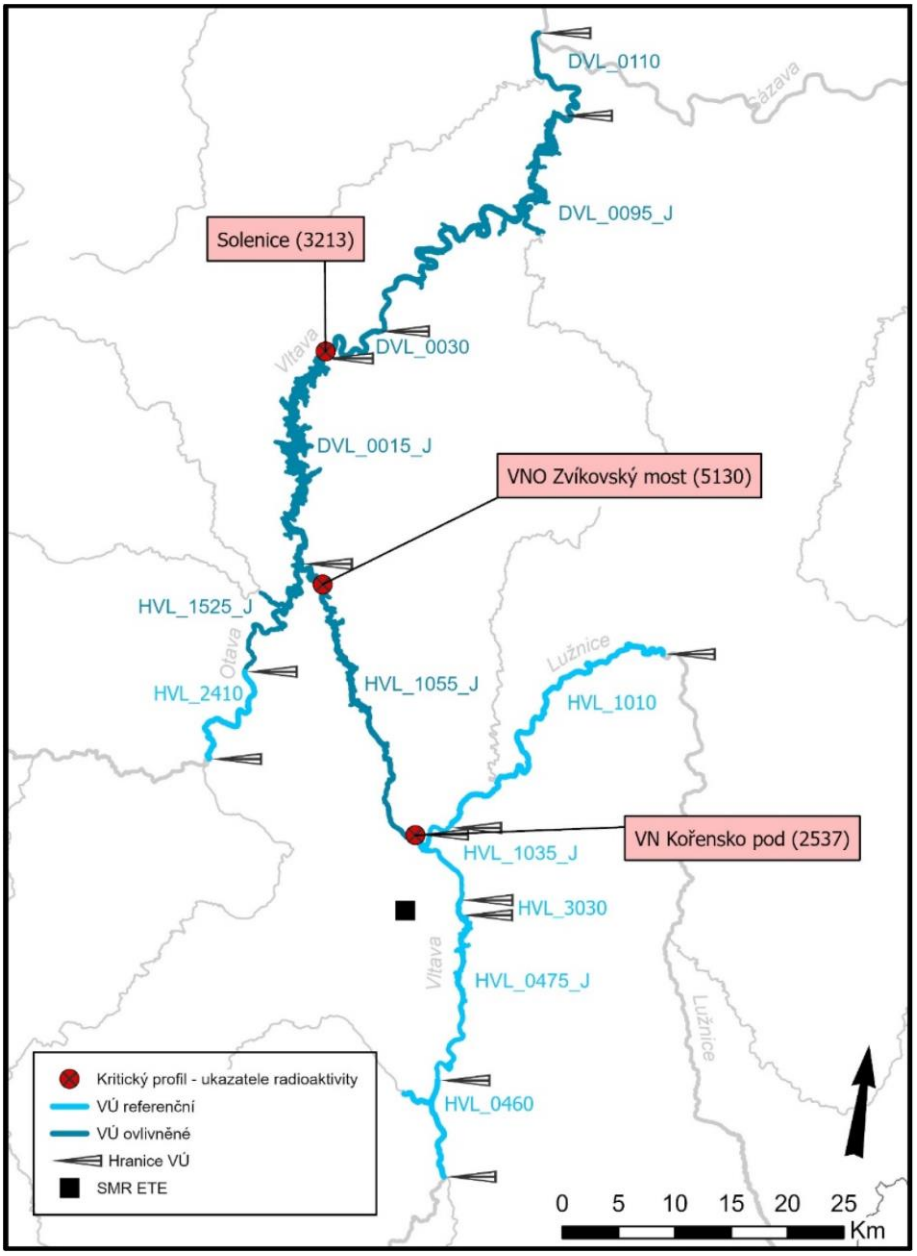
The third critical profile is Solenice, which is assessed primarily in terms of the use of surface water for treatment as drinking water because the first drinking-water abstraction downstream of the SMR ETE wastewater outfall is located below this profile.

Table D.36: Critical profiles along the reach affected by SMR ETE discharges in terms of radioactivity parameters

Profile ID	Watercourse	Profile name	Purpose of assessment
2537	Vltava	Downstream of Kořensko Reservoir	Direct impact of SMR ETE discharge, permissible surface-water pollution
5130	Vltava	Orlík Reservoir, Zvíkov Bridge	Permissible surface-water pollution, ecological potential of the SWB (standing waters)
3213	Vltava	Solenice	Public water-supply use

The critical profiles are shown in the following figure.

Fig. D.16: Critical profiles for assessing the impact of SMR ETE on surface-water quality in terms of radioactivity parameters



Kritický profil – ukazatele radioaktivity	Critical profile - radioactivity parameters
VÚ referenční	Reference SWB
VÚ ovlivněné	Affected water body
Hranice VÚ	SWB boundary
SMR ETE	SMR ETE

Three contributions that may affect the resulting activity concentrations of parameters at the profile downstream of Kořensko Reservoir converge at that profile: surface water from the Vltava River, represented by the Vltava at Hněvkovice profile; surface water from the Lužnice River, represented by the Lužnice at Koloděje profile; and wastewater from SMR ETE and the other components of the capacity alternatives assessed (ETE1,2, or ETE1,2 + New NPP ETE).

No significant tributary enters between the profile downstream of Kořensko Reservoir and the Orlík Reservoir at Zvíkov Bridge profile. However, the upper part of the Orlík Reservoir backwater lies between these profiles, so parameter concentrations are affected by sedimentation due to the reduced flow velocity and increased retention time; this is characterized by the activity-concentration change factor based on actual concentration data at these profiles for 2015–2024.

A mixing equation characterizing the confluence of water from the Vltava and Otava Rivers is used to estimate activity concentrations of radioactivity parameters at the Solenice profile. Changes (decreases) in activity concentrations of radioactivity parameters due to sedimentation in Orlík Reservoir for which sufficient underlying data are unavailable, but which actually occur, are conservatively not included.

The SMR ETE source-term values are used as the SMR ETE contribution. A value of 3.564 million m^3/year is used as the quantity of wastewater discharged from SMR ETE. The same source term is also used to model maximum values.

Actual measured activities of radionuclides discharged from ETE1,2, averaged over 2015–2024, are used as the contribution from ETE1,2. The maximum permitted quantity under the wastewater-discharge permit for ETE1,2, i.e., 10.8 million m^3/year, is used as the quantity of wastewater discharged from ETE1,2.

The annual design discharges specified in the New NPP ETE EIA documentation (for the 2 × 1,700 MW_e output configuration) are used as the New NPP ETE contribution. The anticipated value according to the New NPP ETE EIA documentation, i.e., 15.16 million m^3/year (for the 2 × 1,700 MW_e output configuration), is used as the quantity of wastewater discharged from New NPP ETE.

The flow assumptions are summarized in the table below, which presents the long-term average annual flow (Q_a) and 355-day flow (Q_{355}) for the individual profiles or the minimum guaranteed flow (Q_{zab}) under the operating rules, where established for the profile concerned.

Table D.37: Flow data at profiles for assessing the impact of SMR ETE

Watercourse	Profile name	Q_a [m^3/s]	Q_{zab} [m^3/s]	Q_{355} [m^3/s]
Lužnice	Bechyně (Koloděje)	21.6		2.63
Otava	Topělec	23.2		5.88
Vltava	Týn nad Vltavou (downstream of the dam of the Hněvkovice hydraulic structure)	27.3		9.86
Vltava	Downstream of Kořensko Reservoir	49.1	9.5 *	13
Vltava	Orlík Reservoir, Zvíkov Bridge	49.9		13.7
Vltava	Solenice	76.5		21.1
Vltava	Kamýk nad Vltavou	75.6		30.9
Vltava	Štěchovice	77.9		31.0

Data source: ČHMÚ (* Hněvkovice-Kořensko operating rules)

The flows used are not corrected for water consumption by New NPP ETE and SMR ETE. Water consumption by the existing ETE1,2 units is already included in the flow values. Based on data for the annual quantities of raw water pumped and wastewater discharged, average water consumption is assumed to be 1.64 m^3/s for New NPP ETE and 0.27 m^3/s for SMR ETE. This change in flow is negligible compared with Q_a at the profile downstream of Kořensko Reservoir (49.1 m^3/s). No significant change in Q_{355} flow is anticipated because, during drought, low river flows will be augmented through operation of reservoirs on the Vltava upstream of the discharge point.

For both capacity alternatives assessed (SMR ETE + ETE1,2 and SMR ETE + ETE1,2 + New NPP ETE), activity concentrations at the critical profiles are modeled for two hydrological situations:

- "normal flow" - the long-term average flow (Q_a) is used for modeling,
- "drought - impact of climate change" - Q_{355} flow is used for modeling.

Note: In Czech hydrology, Q_{355} denotes the flow in a watercourse that is reached or exceeded for 355 days per year on long-term average. It represents the threshold of natural hydrological drought. If the current flow in a river or stream falls below this value, the watercourse has an extremely low water level.

Assessment of the SMR ETE + ETE1,2 capacity alternative

The profile downstream of Kořensko Reservoir is the first profile below the Project wastewater outfall. The immediate impact of wastewater discharge is therefore manifested at this profile. Modeled concentrations are compared with permissible pollution under Government Decree No. 401/2015 Coll.

The modeled concentration values at the profile downstream of Kořensko Reservoir, as affected by discharges from SMR ETE + ETE1,2 (see the following table), show that statutory requirements are not exceeded for any of the capacity alternatives assessed, at either normal or low flows. The contributions of the assessed Project capacity alternative to activity fluxes at the profile downstream of Kořensko Reservoir are lower than the surface-water contribution, demonstrating the effect of natural radionuclides or residual contamination by artificial radionuclides. The only exception in this respect is tritium, for which the source is fundamental (95 % of the tritium passing through the profile downstream of Kořensko Reservoir originates in discharges from SMR ETE and ETE1,2). However, most tritium discharged from the assessed capacity alternative, as well as most other radioactivity parameters, is represented by discharges from ETE1,2.

Comparison of the modeled concentration values with statutory requirements for annual maxima showed that exceedances likewise do not occur under the anticipated normal discharges. It should be noted that the model does not consider variability in discharges during the year. If short-term, substantially elevated activity discharges were to coincide with very low flows, failure to meet the required maximum values, particularly for tritium, cannot be entirely ruled out. Such extreme concurrence of very low receiving-water flow and discharge of the maximum permitted

instantaneous quantity of these parameters must therefore be prevented, for example through mutual coordination of discharges among the individual sources (SMR ETE and ETE1,2) and consideration of the current flow in the receiving water.

Table D.38: Modeled activity concentrations of significant parameters at the profile downstream of Kořensko Reservoir for the SMR ETE + ETE1,2 capacity alternative

SMR ETE + ETE1,2 Profile: Downstream of Kořensko Reservoir		Modeled concentration at flow			Legislative requirements	
Parameter	Unit	Q_a	Q_{355}	Q_{zab} (max)	AA	MAX
cα	Bq/l	0.02	0.03	0.06	0.2	0.3
cβ	Bq/l	0.14	0.12	0.25	0.5	1
cβ-^{40}K	Bq/l	0.05	0.04	0.08	0.5	0.5
Cs-137	Bq/l	0.001	0.001	0.001	0.5	2
Sr-90	Bq/l	0.003	0.003	0.006	0.2	1
H-3	Bq/l	31	115	158	1000	3500
Notes on statutory requirements: AA permissible pollution - annual average MAX permissible pollution - maximum						

At the Orlík Reservoir Zvíkov Bridge profile, activity concentrations are modeled for tritium (H-3) as the dominant radionuclide (see the following table). The modeled tritium values are compared with permissible pollution under Government Decree No. 401/2015 Coll. The values for the other radionuclides will be the same as or lower than those at the profile downstream of Kořensko Reservoir. The Orlík Reservoir Zvíkov Bridge profile is also the representative profile for water body HVL_1055_J - Orlík I Reservoir on the Vltava River, which is a type 2BC21F21 standing-water body. Tritium is among the specific pollutants included in the ecological-potential assessment, and the modeled values are therefore also compared with the values established by the applicable methodology. The modeled tritium values do not exceed the requirements for this parameter at this profile.

Table D.39: Modeled activity concentrations of significant parameters at the Orlík Reservoir Zvíkov Bridge profile for the SMR ETE + ETE1,2 capacity alternative

SMR ETE + ETE1,2 Profile: Orlík Reservoir, Zvíkov Bridge		Modeled concentration at flow		Legislative requirements		
Parameter	Unit	Q_a	Q_{355}	AA	MAX	LIM-F
H-3	Bq/l	31	115	1000	3500	1000
Notes on statutory requirements: AA permissible pollution - annual average MAX permissible pollution - maximum LIM-F good ecological potential requirement						

At the Solenice profile, located downstream of the Orlík Reservoir dam, radioactivity parameters are assessed in terms of public water-supply use because the abstraction named 1. SčV Příbram Vltava is located there (see the following table). The results show that the indicative value for tritium is not exceeded and that the limit for the cβ-^{40}K parameter is also met. The cα parameter cannot be calculated because data are unavailable for the Otava at Topělec profile. However, above-limit values for cα are not estimated even at the profile downstream of Kořensko Reservoir, so compliance can also be assumed at Solenice.

Table D.40: Modeled concentrations of significant parameters at the Solenice profile for the SMR ETE + ETE1,2 capacity alternative

SMR ETE + ETE1,2 Profile: Solenice		Modeled concentration at flow		Legislative requirements
Parameter	Unit	Q_a	Q_{355}	LIM-B
cα	Bq/l			0.2
cβ-40K	Bq/l	0.04	0.04	0.5
H-3	Bq/l	21	75	100 [1]
Notes on statutory requirements: LIM-B permissible pollution - annual average/EQS-AA (public water-supply use)				

[1] Government Decree No. 401/2015 Coll. establishes 100 Bq/l as the indicative value of permissible pollution for water intended for treatment as drinking water. The applicable provision of the Government Decree also states that the provisions of Decree No. 422/2016 Coll., on radiation protection and security of a radionuclide source, are also to be used in assessing whether surface water is suitable for treatment as drinking water.

The amendment to SÚJB Decree No. 422/2016 Coll. establishes a maximum permissible tritium activity concentration of 3,500 Bq/l in drinking water for public supply and bottled water placed on the market, with a reference level of 1,000 Bq/l. At the same time, for a discharge from a workplace with a nuclear power installation at a water abstraction point for treatment as drinking water, it establishes the following investigation levels: 1) 100 Bq/l for tritium; if exceeded, it must be assessed whether discharge procedures have been breached and whether the investigation level for Cs-137 has been exceeded; 2) 0.5 Bq/l for Cs-137; if exceeded, the customer abstracting water for treatment as drinking water must be informed of the results of determining the activity concentration of artificial radionuclides.

Assessment of the SMR ETE + ETE1,2 + New NPP ETE capacity alternative

The modeled concentration values at the profile downstream of Kořensko Reservoir, as affected by discharges from SMR ETE + ETE1,2 + New NPP ETE (see the following table), show that radionuclide concentrations will increase, but statutory requirements are not exceeded at either normal or low flows.

Comparison of the modeled concentration values with statutory requirements for annual maxima showed that exceedances likewise do not occur under the anticipated normal discharges. It should again be noted that the model does not consider variability in discharges during the year. If short-term, substantially elevated activity discharges were to coincide with very low flows, failure to meet the required maximum values, particularly for tritium, cannot be entirely ruled out. Such extreme concurrence of very low receiving-water flow and discharge of the maximum permitted instantaneous quantity of these parameters must therefore be prevented, for example through mutual coordination of discharges among the individual sources (SMR ETE, ETE1,2, and New NPP ETE) and consideration of the current flow in the receiving water.

Table D.41: Modeled activity concentrations of significant parameters at the profile downstream of Kořensko Reservoir for the SMR ETE + ETE1,2 + New NPP ETE capacity alternative

SMR ETE + ETE1,2 + New NPP ETE Profile: Downstream of Kořensko Reservoir		Modeled concentration at flow			Legislative requirements	
Parameter	Unit	Q_a	Q_{355}	Q_{zab} (max)	AA	MAX
cα	Bq/l	0.02	0.03	0.06	0.2	0.3
cβ	Bq/l	0.15	0.17	0.31	0.5	1
cβ-^{40}K	Bq/l	0.06	0.09	0.14	0.5	0.5
Cs-137	Bq/l	0.001	0.001	0.002	0.5	2
Sr-90	Bq/l	0.003	0.004	0.006	0.2	1
H-3	Bq/l	109	408	558	1000	3500

Notes on statutory requirements:
AA permissible pollution - annual average
MAX permissible pollution - maximum

At the Orlík Reservoir Zvíkov Bridge profile, activity concentrations are modeled for tritium as the dominant radionuclide (see the following table). The modeled tritium values for the SMR ETE + ETE1,2 + New NPP ETE capacity alternative are compared with permissible pollution under Government Decree No. 401/2015 Coll. The values for the other radionuclides will be the same as or lower than those at the profile downstream of Kořensko Reservoir. The Orlík Reservoir Zvíkov Bridge profile is also the representative profile for water body HVL_1055_J - Orlík I Reservoir on the Vltava River, which is a type 2BC21F21 standing-water body. Tritium is among the specific pollutants included in the ecological-potential assessment, and the modeled values are therefore also compared with the values established by the applicable methodology. The modeled tritium values do not exceed the requirements for this parameter at this profile.

Table D.42: Modeled concentrations of significant parameters at the Orlík Reservoir Zvíkov Bridge profile for the SMR ETE + ETE1,2 + New NPP ETE capacity alternative

SMR ETE + ETE1,2 + New NPP ETE Profile: Orlík Reservoir, Zvíkov Bridge		Modeled concentration at flow		Legislative requirements		
Parameter	Unit	Q_a	Q_{355}	AA	MAX	LIM-F
H-3	Bq/l	109	409	1000	3500	1000

Notes on statutory requirements:
AA permissible pollution - annual average
MAX permissible pollution - maximum
LIM-F good ecological potential requirement

At the Solenice profile, located downstream of the Orlík Reservoir dam, radioactivity parameters are assessed in terms of public water-supply use because the abstraction named 1. SčV Příbram Vltava is located there (see the following table). The modeling results show that, for tritium under the SMR ETE + ETE1,2 + New NPP ETE capacity alternative, the indicative value for drinking-water use may not be met at low flows. At normal flows, this indicative value for tritium is not exceeded. The limit for the cβ-^{40}K parameter is met. The cα parameter could not be calculated because data are unavailable for the Otava at Topělec profile. However, above-limit values for cα are not estimated even at the profile downstream of Kořensko Reservoir, so compliance can also be assumed at Solenice.

Table D.43: Modeled concentrations of significant parameters at the Solenice profile for the SMR ETE + ETE1,2 + New NPP ETE capacity alternative

SMR ETE + ETE1,2 + New NPP ETE Profile: Solenice		Modeled concentration at flow		Legislative requirements
Parameter	Unit	Q_a	Q_{355}	LIM-B
cα	Bq/l			0.2
cβ-40K	Bq/l	0.08	0.21	0.5
H-3	Bq/l	71	265	100
Notes on statutory requirements: LIM-B permissible pollution - annual average/EQS-AA (public water-supply use)				

In addition to the three critical profiles evaluated above, radiological impacts at the Podolí and Hřensko profiles are modeled (see the following table). This modeling focuses on tritium as the determining radionuclide in releases from the nuclear facilities at the Temelín site. The flows published by the Czech Hydrometeorological Institute in the ISVS VODA information system as the long-term average flow (Q_a) and Q_{355} are used to determine tritium activity concentrations at the Podolí and Hřensko profiles: Prague-Chuchle gauging station (200100) for the Podolí profile and Elbe-Hřensko gauging station (245000) for the Hřensko profile. In view of the activity concentration at Solenice, the tritium activity concentration in Vltava tributaries unaffected by discharges of tritiated water from the Temelín site can be disregarded.

The modeling results show that the anticipated tritium activity concentrations at the Podolí and Hřensko profiles under normal-flow conditions meet the EQS-AA (1,000 Bq/l) under Government Decree No. 401/2015 Coll. and the indicative value of permissible pollution for water intended for treatment as drinking water (100 Bq/l) under both capacity alternatives assessed. At low flows (Q_{355}), the indicative value of permissible pollution for water intended for treatment as drinking water (100 Bq/l) at the Podolí profile is also met for the SMR ETE + ETE1,2 capacity alternative. For the SMR ETE + ETE1,2 + New NPP ETE capacity alternative, the indicative value of permissible pollution for water intended for treatment as drinking water is slightly exceeded at low flows (Q_{355}). At the Hřensko profile, the modeled tritium activity concentrations are in the tens of Bq/l and therefore meet all requirements even under low-flow conditions (Q_{355}).

Table D.44: Estimated tritium activity concentrations at the Podolí and Hřensko profiles under normal-flow conditions (Q_a) and climate-change drought conditions (Q_{355}) for the SMR ETE + ETE1,2 and SMR ETE + ETE1,2 + New NPP ETE capacity alternatives

Capacity alternative:		SMR ETE + ETE1,2	SMR ETE + ETE1,2 + New NPP ETE
Normal-flow conditions	Q_a [m³/s]	c(H-3) [Bq/l]	
Podolí	134	12	41
Hřensko	291	5	19
Climate-change drought conditions	Q_{355} [m³/s]	c(H-3) [Bq/l]	
Podolí	47.4	33	118
Hřensko	99.2	16	56

For the "medium discharge" scenario (see Chapter D.I.4.1.3. Impact on the qualitative characteristics of watercourses, page 384 of this Documentation), the activity concentrations of tritium for the interacting impact of SMR ETE + ETE1,2 + New NPP ETE and low Q_{355} flows are 265 Bq/l for Solenice, 118 Bq/l for Podolí, and 56 Bq/l for Hřensko.

The same assessment procedure is repeated for the "maximum discharge" scenario (see Chapter D.I.4.1.3. Impact on the qualitative characteristics of watercourses, page 384 of this Documentation), in which discharges from ETE1,2 are modeled not according to the long-term monitored average discharge of radioactive substances into watercourses, but very conservatively at the maximum permitted values in Bq/year under the current permit to discharge wastewater from ETE1,2 for those parameters for which such values are established. The resulting values are higher, but they do not materially affect the assessment conclusions. The limits are met under all alternatives and for all parameters; only at the Solenice and Podolí profiles may the indicative value for drinking-water use not be met, particularly at low flows. The maximum tritium activity concentrations reached at low Q_{355} flows are 338 Bq/l for Solenice, 151 Bq/l for Podolí, and 72 Bq/l for Hřensko. At Hřensko, the indicative value for tritium concentration in terms of drinking-water use is therefore met even under maximum-discharge and low-flow conditions.

In summary, under both capacity alternatives (SMR ETE + ETE1,2 and SMR ETE + ETE1,2 + New NPP ETE), the receiving surface water meets the statutory requirements for radioactivity parameters under both flow conditions (Q_a and Q_{355}). The exception is tritium, which fails to meet the indicative value for drinking-water use at the Solenice profile under Government Decree No. 401/2015 Coll. under the adverse concurrence of maximum discharge and climate-change flow conditions, meaning low flows. This problem may also be reflected farther downstream at the Prague-Podolí profile. However, the values specified in the 2026 amendment to SÚJB Decree No. 422/2016 Coll. concerning the activity concentration of radionuclides, including tritium, in drinking water for public supply and bottled water placed on the market will reliably be met.

Modeling of maximum activity concentrations showed that the indicative value for tritium activity concentration for public water-supply purposes under Government Decree No. 401/2015 Coll. will not normally be exceeded at the "profile downstream of Kořensko Reservoir". (100 Bq/l). To avoid exceeding this indicative value, however, the concurrence of discharges from the individual sources at the Temelín site will need to be coordinated and the flow conditions in the receiving water taken into account. This condition is included in the measures to minimize the Project's environmental impacts (see Chapter D.IV. CHARACTERISTICS OF MEASURES TO PREVENT, AVOID, AND REDUCE ADVERSE IMPACTS, DESCRIPTION OF COMPENSATORY MEASURES, page 479 of this Documentation).

D.I.3.2.8. Other impacts of ionizing radiation

No radioactive discharges into groundwater will be made from SMR ETE.

Other impacts of ionizing radiation can be ruled out. The ionizing-radiation field, meaning the effect of electromagnetic (gamma) radiation or neutrons directly from process buildings, without the contribution of discharges, is not significant even in the immediate vicinity of the process buildings of either SMR ETE or the existing facilities (the contribution from the spent nuclear fuel storage facility is described and quantified in the preceding chapter) and cannot have a measurable impact on the surrounding environment (publicly accessible areas).

D.I.3.3 Impacts of other physical and biological characteristics

D.I.3.3.1. Impacts of vibration

Impacts of vibration are ruled out. Vibrations caused by operation of equipment, particularly the turbine, attenuate in the subsoil in the immediate vicinity of their source, as do potential vibrations from transportation and handling activities. Their impact on the environment, structures, and population is therefore ruled out.

D.I.3.3.2. Impacts of non-ionizing radiation

The impact of non-ionizing radiation from electric and magnetic fields around power lines is assessed in accordance with Government Decree No. 291/2015 Coll., on protection of health against non-ionizing radiation, as amended, and Czech Standard ČSN 33 2040, Protection against the effects of 50 Hz electromagnetic fields within the zone of influence of electric power system equipment. A detailed assessment is provided in Annex 5.4 to this Documentation (Assessment of impacts of non-ionizing radiation), to which reference is made for details. The procedures and conclusions are summarized below.

According to Annex No. 1 to the above Government Decree, a maximum permissible value of the modified electric field strength in human tissue of E_{mod} = 0.2 V/m is established for the frequency range of 0–10 MHz, which includes the 50 Hz frequency of the electric power system (for individuals in the general, non-occupational environment, meaning the public[1]). Compliance with the maximum permissible value is determined by calculation or measurement under Section 3 of the Government Decree; only calculation is possible for a line that does not yet exist. The modified electric field strength E_{mod} induced in human tissue is calculated at a height of 1.8 m above ground for overhead lines (exposure in the head area) and 0.1 m above ground for underground lines (persons lying on the ground are considered). The calculations conservatively consider the most adverse phase-conductor sequence and the maximum current loading of the lines.

The calculations address the interacting impact of the SMR ETE Project lines (a new 400 kV single-circuit overhead line for power evacuation and new 110 kV underground cable lines for backup auxiliary power supply[2]) and the other existing 400 kV and 110 kV overhead lines of ETE1,2. The following potentially most adverse profiles are assessed:

1) Parallel routing of the 400 kV single-circuit overhead line (power evacuation from SMR ETE) and the 110 kV underground cable lines (backup auxiliary power supply for SMR ETE):
   a) 1.8 m above ground (profile 1a),
   b) 0.1 m above ground (profile 1b).
2) Parallel routing of the 400 kV single-circuit overhead line (power evacuation from SMR ETE) and two 400 kV single-circuit overhead lines (power evacuation from ETE1,2):
   a) 1.8 m above ground (profile 2a).
3) Crossing of the 110 kV underground cable lines (backup auxiliary power supply for SMR ETE) with the 400 kV and 110 kV overhead lines (power evacuation and standby auxiliary power supply for ETE1,2):
   a) 1.8 m above ground (profile 3a),
   b) 0.1 m above ground (profile 3b).

These calculation cases conservatively cover both the ordinary route of the Project lines and the potentially most adverse arrangement where they run in parallel with or cross other lines.

The maximum modified electric field strengths E_{mod} determined are summarized in the following table.

[1] A limit five times higher, i.e., E_{mod} = 1.0 V/m, is established for employees.

[2] The backup auxiliary power-supply lines will not carry current continuously and will be loaded only exceptionally. For conservatism, however, the calculation assumes continuous current loading.

Table D.45: Maximum modified electric field strengths E_{mod}

Profile	Characteristic	Height	Limit E_{mod}	E_{mod}
		[m]	[V/m]	
Profile 1a	Parallel routing of the 400 kV single-circuit overhead line (power evacuation from SMR ETE) and the 110 kV underground cable lines (backup auxiliary power supply for SMR ETE)	1.8	0.2	0.047
Profile 1b		0.1		0.045
Profile 2a	Parallel routing of the 400 kV single-circuit overhead line (power evacuation from SMR ETE) and two 400 kV single-circuit overhead lines (power evacuation from ETE1,2)	1.8		0.048
Profile 3a	Crossing of the 110 kV underground cable lines (backup auxiliary power supply for SMR ETE) with the 400 kV and 110 kV overhead lines (power evacuation and standby auxiliary power supply for ETE1,2)	1.8		0.049
Profile 3b		0.1		0.052

The results show that the maximum permissible modified electric field strength of E_{mod} = 0.2 V/m established by Government Decree No. 291/2015 Coll., on protection of health against non-ionizing radiation, as amended, is met throughout publicly accessible areas and for all line arrangements, with a substantial margin.

D.I.3.3.3. Impacts of light pollution

The SMR ETE site will be illuminated. As at the existing ETE1,2 site, the lighting will include both red aviation obstruction lights installed on vertical structures, if required by aviation regulations, and lighting for roads and operational areas within the SMR site.

The aircraft warning lights will comply with the applicable regulations, leaving no scope to minimize their impact on light pollution in the area through their location, orientation, or luminous intensity. These are essential safety and security installations.

The Project itself will be illuminated in a manner that minimizes light pollution in the surrounding area. Project lighting will be designed in accordance with Ministry of the Environment Methodological Guideline Ref. No. MZP/2023/710/2146 and standard ČSN 36 0459, Limiting the Adverse Effects of Outdoor Lighting, so as to eliminate light pollution in the surrounding area. The SMR site lighting will therefore use currently available methods to limit light pollution of the night sky and landscape. Luminaires that limit light emission in unnecessary directions, meaning toward the sky, will be used. Nevertheless, the lighting characteristics, including location, orientation, and luminous intensity, will be governed by physical-protection requirements. It can therefore be expected that the SMR ETE site will be clearly visible at night even after these measures are implemented, but this impact will be minimized through an optimized lighting design. It should be added that this will not be a new phenomenon in the area: the ETE1,2 site is already illuminated, and New NPP ETE will also be illuminated in the future, in each case subject to the limiting conditions specified above.

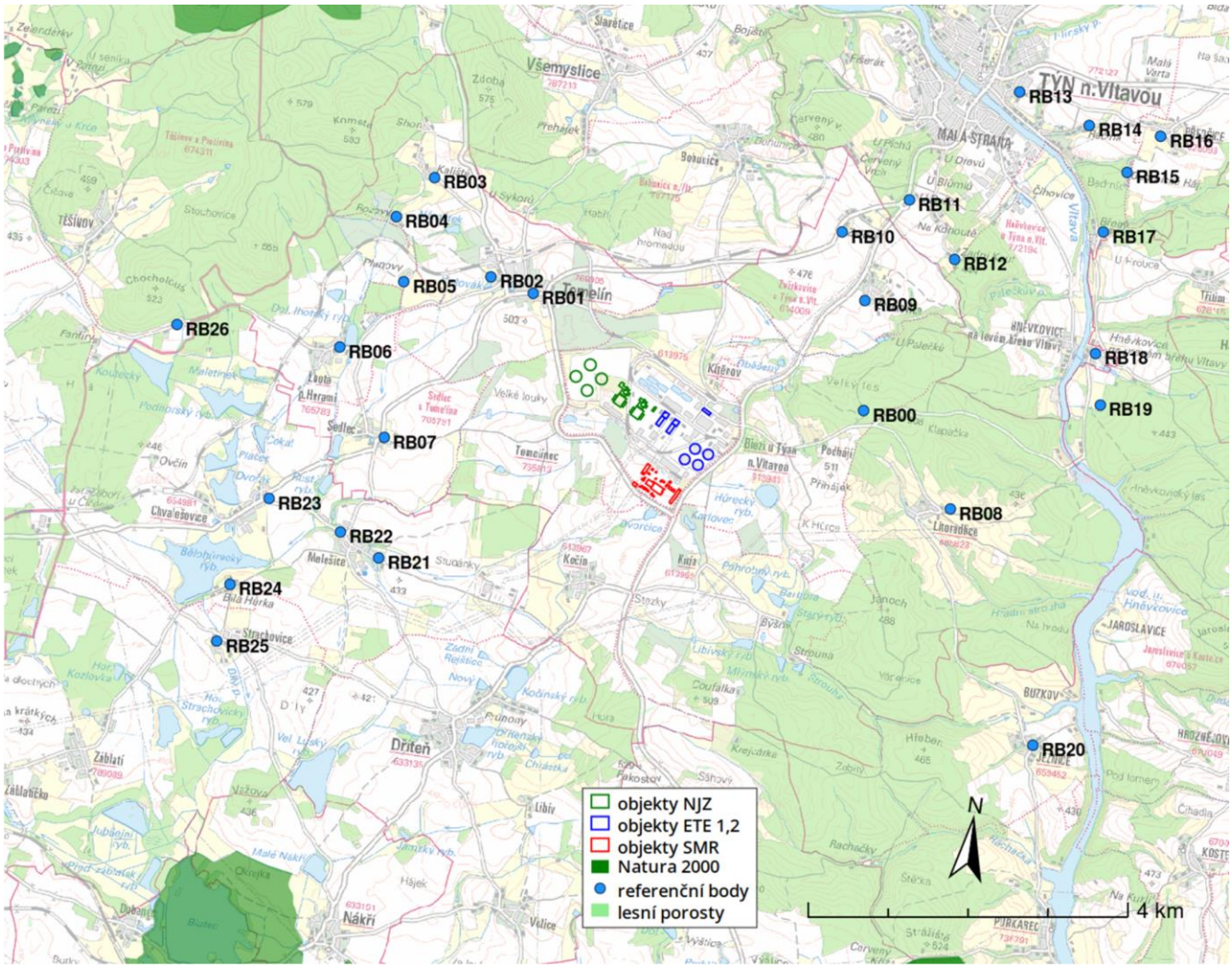
D.I.3.3.4. Impacts of shading

The assessment of shading in the area considers both the impact of structures, meaning shadows cast by structures, and the impact of steam plumes from cooling towers, meaning shading caused by steam plumes. The assessment of shading from steam plumes is based on interpretation of the results of the Institute of Atmospheric Physics study presented in Chapter D.I.2.2.1. Impacts on local climate (page 334 of this Documentation).

Shading is assessed both for SMR ETE alone and for the total cumulative impact of SMR ETE, the existing ETE1,2 structures, and the planned New NPP ETE structures (the 2 × 1,700 MW_e alternative with 4 cooling towers).

Reference points are defined in residential areas within the affected territory, and shading durations are assessed in tables for these points. The points are selected to represent the locations where SMR ETE, ETE1,2, and New NPP ETE are expected to have the greatest impact. For consistency and comparability of results, these are the same locations as in the earlier analysis of New NPP ETE impacts, which served as one of the supporting documents for preparation of the New NPP ETE EIA documentation. Only locations with a real possibility of shading in view of the Sun's position in the sky, the structures assessed, and residential development are included. For this reason, some nearby inhabited areas, such as Kočín and other parts of the municipality of Dříteň, are not assessed because the SMR ETE, ETE1,2, and New NPP ETE structures will clearly have no shading impact at these locations.

Fig. D.17: Locations of the structures and reference points assessed

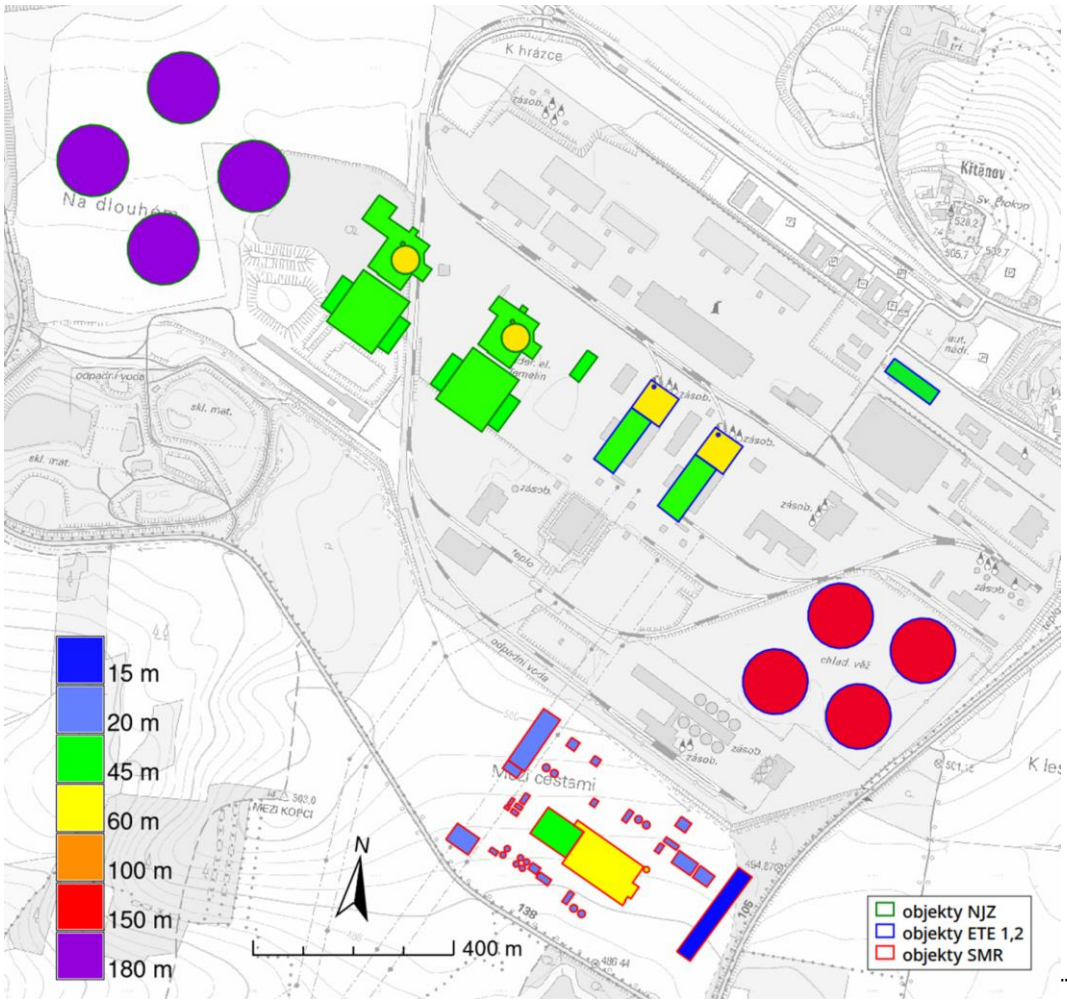


objekty NJZ	New NPP structures
objekty ETE 1,2	ETE1,2 structures
objekty SMR	SMR structures
Natura 2000	Natura 2000
referenční body	reference points
lesní porosty	forest stands

The heights of the structures are based on actual data for ETE1,2 and anticipated data for SMR ETE and New NPP ETE (the 2 × 1,700 MW_e alternative with four cooling towers). The dominant SMR ETE structure will be the reactor building, up to 60 m high[1]. An overview of the vertical arrangement of the structures assessed is shown in the following figure.

[1] Use of an assembly hall, up to 85 m high, is anticipated during SMR ETE construction, but this structure will be temporary and is not included in the modeling.

Fig. D.18: Graphic overview of the heights of the structures assessed



objekty NJZ	New NPP structures
objekty ETE 1,2	ETE1,2 structures
objekty SMR	SMR structures

The durations of shading by structures at the reference points are shown in the following table.

Table D.46: Durations of shading by structures at the reference points

Ref. point	SMR ETE		SMR ETE + ETE1,2 + New NPP ETE		Ref. point	SMR ETE		SMR ETE + ETE1,2 + New NPP ETE	
	Max./day [min]	Year [h]	Max./day [min]	Year [h]		Max./day [min]	Year [h]	Max./day [min]	Year [h]
RB00	0.00	0.0	21.00	16.7	RB14	0.00	0.0	6.00	2.1
RB01	0.00	0.0	63.00	65.5	RB15	0.00	0.0	0.00	0.0
RB02	0.00	0.0	42.00	47.1	RB16	0.00	0.0	9.00	3.6
RB03	0.00	0.0	18.00	9.5	RB17	0.00	0.0	6.00	0.8
RB04	0.00	0.0	9.00	4.5	RB18	0.00	0.0	0.00	0.0
RB05	0.00	0.0	27.00	13.9	RB19	0.00	0.0	0.00	0.0
RB06	0.00	0.0	21.00	11.1	RB20	0.00	0.0	0.00	0.0
RB07	3.00	0.3	30.00	26.7	RB21	0.00	0.0	12.00	3.1
RB08	0.00	0.0	12.00	4.0	RB22	3.00	0.2	12.00	4.6
RB09	0.00	0.0	15.00	14.2	RB23	0.00	0.0	18.00	9.8
RB10	0.00	0.0	3.00	0.6	RB24	0.00	0.0	6.00	2.7
RB11	0.00	0.0	0.00	0.0	RB25	3.00	0.1	9.00	3.7
RB12	0.00	0.0	12.00	7.1	RB26	0.00	0.0	0.00	0.0
RB13	0.00	0.0	0.00	0.0					

Shading modeling shows that the SMR ETE Project will have an insignificant impact on shading in the surrounding area. The impact will occur primarily at locations west to southwest of the proposed SMR ETE structures. Of the selected reference points, shading from SMR ETE was indicated only at RB7 (Sedlec), RB22 (Malešice), and RB25 (Strachovice), for no more than 3 minutes per day and for an annual total of 0.1 to 0.3 hours. The total cumulative duration of shading caused by all the structures specified above at these three reference points will range from 9 to 30 minutes per day and approximately 4 to 27 hours per year.

Total cumulative shading from the structures assessed (SMR ETE + ETE1,2 + New NPP ETE) will reach its maximum at the selected locations in the municipality of Temelín, where maxima may reach up to one hour per day during part of the year and approximately 65 hours per year. At these locations, however, shading will be caused exclusively by the ETE1,2 and New NPP ETE structures. The SMR ETE Project will make no contribution to total shading there and will not change the situation in this respect.

In view of the short shading durations potentially caused by the Project and the locations of Natura 2000 sites, which are entirely outside the range of shading impacts from either SMR ETE alone or the cumulative impact of SMR ETE + ETE1,2 + New NPP ETE, adverse impacts on these ecosystems can also be ruled out.

In summary, any shading by SMR ETE structures will not cause annoyance to residents at any location in the area assessed and will not adversely affect ecosystems.

The contribution of the SMR ETE Project to the cumulative shading impact is small. In residential areas of the municipalities of Malešice and Sedlec, where negligible shading due to SMR ETE is calculated, the implemented Project will account for only approximately one-tenth to one-third of the total shading duration. Most of the impact there will be caused by the combined impact of ETE1,2 and New NPP ETE. Nevertheless, even with the addition of SMR ETE at these locations, total shading durations will remain safely below values that could cause annoyance to residents, no more than 30 minutes per day in the most adverse case.

Because the calculated data represent a theoretical maximum based on continuously cloudless skies, actual annual shading durations will be approximately 60 % lower on average, and the calculated maximum daily shading durations will probably also be lower than the modeled results.

Of the surrounding municipalities, the area shaded by SMR ETE steam plumes will affect only Temelín, including the Sedlec part, and a small part of the cadastral area of the municipality of Dříteň (Malešice and Kočín). This is the edge of the affected territory, where shading due to SMR ETE is expected for 1 to 2 % of annual time with cloud cover of less than 7/8, which averages 2,573 hours according to climate data for the Temelín site. The total annual duration of shading due to SMR ETE in the affected settlements specified above is therefore approximately 26 to 51 hours per year.

The cumulative impact of the SMR ETE + ETE1,2 + New NPP ETE steam plumes will be several times greater than that of SMR ETE alone and will extend over a substantially larger area, particularly eastward. It will represent 4 to 5 % of annual time with cloud cover of less than 7/8 in the municipality of Temelín, 2 to 5 % in Týn nad Vltavou, and 2 to 3 % in Bečice; the eastern edge of the affected territory will extend toward the municipality of Dolní Bukovsko, with a calculated shading frequency of up to 2 %. By reasoning analogous to that applied above for SMR ETE, it can be concluded that in the municipality of Temelín, where the cumulative impact will be greatest, the shading duration determined by the calculation method used will reach no more than approximately 103 to 129 hours per calendar year. Most of the cumulative impact will clearly be caused not by SMR ETE operation but by the other power sources named.

No reference values have been established for annoyance due to shading by steam plumes. As in the case of shading by structures, the degree of annoyance is subjective. However, steam plumes are perceived differently from shadows cast by solid structures. Because a plume is partly permeable to sunlight and its permeability changes gradually at its edges, its effect is practically the same as that of natural cloud cover, to which the human sensory system is naturally adapted. The subjective annoyance caused by shading from steam plumes is therefore lower than that caused by shading from solid structures. The anticipated impact of SMR ETE steam plumes on shading at surrounding inhabited locations can therefore be assessed as insignificant. Given the similarity of the effect to natural cloud cover, at the very low calculated frequencies of occurrence the effect will probably be imperceptible to the senses. The total cumulative impact of SMR ETE, ETE1,2, and New NPP ETE can be assessed as minor. The new SMR ETE contribution to the total impact will not change the situation in terms of potential annoyance from shading.

In terms of the adverse impact of shading in the surrounding area, the SMR ETE Project at the Temelín site, including the cumulative impacts of other sources, will therefore be acceptable.

D.I.3.3.5. Impacts of other factors

Impacts of other physical or biological factors are ruled out.

D.I.3.4. Impacts during construction or termination of operation

D.I.3.4.1. Impacts of noise

Project construction will involve both intensive activity at the construction site (the main construction site, construction site facilities, and utility-corridor routes) and associated construction traffic on public roads (transportation of construction and structural materials and transportation of

workers). The noise impact of these activities is assessed in the acoustic study (Annex 5.2 to this Documentation), to which reference is made for details. The results are summarized below.

The noise situation at the construction site is assessed for seven acoustically significant work stages (scenarios):

- construction 1 - preparatory work (topsoil stripping from the construction area and construction site facility areas),
- construction 2 - preparatory work (excavation in the construction area and construction site facility areas; bulk earthworks),
- construction 3 - construction of construction site facilities,
- construction 4 - SMR ETE construction (excavation),
- construction 5 - SMR ETE construction (foundations),
- construction 6 - SMR ETE construction (construction of the main generating unit and other structures),
- construction 7 - SMR ETE construction (installation work on the main generating unit plus other activities).

Construction work at the construction site will be performed only during the daytime, i.e., between 7:00 a.m. and 9:00 p.m. The resulting equivalent sound pressure levels at the nearest, or potentially most affected, protected outdoor spaces of buildings during the construction stages specified are presented in the following table.

Table D.47: Noise from construction activities - SMR ETE construction

Reference point	Location	Height	Limit	1	2	3	4	5	6	7
		[m]	$L_{Aeq,T}$ [dB], daytime (7:00 a.m.–9:00 p.m.)							
MB01	Edge of Litoradlice	3	65	23.8	21.8	28.0	18.9	26.7	26.9	20.8
		6		24.6	22.9	28.9	19.8	27.5	27.8	21.9
MB02	Near the former farmstead beyond the former village of Knín	3		30.4	28.0	36.0	24.5	33.3	33.6	27.1
		6		30.8	28.4	36.4	24.9	33.7	34.0	27.5
MB03	North-eastern edge of Kočín	3		36.5	35.4	45.2	29.0	40.6	40.8	31.9
		6		37.1	36.0	46.5	29.7	41.4	41.7	32.4
MB04	North-eastern edge of Kočín	3		36.6	35.5	46.1	29.4	41.0	41.2	32.0
		6		37.2	35.7	47.4	30.2	41.2	41.4	32.4
MB05	South-western edge of Kočín	3		31.9	31.2	39.0	25.9	36.4	36.6	27.8
		6		32.4	31.8	39.6	26.5	36.9	37.1	28.5
MB06	Edge of Malešice	3		23.1	23.3	30.5	18.2	27.6	27.8	20.4
		6		23.7	23.9	31.0	18.9	28.3	28.5	21.1
MB07	Edge of Sedlec	3		22.3	23.4	28.2	18.5	26.7	26.9	20.3
		6		23.1	24.2	29.0	19.3	27.4	27.6	21.1
MB08	Edge of Temelín	3		26.4	31.4	33.8	29.5	35.3	35.3	29.8
		6		26.9	31.8	34.3	30.0	35.6	35.6	30.2

Note: For a map showing reference-point locations, see Chapter C.II.3.1. Noise (page 231 of this Documentation).

If an assembly hall is used, noise from activities performed inside the hall will be further reduced.

The results show that the public-health limit for construction noise will not be exceeded in the protected outdoor spaces of buildings in the nearest residential areas during any construction period.

To assess the interacting (cumulative) impacts of SMR ETE and New NPP ETE construction, the most adverse scenario in terms of acoustic impact is also selected. It is characterized by construction of SMR ETE structures concurrently with bulk earthworks at the New NPP ETE construction site. The resulting equivalent sound pressure levels at the nearest, or potentially most affected, protected outdoor spaces of buildings for this concurrence of activities are presented in the following table.

Table D.48: Noise from construction activities - SMR ETE + New NPP ETE construction

Reference point	Location	Height	Limit	Construction SMR ETE	Construction New NPP ETE	Construction SMR ETE + New NPP ETE
		[m]	$L_{Aeq,T}$ [dB], daytime (7:00 a.m.–9:00 p.m.)			
MB01	Edge of Litoradlice	3	65	26.9	32.1	33.2
		6		27.8	32.1	33.5
MB02	Near the former farmstead beyond the former village of Knín	3		33.6	36.0	38.0
		6		34.0	36.0	38.1
MB03	North-eastern edge of Kočín	3		40.8	42.8	44.9
		6		41.7	42.8	45.3
MB04	North-eastern edge of Kočín	3		41.2	42.6	45.0
		6		41.4	42.6	45.1
MB05	South-western edge of Kočín	3		36.6	39.2	41.1
		6		37.1	39.2	41.3
MB06	Edge of Malešice	3		27.8	34.1	35.0

		6		28.5	34.1	35.2
MB07	Edge of Sedlec	3		26.9	35.9	36.4
		6		27.6	35.9	36.5
MB08	Edge of Temelín	3		35.3	49.4	49.6
		6		35.6	49.4	49.6

Note: For a map showing reference-point locations, see Chapter C.II.3.1. Noise (page 231 of this Documentation).

The results show that the public-health limits for construction-activity noise are met at all reference points representing protected outdoor spaces of buildings for the potential concurrence of SMR ETE and New NPP ETE construction activities.

Transportation of workers and materials during construction will be limited to the daytime, except for specific time-limited or acoustically insignificant activities, such as transportation of oversized and heavy components. Given their short duration, these activities will not have a significant impact on nighttime noise exposure. The acoustic situation is therefore assessed for the daytime (6:00 a.m.–10:00 p.m.) and the 2034 time horizon, conservatively also considering potential cumulative impacts with the initial phase of New NPP ETE construction. Noise from traffic on public roads during construction under the scenarios specified is summarized in the following table.

Table D.49: Construction noise - traffic on public roads

Reference point	Story	Limit	ETE1,2	ETE1,2 + SMR ETE construction	ETE1,2 + SMR ETE construction + New NPP ETE construction
		$L_{Aeq,T}$ [dB], daytime (6:00 a.m.–10:00 p.m.)			
KOC 1	1st	68	53.4	53.5	53.7
	2nd		54.1	54.2	54.4
TEM 1	1st		62.0	62.0	62.0
	2nd		62.3	62.3	62.3
TEM 2	1st		59.1	59.4	59.7
	2nd		62.4	62.7	63.1
TEM 3	1st		63.7	64.3	65.0
	2nd		64.3	65.0	65.6
TEM 4	1st		64.5	65.1	65.8
	2nd		64.9	65.5	66.1
TEM 5	1st		63.4	64.0	64.6
	2nd		64.8	65.4	66.0
TEM 6	1st		56.1	57.7	59.3
	2nd		57.4	59.0	60.7
TEM 7	1st		59.0	60.6	62.3
	2nd		60.3	62.0	63.6
TYN 1	1st		61.8	62.4	63.1
	2nd		63.5	64.1	64.8
TYN 2	1st		56.5	57.0	57.7
	2nd		57.3	57.9	58.6
	3rd		58.1	58.6	59.3
	4th		58.8	59.4	60.1
	5th		59.5	60.0	60.7
	6th		60.1	60.7	61.3
TYN 3	1st		58.4	59.0	59.6
	2nd		59.5	60.0	60.7
	3rd		60.6	61.1	61.8
	4th		61.5	62.1	62.7
	5th		62.0	62.5	63.2
	6th		62.2	62.7	63.4
TYN 4	1st		62.5	63.0	63.6
	2nd		65.4	65.9	66.5
TYN 5	1st		57.9	59.1	60.0
	2nd		62.9	64.0	65.0
TYN 6	1st		62.9	64.1	65.2
	2nd		64.1	65.3	66.4
ZVER 1	1st		58.1	58.8	59.7
	2nd		58.9	59.7	60.6
ZVER 2	1st		61.9	62.6	63.5
	2nd		63.2	63.9	64.9

Note: For a map showing reference-point locations, see Chapter C.II.3.1. Noise (page 231 of this Documentation).

The results show that, under the individual future conditions arising from the interacting operation of ETE1,2 and construction of SMR ETE and New NPP ETE, the daytime and nighttime public-health noise limits under Government Decree No. 272/2011 Coll., on protection of health against adverse effects of noise and vibrations, as amended, will be met at all reference points (protected outdoor spaces of buildings).

A comparison of motor-vehicle traffic volumes on the road network studied shows an increase in the number of both passenger cars and trucks on most roads directly associated with SMR ETE construction activities. This increase is also reflected in the calculated sound pressure levels. The highest contributions occur in the municipality of Temelín, where the impact of traffic associated with SMR ETE construction is up to 1.7 dB and, when the impact of the initial phase of New NPP ETE construction is included, up to 3.3 dB.

The same conclusions also apply to the interacting impacts of the proposed Temelín concrete mixing plant and recycling facility project (JHC1253), which, given the volume of traffic it generates, does not present the potential for significant cumulative interaction. The same applies to the planned Hůrka u Temelína – composting plant project (JHC1259).

At night, no increase occurs in traffic noise associated with SMR ETE construction. No acoustic measures need to be proposed.

Although all transportation of materials and raw materials required for construction (100 %) is conservatively assumed to use the road network for purposes of this Documentation, transportation of some raw materials and materials by rail cannot be ruled out because a rail siding is available. However, there is no potential for exceedance of public-health noise limits at the most affected protected outdoor space of buildings in the vicinity of the rail siding, given the more than sufficient distance between the rail siding and the protected space.

As regards noise impacts during termination of operation and decommissioning, it can be conservatively assumed that they will not exceed the impacts specified above for the periods of operation or construction.

D.I.3.4.2. Impacts of ionizing radiation

No impacts of ionizing radiation will arise during SMR ETE construction: no radioactive discharges will be made and no ionizing-radiation sources of practical relevance to environmental protection will be used. Potential sources may include sealed radionuclide sources incorporated into various measuring instruments, such as radiographic inspection equipment for weld inspection, but these will be used in accordance with their technical conditions and without significant impacts on the surrounding area. No radioactive substances capable of entering the geological environment or groundwater will be used at the SMR ETE construction site. Water from the existing public water-supply system, or raw water from the Vltava River pumped to the ETE1,2 water reservoir, is anticipated to be used for construction purposes. Radiological impacts on the surrounding area during construction will therefore arise only from operation of ETE1,2.

SMR ETE construction will take place during continuous operation of ETE1,2. The radiological effect on SMR ETE construction workers will be included in the ETE1,2 assessment in the regular annual reports on the results of monitoring discharges and the radiation situation around the Temelín Nuclear Power Plant. Assessment of the occupational environment is not part of the environmental-impact assessment; however, radiological impacts on construction workers can be expected to remain reliably below the dose optimization constraint established by SÚJB.

During termination of operation and decommissioning of SMR ETE, radiological impacts will decrease by several orders of magnitude compared with the operating period. During termination of operation and decommissioning of SMR ETE, discharges will gradually decrease substantially compared with the operating period. The isotopic composition of atmospheric discharges during termination of operation and decommissioning will differ from that during operation. In particular, the proportion of noble gases and iodine in atmospheric discharges will be lower by several orders of magnitude, and tritium discharges in atmospheric and liquid discharges will be reduced by at least one order of magnitude, with a further gradual downward trend. The corresponding effective doses to the population will decrease proportionately. Specific products, namely radioactive aerosols, arising from decontamination and fragmentation activities during termination of operation and decommissioning will be minimized by optimizing the activities and using filtration and ventilation technologies. Based on the projected discharge data and experience with preparations for and decommissioning of other nuclear facilities, it can be stated that if the radiological impacts of SMR ETE operation are acceptable, the impacts of termination of operation and decommissioning of SMR ETE will also reliably be acceptable.

Decommissioning, meaning the dismantling or permanent closure of power plants or reactors, is subject to a separate environmental- and public-health-impact assessment under Act No. 100/2001 Coll., on environmental impact assessment, as amended. The assessment will therefore be performed as part of decommissioning preparations.

D.I.3.4.3. Impacts of other physical and biological factors

D.I.3.4.3.1. Impact of vibration

Blasting is not anticipated during construction, but its use cannot be entirely ruled out. In that event, a blasting method will be used that ensures compliance with both Czech Standard ČSN 73 0040, Loads on structures due to technical seismicity and their response, and Government Decree No. 272/2011 Coll., on protection of health against adverse effects of noise and vibrations, as amended. If they occur at all, these will be isolated seismic events. Significant environmental impacts are not anticipated in this respect, and the manner in which these activities are performed will rule out impacts on the operational safety of ETE1,2.

Likewise, the impacts of construction traffic at the construction site and on the wider road network will not be significant. Traffic-induced vibrations attenuate in the subsoil in the immediate vicinity of their source, and their impact on the environment, meaning the population or structures, is ruled out. Similar conclusions can also be applied to the period of termination of operation and decommissioning.

D.I.3.4.3.2. Impacts of non-ionizing radiation

During construction or termination of operation, impacts of non-ionizing radiation, meaning magnetic or electric fields around electrical equipment, will not be significant. The 400 kV line will not be operated during these periods; the construction site will be supplied from the distribution system by lines at the 110 kV or 22 kV voltage level. The electric- and magnetic-field impacts from these lines are reliably below the applicable limits. Similar conclusions can also be applied to the period of termination of operation and decommissioning.

D.I.3.4.3.3. Impact of light pollution

The construction site will be illuminated during construction. The lighting can be expected to be relatively intense to allow continuous work to be performed safely, particularly concrete work that cannot be interrupted. The impact will be most pronounced in winter, when natural daylight is shorter. Given the location of the SMR site, the light will be visible from surrounding municipalities, particularly Kočín, and from the wider area, and its intensity will most likely be higher than the existing lighting at the ETE1,2 site. Construction-site lighting will also include red aviation obstruction marking of vertical structures, including cranes and potentially structures that progressively increase in height, such as ventilation stacks. If an assembly hall is used, lighting impacts from activities performed inside the hall will be reduced.

This impact will be limited to the construction period. After construction is completed, it will gradually disappear and be replaced by standard lighting. Given its temporary nature, the impact will at most cause annoyance and will not pose a hazard. Similar conclusions can also be applied to the period of termination of operation and decommissioning.

D.I.3.4.3.4. Impacts of other factors

Impacts of other physical or biological factors during construction or termination of operation are ruled out.

D.I.4. Impacts on surface water and groundwater

4. Impacts on surface water and groundwater

D.I.4.1. Impacts on surface water

D.I.4.1.1. Impact on the area's drainage characteristics

Implementation of the SMR ETE Project will result in the paving or other hard surfacing of areas that are currently cultivated or grassed and where precipitation currently infiltrates. The construction of impervious surfaces will therefore increase stormwater runoff by up to 175,000 m^3/year.

The hydrogeological assessment demonstrates that the site for SMR ETE has unsuitable conditions and mutually interacting circumstances that prevent the design, permitting, and implementation of stormwater infiltration, as required by Section 5(3) of Act No. 254/2001 Coll., the Water Act, as amended. Stormwater will therefore be conveyed by a separate sewer system into surface water. Groundwater will need to be pumped from the SMR ETE site to lower the groundwater level at the reactor building and other buildings depending on their foundation depth, in a quantity of no more than 63,000 m^3/year. The pumped groundwater will also be discharged into surface water.

Pumping groundwater and conveying stormwater from the site designated for SMR ETE construction, which lies in the Dvorčický Stream catchment, will affect runoff conditions such that groundwater will drain into Dvorčický Stream farther downstream rather than in the present spring areas immediately at the foot of the ETE terrain elevation, meaning north of Dvorčice Pond in the case of SMR ETE. Conveying 1.2 l/s of stormwater from the 11.2 ha outer part of the SMR ETE construction site and at least 1 l/s of pumped groundwater, and potentially water pumped from the SMR retention basin, into Dvorčice Reservoir and then Dvorčický Stream can be expected to eliminate possible adverse impacts and optimally preserve the water regime of Dvorčický Stream and Dvorčice Pond.

Stormwater from the 18.3 ha inner fenced SMR ETE site will be conveyed through a retention basin at the northeastern tip of the SMR ETE siting area and the existing final ETE1,2 sewer collector into the Strouha Stream. Pumped groundwater and stormwater from ETE1,2 are conveyed there, and pumped groundwater and stormwater from New NPP ETE are also planned to be conveyed there.

D.I.4.1.2. Impact on the quantitative characteristics of watercourses

D.I.4.1.2.1 Introductory information

The impacts are assessed for SMR ETE, with an output of up to 500 MW_e, in interaction with the other projects at the site, namely ETE1,2 with an output of 2 × 1,100 MW_e and New NPP ETE with an output of 2 × 1,700 MW_e, for a total output of 6,100 MW_e.

The assessment considers the SSP245 climate-change scenario, "middle of the road with environmental systems deteriorating", and the EC-Earth3, MPI-ESM1-2-HR, TaiESM1, and ALADIN-CLIMATE/CZ climate-impact models for the reference years 2060 (2046–2075) and 2080 (2066–2095). A solution representing the current hydrological conditions in the 1981–2010 reference period (HIST) and hydrological conditions assuming warming of 2 °C relative to the present (HIST+2) is also included. A total of 10 water-management solution alternatives were modeled. They are listed in the following table.

Table D.50: Overview of modeled water-management solution alternatives

ETE abstraction alternative	Reference year	Emission scenario	Model
SMR ETE + ETE1,2 + New NPP ETE (500 MW_e + 2,200 MW_e + 3,400 MW_e)	present	HIST	hist
	-	HIST+2	warming of 2 °C
	2060	SSP2-4.5	EC-Earth3
		SSP2-4.5	MPI-ESM1-2-HR
		SSP2-4.5	TaiESM1
		SSP2-4.5	ALADIN-CLIMATE/CZ
	2080	SSP2-4.5	EC-Earth3
		SSP2-4.5	MPI-ESM1-2-HR
		SSP2-4.5	TaiESM1
		SSP2-4.5	ALADIN-CLIMATE/CZ

D.I.4.1.2.2. Water abstraction and discharge

Water for SMR ETE will be abstracted from the Vltava River at Hněvkovice Reservoir; wastewater will also be discharged into the Vltava, at the Kořensko Dam profile. Water abstraction and wastewater discharge for SMR ETE, ETE1,2, and New NPP ETE are or will be arranged identically. The following table presents raw-water abstraction and wastewater-discharge values, which are identical for all models and climate-change impact scenarios.

Table D.51: Raw-water abstraction for ETE from Hněvkovice Reservoir and ETE wastewater discharge at the Kořensko profile

	Water abstraction			Water discharge		
	SMR	ETE1,2 + New NPP ETE	SMR ETE + ETE1,2 + New NPP ETE	SMR	ETE1,2 + New NPP ETE	SMR ETE + ETE1,2 + New NPP ETE
Output [MW_e]	500	5600	6100	500	5600	6100
	[thousand m^3]			[thousand m^3]		
January	914.9831	9372.699	10287.682	271.3969	2016.975	2288.372
February	839.2653	8597.079	9436.3438	248.7091	1848.363	2097.072
March	965.7114	9892.338	10858.049	286.5983	2129.95	2416.548
April	979.3947	10032.5	11011.898	290.698	2160.418	2451.116
May	1068.06	10940.75	12008.811	317.265	2357.859	2675.124
June	1063.814	10897.26	11961.072	315.9924	2348.401	2664.394
July	1119.571	11468.41	12587.977	332.6982	2472.556	2805.254
August	1114.42	11415.64	12530.061	332.6982	2472.556	2805.254
September	1039.539	10648.6	11688.136	308.7182	2294.341	2603.059
October	1024.724	10496.84	11521.561	304.2795	2261.353	2565.632
November	935.9393	9587.366	10523.305	277.6762	2063.641	2341.318
December	934.5797	9573.439	10508.018	277.2701	2060.624	2337.894
Year	12,000	122,922.9	134,922.91	3,564	26,475.56	30,039.56

D.I.4.1.2.3. Water-supply reliability

Water-supply reliability is assessed in Annex 4.1 to this Documentation (Assessment of impacts on surface water and groundwater), to which reference is made for details. The results and conclusions are summarized below.

Water-supply reliability and impacts on the minimum residual flow in the Vltava River are assessed using water-management balance and simulation-modeling methods based on the monthly flow series determined for a 44-year period. The Vltava catchment as far as the Prague-Velká

Chuchle gauging-station profile is considered the area of interest. The water-management system considered comprises the Lipno I, Lipno II, Římov, Hněvkovice, Kořensko, Orlík, Slapy, Švihov, and Vrané waterworks. Simulation of operation of the active storage of Lipno I, Římov, Kořensko, Orlík, Slapy, Švihov, and Vrané reservoirs complies with the requirements of the applicable operating rules, including provision of the required minimum flows downstream of the waterworks. Operation of Lipno I Reservoir assumes use of the entire active storage in accordance with the operating rules.

Requirements for other water abstractions and water-discharge data in the catchment of interest are taken from recorded actual values.

Abstractions for the Temelín site and minimum flows at the Lipno I, Lipno II, Hněvkovice, and Kořensko profiles are actively secured through operation of the active storage of Lipno I and Hněvkovice reservoirs. Minimum flows downstream of Vrané Reservoir are secured through operation of the active storage of Orlík and Slapy reservoirs. Flows at the profile of interest are also affected by operation of the active storage of Římov and Švihov reservoirs. The operating procedures under the operating rules for these reservoirs are as follows (only the parts relevant to flow simulation are presented):

Lipno I:

The reservoir is intended to provide:

- a minimum flow (MQ) of 6 m^3/s in the Vltava downstream of Lipno II Reservoir and a minimum flow of 1.50 m^3/s in the old Vltava channel downstream of Lipno I Reservoir,
- augmentation and supplementation of the minimum average daily flow downstream of Hněvkovice Reservoir to 6.5 m^3/s and the minimum average daily flow at the Kořensko profile to 9.5 m^3/s,
- supply of surface water to the Loučovice paper mill and the municipal water-supply system of Loučovice.

The active storage is defined between elevations 716.10 and 724.90 m above sea level and has a volume of 252.991 million m^3.

The active storage provides:

- a minimum flow of 6 m^3/s in the watercourse downstream of Lipno II Reservoir,
- a minimum flow of 1.50 m^3/s in the old Vltava channel upstream of Lipno II Reservoir,

in cooperation with Hněvkovice Reservoir:

- abstraction for ETE,
- a minimum average daily flow of 6.5 m^3/s downstream of Hněvkovice Reservoir,
- a minimum average daily flow of 9.5 m^3/s at the Kořensko profile (downstream of the confluence of the Vltava and Lužnice rivers),
- water abstractions through the industrial water-supply system for the municipal water-supply system of Loučovice and the Loučovice paper mill.

Reservoir operation is managed within the active-storage range according to the dispatching diagram. The dispatching diagram contains a control line:

- to secure a minimum flow of 6 m^3/s downstream of Lipno II Reservoir and the required flow supplementation into Hněvkovice Reservoir, so that an average daily flow of 6.5 m^3/s is secured downstream of Hněvkovice Reservoir,
- to secure the minimum flow downstream of Lipno II Reservoir and the required flow supplementation into Hněvkovice Reservoir, so that water abstraction for the Temelín site, a minimum average daily flow of 6.5 m^3/s in the watercourse downstream of Hněvkovice Reservoir, and a minimum average daily flow of 9.5 m^3/s at the Kořensko profile are secured,
- when the reservoir level is between the maximum active-storage level and the dispatching-diagram line, the peaking hydroelectric power plant abstracts and processes a flow and operates in a mode such that discharge downstream of Lipno II Reservoir ranges from 6 m^3/s to 20 m^3/s.

Where hydrological and operating conditions permit, consideration is given to ensuring that the reservoir level does not fall below an elevation of 723.60 m above sea level during summer (June through August).

Hněvkovice:

The reservoir is intended to:

- in cooperation with Lipno I Reservoir, secure a minimum average daily flow of 6.5 m^3/s in the Vltava downstream of the reservoir, an average daily flow of 9 m^3/s in the Vltava downstream of its confluence with the Lužnice, and surface-water abstraction for the Temelín Nuclear Power Plant,
- provide surface-water abstractions from the reservoir under the applicable permits.

The active storage of Hněvkovice Reservoir is defined between elevations 364.60 and 370.10 m above sea level and has a volume of 12.155 million m^3.

The active storage is divided at the dispatching level of 365.85 m above sea level into free-operation and controlled-operation zones. Except during emergency operation, the reservoir level falls below this elevation only during minimum flows in the event of a hydrological failure. In this situation, water may be abstracted from the reservoir

for the Temelín site, and the minimum flow may be discharged into the watercourse downstream of the reservoir depending on the amount supplemented from Lipno I Reservoir.

The Povodí Vltavy, s.p. water-management control center in Prague and the hydropower-plant control center manage water operations and releases from Lipno I Reservoir so that the Hněvkovice reservoir level does not fall below the dispatching level of 365.85 m above sea level, until the active storage of Lipno I Reservoir is depleted.

Orlík: The reservoir is intended to provide:

- at the dam profile:
  - use of hydropower at the peaking hydroelectric power plant,
- in the Kořensko-Vrané river reach:
  - water-use requirements, in cooperation with Slapy Reservoir in the Slapy-Vrané reach,
  - the minimum flow MQ downstream of Vrané Reservoir, in cooperation with Slapy Reservoir.

Kamýk: The reservoir is intended to provide partial balancing of flows downstream of the Orlík peaking hydroelectric power plant and power generation at the semi-peaking hydroelectric power plant, as well as technical provision of water abstraction for 1. SčV Příbram. The reservoir has no active storage and is not relevant to the simulation.

Slapy: The reservoir is intended to provide:

- at the dam profile
  - use of hydropower at the peaking hydroelectric power plant,
- in the Slapy-Vrané river reach
  - surface-water abstractions, in cooperation with Orlík Reservoir,
  - the minimum flow MQ downstream of Vrané Reservoir, in cooperation with Orlík Reservoir.

Operation of Orlík and Slapy reservoirs: The reservoirs provide the purposes specified above by preferentially using the active storage of Orlík Reservoir until the elevation of 334.60 m above sea level is reached. Requirements are then met from the active storage of Slapy Reservoir until it is depleted to the permanent-storage level. Finally, the remaining active storage in Orlík Reservoir is used. The condition to provide for recreation, water sports, and navigation on Slapy Reservoir, by maintaining the level between elevations 269.10 and 270.60 m above sea level from April through September, is operational in nature; if necessary in the event of hydrological failure, the operation specified above takes priority.

Štěchovice: The reservoir is intended to provide partial balancing of flows downstream of the Slapy peaking hydroelectric power plant and power generation at the semi-peaking and pumped-storage hydroelectric power plant. The reservoir has no active storage and is not relevant to the simulation.

Vrané: The reservoir is intended to balance outflows from the semi-peaking hydroelectric power plant and the effects of the Štěchovice pumped-storage hydroelectric power plant, and to provide the minimum flow MQ1 secured by this part of the Vltava Cascade downstream of the dam. The reservoir has no active storage.

Švihov: The reservoir is intended to provide:

- at the dam profile:
  - the minimum discharge MQ from the reservoir, the level of which depends on the water volume in the reservoir,
  - direct abstraction for the water-treatment plant,
  - seasonal flushing, 3 million m^3 in April or May and 3 million m^3 from October through November, at the expense of water abstraction for the treatment plant if the level falls below an elevation of 358.50 m above sea level,
- at the Kácov profile on the Sázava River:
  - compensatory augmentation of the minimum flow MQ2 from June through August, if the reservoir level is below an elevation of 375.00 m above sea level, in a quantity of no more than 3 million m^3/year.

Under the recommendation in Czech Standard ČSN 75 2405, Water-management design of reservoirs, the required reliability for abstraction for a nuclear power plant is $p_t \geq 99.5$ %, and the required reliability of minimum residual flows is $p_t \geq 98.5$ %.

The simulations as far as the Kořensko profile, including reliability of water abstraction for the Temelín site, show the following:

- Under both current hydrological conditions and the scenario involving warming of 2 °C relative to current conditions, reliability of the water-abstraction requirements for the Temelín site is assessed as failure-free, meaning provision of 100 % of the required quantity of water.
- For the 2060 reference year, failure-free abstraction is assessed for three of the four alternatives, while the recommended value is not reached for one alternative.

- For the 2080 reference year, failure-free abstraction is assessed for three of the four alternatives, while the standard-recommended value of p_t = 99.5 % is not reached for one alternative.
- For all alternatives under which abstraction for the Temelín site is assessed as failure-free or abstraction reliability reaches the standard-recommended value, the standard-recommended reliability of p_t = 98.5 % is also met, meaning reached or exceeded, for minimum flows downstream of the Lipno II, Hněvkovice, and Kořensko waterworks.
- The recreational water level in Lipno I Reservoir is monitored separately in the assessment as a supplementary parameter, with an indicative value of p_t = 95 % for recreational use. The impact of warming is pronounced for the Lipno I recreational water level, whose reliability under the scenario involving warming of 2 °C relative to current conditions decreases from 97.1 % under current hydrological conditions to 75.5 %. In the 2060 reference period, reliability is met under two alternatives and falls below 95 % under two; in the 2080 reference period, one of the four alternatives produces a favorable result. These results are consistent with the operating rules for Lipno I and Hněvkovice reservoirs, which show that a reduction in the water level in their active storage due to a combination of increased abstraction requirements and adverse hydrological conditions will first be reflected in reduced reliability of the Lipno I recreational water level.

The following tables also provide an overview of water-supply reliability for ETE and reliability of minimum flows and the Lipno I recreational water level.

Table D.52: Reliability of water abstraction for SMR ETE + ETE1,2 + New NPP ETE under the SSP245 scenario

Reference period	Model	p_t [%]	p_d [%]	Maximum failure depth [%]	Maximum failure duration [months]	Assessment
present	hist	99.9	100.0	0	0	failure-free supply
-	warming of 2 °C	99.9	100.0	0	0	failure-free supply
2060	EC-Earth3	99.9	100.0	0	0	failure-free supply
2060	MPI-ESM1-2-HR	99.9	100.0	0	0	failure-free supply
2060	TaiESM1	98.5	99.3	79	2	recommended value not reached for class A abstractions
2060	ALADIN-CLIMATE/CZ	99.9	100.0	0	0	failure-free supply
2080	EC-Earth3	99.9	100.0	0	0	failure-free supply
2080	MPI-ESM1-2-HR	99.9	100.0	0	0	failure-free supply
2080	TaiESM1	87.9	91.8	95	11	significant reliability failures under the adverse scenario
2080	ALADIN-CLIMATE/CZ	99.9	100.0	0	0	failure-free supply

Notes: p_t - reliability by duration; p_d - reliability by supply

Table D.53: Reliability of minimum flows and the Lipno I recreational water level for SMR ETE + ETE1,2 + New NPP ETE under the SSP245 scenario

Reference period	Model	MQ Lipno II p_t [%]	MQ Hněvkovice p_t [%]	MQ Kořensko p_t [%]	Lipno I recreational water level p_t [%]
present	hist	99.9	99.9	99.9	97.1
-	warming of 2 °C	99.9	99.9	99.9	75.5
2060	EC-Earth3	99.9	99.9	99.9	93.3
2060	MPI-ESM1-2-HR	99.9	99.9	99.9	97.1
2060	TaiESM1	99.1	98.9	98.9	68.5
2060	ALADIN-CLIMATE/CZ	99.9	99.9	99.9	97.1
2080	EC-Earth3	99.9	99.9	99.9	96.4
2080	MPI-ESM1-2-HR	99.9	99.7	99.7	84.8
2080	TaiESM1	88.8	88.2	89.4	40.7
2080	ALADIN-CLIMATE/CZ	99.9	99.9	99.9	84.0

Notes: p_t - reliability by duration

The results in the area of interest downstream of the Kořensko profile as far as the Prague-Velká Chuchle profile are as follows:

- Under current hydrological conditions, reliability of the minimum-flow requirements at the Vrané and Prague-Velká Chuchle profiles and the storage function of Orlík and Slapy reservoirs is assessed as failure-free (p_t = 99.9 %).
- For the 2060 reference year, reliability of the minimum-flow requirements at the Vrané and Prague-Velká Chuchle profiles and the storage function of Orlík and Slapy reservoirs is assessed as failure-free (p_t = 99.9 %) under two alternatives. Under the remaining two alternatives, the standard-recommended value of p_t = 98.5 % is exceeded or reached, except for filling of the active storage of Slapy Reservoir under one of the alternatives.
- For the 2080 reference year, failure-free provision is assessed under one alternative, and the standard-recommended value of p_t = 98.5 % is exceeded under two alternatives. Under the remaining alternative, the standard-recommended value of p_t = 98.5 % is not reached; under this alternative, minimum flows at the Vrané and Prague-Velká Chuchle profiles are secured with reliability of p_t = 97.2 %.

The following table also shows reliability of minimum flows at the Vrané and Prague-Chuchle profiles and the storage function of Orlík and Slapy reservoirs.

Table D.54: Reliability of minimum flows at the Vrané and Prague-Chuchle profiles and the storage function of Orlík and Slapy reservoirs for SMR ETE + ETE1,2 + New NPP ETE under the SSP245 scenario

Reference period	Model	MQ Vrané p_t [%]	MZP Prague-Chuchle p_t [%]	Orlík storage function p_t [%]	Slapy storage function p_t [%]
present	hist	99.9	99.9	99.9	99.9
2060	EC-Earth3	99.5	99.5	99.5	99.1
2060	MPI-ESM1-2-HR	99.9	99.9	99.9	99.9
2060	TaiESM1	98.7	98.5	98.5	97.8
2060	ALADIN-CLIMATE/CZ	99.9	99.9	99.9	99.9
2080	EC-Earth3	99.9	99.9	99.9	99.9
2080	MPI-ESM1-2-HR	99.1	99.1	98.9	98.9
2080	TaiESM1	97.6	97.2	97.2	95.7
2080	ALADIN-CLIMATE/CZ	99.7	99.5	99.5	99.3

Notes: p_t - reliability by duration

D.I.4.1.2.4. Overall summary of impacts on quantitative characteristics

Under most hydrological alternatives assessed, the impact of the SMR ETE Project on surface-water quantity is acceptable in terms of securing water abstraction. However, the system is sensitive to the combination of the cumulative water-volume requirement for SMR ETE + ETE1,2 + New NPP ETE and markedly adverse climate trends. Under the current hydrological conditions considered, the cumulative surface-water abstraction requirement for the Temelín site is secured. In both the 2060 and 2080 reference periods, failure-free abstraction for the Temelín site is assessed in three of the four models.

Minimum-flow reliability downstream of the Lipno II, Hněvkovice, and Kořensko waterworks is met in most models; only one less favorable model fails in the future period through 2080. For the Vltava Cascade downstream of the Kořensko waterworks, the impact of the SMR ETE Project, cumulatively with ETE1,2 + New NPP ETE, is not manifested under current hydrological conditions. By 2060, the system is still assessed as having sufficient reliability in most models; by 2080, one of the four climate models indicates a greater need to augment flows from active storage.

Because water supply for the Project is secured within the requirements of the applicable waterworks operating rules, including provision of the required minimum flows downstream of the waterworks, use of the water by other entities, such as operation of small hydroelectric power plants, whose water-management permits are also based on the applicable operating rules for waterworks in the affected catchment, is not quantitatively affected.

D.I.4.1.3. Impact on the qualitative characteristics of watercourses

D.I.4.1.3.1. Introductory information

The impact of operation of the SMR ETE Project on water quality is estimated both for concurrent operation with the existing ETE1,2 units and for concurrent operation with New NPP ETE, resulting in two capacity alternatives:

- SMR ETE (500 MW_e) + ETE1,2 (2 × 1,100 MW_e),
- SMR ETE (500 MW_e) + ETE1,2 (2 × 1,100 MW_e) + New NPP ETE (2 × 1,700 MW_e).

For both alternatives, the impact of Project operation is modeled at the critical profiles for two hydrological situations:

- "normal flow" - the long-term average flow Q_a is used for modeling,
- "drought - impact of climate change" - Q_{355} flow is used for modeling.

In addition, maximum or minimum values are modeled at the profile downstream of Kořensko Reservoir using the minimum guaranteed flow Q_{zab}.

Modeling is also performed for two discharge scenarios:

- "medium discharge" - based on actually measured concentrations in wastewater from ETE1,2 (2015–2024 average) and analogous concentrations in wastewater for SMR ETE and New NPP ETE, using the assumption that water management at all three facilities will be similar in principle; for radioactivity parameters, actual measured values of activity discharged from ETE1,2 (2015-2024 average) are used, while for the other sources in the assessed Project capacity alternative (SMR ETE and, where applicable, New NPP ETE), the specified SMR source term or the design radionuclide discharges under the New NPP ETE EIA documentation are conservatively used,
- "maximum discharge" - based on the "max" or "m" emission limits established in the wastewater-discharge permit for ETE1,2[1]; for the other sources in the assessed capacity alternatives (SMR ETE and, where applicable, New NPP ETE), the same approach as for the medium-discharge scenario is used; this scenario represents an extreme, bounding condition that has not occurred in practice at ETE1,2.

[1] The permit to discharge wastewater from ETE1,2 was issued by decision of the water authority of the Regional Authority of the South Bohemian Region, ref. No.: KUJCK 107824/2023 dated September 25, 2023.

The calculation method used focuses on water quality in the Vltava River, which receives wastewater from ETE1,2 and will also receive wastewater from SMR ETE or New NPP ETE.

D.I.4.1.3.2. Impact on water quality

The impact on water quality is assessed in Annex 4.1 to this Documentation (Assessment of impacts on surface water and groundwater), to which reference is made for details. The results and conclusions are summarized below.

The analysis results for changes in water quality presented below relate to the critical profiles (see Chapter C.II.4.1.3. Qualitative data, page 249 of this Documentation). The modeled parameters are presented for both the capacity alternative comprising SMR ETE + ETE1,2 and the capacity alternative comprising SMR ETE + ETE1,2 + New NPP ETE. The hydrological situation is presented for normal flow (Q_a) and drought (Q_{355}), taking the impact of climate change into account. Discharge is presented here only for the "medium discharge" scenario.

At the critical profiles, parameters for assessing impacts on surface-water quality are evaluated so as to correspond to the surface-water quality requirements relevant to the critical profile concerned. Parameter values are first presented in tables for the individual critical profiles, followed by a narrative assessment of impacts by individual area of impact on surface-water quality.

D.I.4.1.3.2.1. Model results for the critical profiles

Profile downstream of Kořensko Reservoir

Modeled concentrations at this profile are compared with permissible pollution under Government Decree No. 401/2015 Coll., taking into account that the profile lies in the catchment of a reservoir used for bathing.

Modeled concentrations of significant parameters when the watercourse is affected by the SMR ETE + ETE1,2 project capacity alternative are presented in the following table.

Table D.55: Profile downstream of Kořensko Reservoir - concentrations of significant parameters, SMR ETE + ETE1,2 capacity alternative, Q_a and Q_{355}, medium discharge

SMR ETE + ETE1,2 Profile: Downstream of Kořensko Reservoir Scenario: Average discharge		Modeled concentration at flow		Legislative requirements			
Parameter	Unit	Q_a	Q_{355}	AA	MAX	MIN	LIM-C
T	°C	11.5	11.7		29		
pH		7.8	7.7		9	5	
O_2	mg/l					9	
O_2 saturation	%						
BOD_5	mg/l	4.1	3.4	3.8			
$CHSK_{Cr}$	mg/l	32	29	26			
TOC	mg/l	12	11	10			
P_{total}	mg/l	0.13	0.11	0.15			0.05
$P\text{-}PO_4^{3-}$	mg/l	0.04	0.04				
N_{total}	mg/l	2.6	2.3	6			
$N\text{-}NO_3^-$	mg/l	1.6	1.5	5.4			
$N\text{-}NO_2^-$	mg/l	0.02	0.02				
$N\text{-}NH_4^+$	mg/l	0.13	0.15	0.23			
DS_{105}	mg/l	168	158	750			
DS_{550}	mg/l	-	-	470			
SS_{105}	mg/l	14.6	11.8	20			
Cl^-	mg/l	19	16	150			
SO_4^{2-}	mg/l	20	20	200			
Mg	mg/l	5.2	4.8	120			
Ca	mg/l	18	16	190			
C_{10}–C_{40}	mg/l	0.05	0.05	0.1			
fluoranthene	µg/l	0.012	0.013	0.0063	0.12		
benzo[a]pyrene	µg/l	0.004	0.005	0.000017	0.27		
benzo[b]fluoranthene	µg/l	0.004	0.004		0.017		
benzo[k]fluoranthene	µg/l	0.002	0.002		0.017		
benzo[g,h,i]perylene	µg/l	0.003	0.004		0.0082		
phenanthrene	µg/l	0.008	0.009	0.03			
pyrene	µg/l	0.010	0.011	0.024			
Al	µg/l	227	240	1000			
Ni	µg/l	1.5	1.3	4	34		
AOX	µg/l	22	22	25			
alachlor	µg/l	0.063	0.048	0.1			

metolachlor	µg/l	0.075	0.054	0.2			
terbuthylazine	µg/l	0.029	0.021	0.5			
EDTA	µg/l	3.0	3.0	5			

Notes on statutory requirements:

AA	permissible pollution - annual average/EQS-AA (Government Decree No. 401/2015 Coll.)
MAX	permissible pollution - maximum/EQS-MAC (Government Decree No. 401/2015 Coll.)
MIN	permissible pollution - minimum (Government Decree No. 401/2015 Coll.)
LIM-C	permissible pollution - annual average/EQS-AA (bathing waters) (Government Decree No. 401/2015 Coll.)

Modeled concentrations of significant parameters when the watercourse is affected by the SMR ETE + ETE1,2 + New NPP ETE project capacity alternative are presented in the following table.

Table D.56: Profile downstream of Kořensko Reservoir - concentrations of significant parameters, SMR ETE + ETE1,2 + New NPP ETE capacity alternative, Q_a and Q_{355}, medium discharge

SMR ETE + ETE1,2 + New NPP ETE Profile: Downstream of Kořensko Reservoir Scenario: Average discharge		Modeled concentration at flow		Legislative requirements			
Parameter	Unit	Q_a	Q_{355}	AA	MAX	MIN	LIM-C
T	°C	11.7	12.4		29		
pH		7.8	7.8		9	5	
O_2	mg/l					9	
O_2 saturation	%						
BOD_5	mg/l	4.1	3.5	3.8			
$CHSK_{Cr}$	mg/l	32	31	26			
TOC	mg/l	12	12	10			
P_{total}	mg/l	0.13	0.13	0.15			0.05
$P\text{-}PO_4^{3-}$	mg/l	0.04	0.04				
N_{total}	mg/l	2.7	2.6	6			
$N\text{-}NO_3^-$	mg/l	1.7	1.8	5.4			
$N\text{-}NO_2^-$	mg/l	0.02	0.03				
$N\text{-}NH_4^+$	mg/l	0.14	0.15	0.23			
DS_{105}	mg/l	173	177	750			
DS_{550}	mg/l	-	-	470			
SS_{105}	mg/l	15	12	20			
Cl^-	mg/l	19	18	150			
SO_4^{2-}	mg/l	21	24	200			
Mg	mg/l	5.3	5.4	120			
Ca	mg/l	19	18	190			
C_{10}–C_{40}	mg/l	0.05	0.06	0.1			
fluoranthene	µg/l	0.013	0.015	0.0063	0.12		
benzo[a]pyrene	µg/l	0.004	0.005	0.000017	0.27		
benzo[b]fluoranthene	µg/l	0.004	0.005		0.017		
benzo[k]fluoranthene	µg/l	0.002	0.003		0.017		
benzo[g,h,i]perylene	µg/l	0.003	0.005		0.0082		
phenanthrene	µg/l	0.009	0.010	0.03			
pyrene	µg/l	0.010	0.013	0.024			
Al	µg/l	236	274	1000			
Ni	µg/l	1.5	1.4	4	34		
AOX	µg/l	23	25	25			
alachlor	µg/l	0.065	0.053	0.1			
metolachlor	µg/l	0.076	0.059	0.2			
terbuthylazine	µg/l	0.029	0.023	0.5			
EDTA	µg/l	3.1	3.4	5			

Notes on statutory requirements:

AA	permissible pollution - annual average/EQS-AA (Government Decree No. 401/2015 Coll.)
MAX	permissible pollution - maximum/EQS-MAC (Government Decree No. 401/2015 Coll.)
MIN	permissible pollution - minimum (Government Decree No. 401/2015 Coll.)
LIM-C	permissible pollution - annual average/EQS-AA (bathing waters) (Government Decree No. 401/2015 Coll.)

Orlík Reservoir Zvíkov Bridge profile

Like the profile downstream of Kořensko Reservoir, the Orlík Reservoir Zvíkov Bridge profile is assessed in terms of permissible pollution under Government Decree No. 401/2015 Coll., taking into account that additional bathing-water areas in the lower part of Orlík Reservoir lie downstream of this profile. This is also the representative profile for water body HVL_1055_J - Orlík I Reservoir on the Vltava River, so compliance with the ecological-potential values established by the methodology is also assessed.

Modeled concentrations of significant parameters when the watercourse is affected by the SMR ETE + ETE1,2 project capacity alternative are presented in the following table.

Table D.57: Orlík Reservoir Zvíkov Bridge profile - concentrations of significant parameters, SMR ETE + ETE1,2 capacity alternative, Q_a and Q_{355}, medium discharge

SMR ETE + ETE1,2 Profile: Orlík Reservoir, Zvíkov Bridge Scenario: Average discharge		Modeled concentration at flow		Legislative requirements					
Parameter	Unit	Q_a	Q_{355}	AA	MAX	MIN	LIM-C	LIM-E	LIM-F
T	°C				29			28 *	20
pH					9	5		6–9 *	5–10
O_2	mg/l					9		≥7 *	
O_2 saturation	%							50 *	50–200
BOD_5	mg/l			3.8				3.2	
$CHSK_{Cr}$	mg/l			26					
TOC	mg/l	11	10	10					
P_{total}	mg/l	0.08	0.07	0.15			0.05		0.04
$P\text{-}PO_4^{3-}$	mg/l	0.02	0.02						
N_{total}	mg/l	1.8	1.6	6					
$N\text{-}NO_3^-$	mg/l	1.0	0.9	5.4					
$N\text{-}NO_2^-$	mg/l	0.02	0.02					0.12	
$N\text{-}NH_4^+$	mg/l	0.09	0.10	0.23				0.16	
NH_3	mg/l							0.025 *	
DS_{105}	mg/l			750					
DS_{550}	mg/l			470					
SS_{105}	mg/l			20					
Cl^-	mg/l			150					
SO_4^{2-}	mg/l			200					
Mg	mg/l	4.7	4.3	120					
Ca	mg/l	16	15	190					
C_{10}–C_{40}	mg/l			0.1					
fluoranthene	µg/l			0.0063	0.12				
benzo[a]pyrene	µg/l			0.000017	0.27				
benzo[b]fluoranthene	µg/l				0.017				
benzo[k]fluoranthene	µg/l				0.017				
benzo[g,h,i]perylene	µg/l				0.0082				
phenanthrene	µg/l			0.03					
pyrene	µg/l			0.024					
Al	µg/l			1000					
Ni	µg/l			4	34				
AOX	µg/l			25					
alachlor	µg/l			0.1					
metolachlor	µg/l			0.2					
terbuthylazine	µg/l			0.5					
EDTA	µg/l			5					

Notes on statutory requirements:

AA permissible pollution - annual average/EQS-AA (Government Decree No. 401/2015 Coll.)
MAX permissible pollution - maximum/EQS-MAC (Government Decree No. 401/2015 Coll.)
MIN permissible pollution - minimum (Government Decree No. 401/2015 Coll.)
LIM-C permissible pollution - annual average/EQS-AA (bathing waters) (Government Decree No. 401/2015 Coll.)
LIM-E permissible pollution - annual average/EQS-AA (cyprinid waters) (Government Decree No. 401/2015 Coll.) (* permissible values under Government Decree No. 71/2003 Coll.)
LIM-F requirement for good ecological potential (Methodology for assessing the ecological status of flowing surface-water bodies (river category))

Modeled concentrations of significant parameters when the watercourse is affected by the SMR ETE + ETE1,2 + New NPP ETE project capacity alternative are presented in the following table.

Table D.58: Orlík Reservoir Zvíkov Bridge profile - concentrations of significant parameters, SMR ETE + ETE1,2 + New NPP ETE capacity alternative, Q_a and Q_{355}, medium discharge

SMR ETE + ETE1,2 + New NPP ETE Profile: Orlík Reservoir, Zvíkov Bridge Scenario: Average discharge		Modeled concentration at flow		Legislative requirements					
Parameter	Unit	Q_a	Q_{355}	AA	MAX	MIN	LIM-C	LIM-E	LIM-F
T	°C				29			28 *	20
pH					9	5		6–9 *	5–10
O_2	mg/l					9		≥7 *	
O_2 saturation	%							50 *	50–200
BOD_5	mg/l			3.8				3.2	
$CHSK_{Cr}$	mg/l			26					
TOC	mg/l	11	11	10					
P_{total}	mg/l	0.08	0.08	0.15			0.05		0.04
$P\text{-}PO_4^{3-}$	mg/l	0.025	0.027						
N_{total}	mg/l	1.8	1.8	6					
$N\text{-}NO_3^-$	mg/l	1.0	1.1	5.4					
$N\text{-}NO_2^-$	mg/l	0.02	0.03					0.12	
$N\text{-}NH_4^+$	mg/l	0.09	0.10	0.23				0.16	
NH_3	mg/l							0.025 *	
DS_{105}	mg/l			750					
DS_{550}	mg/l			470					
SS_{105}	mg/l			20					
Cl^-	mg/l			150					
SO_4^{2-}	mg/l			200					
Mg	mg/l	4.8	4.9	120					
Ca	mg/l	17	16	190					
C_{10}–C_{40}	mg/l			0.1					
fluoranthene	µg/l			0.0063	0.12				
benzo[a]pyrene	µg/l			0.000017	0.27				
benzo[b]fluoranthene	µg/l				0.017				
benzo[k]fluoranthene	µg/l				0.017				
benzo[g,h,i]perylene	µg/l				0.0082				
phenanthrene	µg/l			0.03					
pyrene	µg/l			0.024					
Al	µg/l			1000					
Ni	µg/l			4	34				
AOX	µg/l			25					
alachlor	µg/l			0.1					
metolachlor	µg/l			0.2					
terbuthylazine	µg/l			0.5					
EDTA	µg/l			5					

Notes on statutory requirements:

AA permissible pollution - annual average/EQS-AA (Government Decree No. 401/2015 Coll.)
MAX permissible pollution - maximum/EQS-MAC (Government Decree No. 401/2015 Coll.)
MIN permissible pollution - minimum (Government Decree No. 401/2015 Coll.)
LIM-C permissible pollution - annual average/EQS-AA (bathing waters) (Government Decree No. 401/2015 Coll.)
LIM-E permissible pollution - annual average/EQS-AA (cyprinid waters) (Government Decree No. 401/2015 Coll.) (* permissible values under Government Decree No. 71/2003 Coll.)
LIM-F requirement for good ecological potential (Methodology for assessing the ecological status of flowing surface-water bodies (river category))

Solenice profile

At the Solenice profile, located downstream of the Orlík Reservoir dam, surface-water quality is assessed in terms of public water-supply use because the abstraction named 1. SčV Příbram Vltava is located there. The modeled concentrations of parameters significant at this profile are presented in the following table.

Table D.59: Solenice profile - concentrations of significant parameters, SMR ETE + ETE1,2 capacity alternative, Q_a and Q_{355}, medium discharge

SMR ETE + ETE1,2 Profile: Solenice Scenario: Average discharge		Modeled concentration at flow		Legislative requirements
Parameter	Unit	Q_a	Q_{355}	LIM-B
T	°C			
pH				
O_2	mg/l			
O_2 saturation	%			
BOD_5	mg/l			2.7
$CHSK_{Cr}$	mg/l			5.9
TOC	mg/l	8.7	8.2	4.5
P_{total}	mg/l	0.07	0.06	
$P\text{-}PO_4^{3-}$	mg/l	0.04	0.04	
$N\text{-}NO_3^-$	mg/l	2.1	2.0	
$N\text{-}NO_2^-$	mg/l	0.015	0.016	
$N\text{-}NH_4^+$	mg/l	0.09	0.09	
SO_4^{2-}	mg/l			180
Mg	mg/l	5.5	5.2	
Ca	mg/l	19	18	
Notes on statutory requirements: LIM-B permissible pollution - annual average/EQS-AA (public water-supply use) (Government Decree No. 401/2015 Coll.)				

Modeled concentrations of significant parameters when the watercourse is affected by the SMR ETE + ETE1,2 + New NPP ETE project capacity alternative are presented in the following table.

Table D.60: Solenice profile - concentrations of significant parameters, SMR ETE + ETE1,2 + New NPP ETE capacity alternative, Q_a and Q_{355}, medium discharge

SMR ETE + ETE1,2 + New NPP ETE Profile: Solenice Scenario: Average discharge		Modeled concentration at flow		Legislative requirements
Parameter	Unit	Q_a	Q_{355}	LIM-B
T	°C			
pH				
O_2	mg/l			
O_2 saturation	%			
BOD_5	mg/l			2.7
$CHSK_{Cr}$	mg/l			5.9
TOC	mg/l	8.8	8.7	4.5
P_{total}	mg/l	0.07	0.07	
$P\text{-}PO_4^{3-}$	mg/l	0.043	0.045	
$N\text{-}NO_3^-$	mg/l	2.2	2.3	
$N\text{-}NO_2^-$	mg/l	0.02	0.02	
$N\text{-}NH_4^+$	mg/l	0.09	0.09	
SO_4^{2-}	mg/l			180
Mg	mg/l	5.6	5.6	
Ca	mg/l	19	19	
Notes on statutory requirements: LIM-B permissible pollution - annual average/EQS-AA (public water-supply use) (Government Decree No. 401/2015 Coll.)				

Kamýk nad Vltavou

Kamýk nad Vltavou profile is the representative profile for water body DVL_0030, Vltava from the Orlík reservoir dam to the backwater of the Slapy reservoir. Modeled concentrations of significant parameters when the watercourse is affected by the SMR ETE + ETE1,2 project capacity alternative are presented in the following table.

Table D.61: Kamýk nad Vltavou profile - concentrations of significant parameters, SMR ETE + ETE1,2 capacity alternative, Q_a and Q_{355}, medium discharge

SMR ETE + ETE1,2 Profile: Kamýk nad Vltavou Scenario: Average discharge		Modeled concentration at flow		Legislative requirements
Parameter	Unit	Q_a	Q_{355}	LIM-F
T	°C			14
pH				6–8.5
O_2	mg/l			
O_2 saturation	%			60–150
BOD_5	mg/l			2.2
P_{total}	mg/l	0.061	0.055	0.05
$P\text{-}PO_4^{3-}$	mg/l	0.037	0.036	0.035
$N\text{-}NO_3^-$	mg/l	2.1	2.0	3.2
$N\text{-}NO_2^-$	mg/l	0.06	0.07	0.1
$N\text{-}NH_4^+$	mg/l			14
Notes on statutory requirements: LIM-F requirement for good ecological potential (Methodology for assessing general physicochemical components of the ecological potential of flowing surface-water bodies)				

Modeled concentrations of significant parameters when the watercourse is affected by the SMR ETE + ETE1,2 + New NPP ETE project capacity alternative are presented in the following table.

Table D.62: Kamýk nad Vltavou profile - concentrations of significant parameters, SMR ETE + ETE1,2 + New NPP ETE capacity alternative, Q_a and Q_{355}, medium discharge

SMR ETE + ETE1,2 + New NPP ETE Profile: Kamýk nad Vltavou Scenario: Average discharge		Modeled concentration at flow		Legislative requirements
Parameter	Unit	Q_a	Q_{355}	LIM-F
T	°C			14
pH				6–8.5
O_2	mg/l			
O_2 saturation	%			60–150
BOD_5	mg/l			2.2
P_{total}	mg/l	0.06	0.06	0.05
$P\text{-}PO_4^{3-}$	mg/l	0.038	0.040	0.035
$N\text{-}NO_3^-$	mg/l	2.2	2.3	3.2
$N\text{-}NO_2^-$	mg/l	0.06	0.07	0.1
$N\text{-}NH_4^+$	mg/l			14
Notes on statutory requirements: LIM-F requirement for good ecological potential (Methodology for assessing general physicochemical components of the ecological potential of flowing surface-water bodies)				

Štěchovice profile

The Štěchovice profile is included in the assessment because salmonid waters are located there. Modeled concentrations of significant parameters at the Štěchovice profile are presented in the following table.

Table D.63: Štěchovice profile - concentrations of significant parameters, SMR ETE + ETE1,2 capacity alternative, Q_a and Q_{355}, medium discharge

SMR ETE + ETE1,2 Profile: Štěchovice Scenario: Average discharge		Modeled concentration at flow		Legislative requirements
Parameter	Unit	Q_a	Q_{355}	LIM-D
T	°C			21.5 *
pH				6–9 *
O_2	mg/l			≥9 *
O_2 saturation	%			50 *
BOD_5	mg/l			1.8
$N\text{-}NO_2^-$	mg/l	0.011	0.012	0.08
$N\text{-}NH_4^+$	mg/l	0.035	0.037	0.03
NH_3	mg/l			0.025 *
Notes on statutory requirements: LIM-F permissible pollution - annual average/EQS-AA (salmonid waters) (Government Decree No. 401/2015 Coll.) (* permissible values under Government Decree No. 71/2003 Coll.)				

Modeled concentrations of significant parameters when the watercourse is affected by the SMR ETE + ETE1,2 + New NPP ETE project capacity alternative are presented in the following table.

Table D.64: Štěchovice profile - concentrations of significant parameters, SMR ETE + ETE1,2 + New NPP ETE capacity alternative, Q_a and Q_{355}, medium discharge

SMR ETE + ETE1,2 + New NPP ETE Profile: Štěchovice Scenario: Average discharge		Modeled concentration at flow		Legislative requirements
Parameter	Unit	Q_a	Q_{355}	LIM-D
T	°C			21.5 *
pH				6–9 *
O_2	mg/l			≥9 *
O_2 saturation	%			50 *
BOD_5	mg/l			1.8
$N\text{-}NO_2^-$	mg/l	0.012	0.015	0.08
$N\text{-}NH_4^+$	mg/l	0.036	0.040	0.03
NH_3	mg/l			0.025 *
Notes on statutory requirements: LIM-F permissible pollution - annual average/EQS-AA (salmonid waters) (Government Decree No. 401/2015 Coll.) (* permissible values under Government Decree No. 71/2003 Coll.)				

D.I.4.1.3.2.2. Commentary on the model results at the critical profiles

Impacts on surface-water quality according to permissible pollution values under Government Decree No. 401/2015 Coll.

The modeled values at the profile downstream of Kořensko Reservoir are compared with permissible pollution values. Under both capacity alternatives (ETE1,2 + SMR ETE or ETE1,2 + New NPP ETE + SMR ETE) at normal Q_a flow, the permissible pollution annual average may be exceeded for $CHSK_{Cr}$, TOC, and BOD_5, and for the PAHs fluoranthene and benzo[a]pyrene.

It should be noted that the statutory requirements for these parameters are not fully met even at present; water quality in the Lužnice River is particularly unsatisfactory (see Chapter C.II.4.1.3. Qualitative data, page 249 of this Documentation). The principal cause of this condition can therefore be attributed to existing surface-water quality and, for most of the parameters named ($CHSK_{Cr}$, TOC, BOD_5, and P_{total}) at normal flows, specifically to the inflow from the Lužnice River.

The situation is similar at low flows. For some parameters, the modeled situation at the profile downstream of Kořensko Reservoir at Q_{355} is more favorable than at Q_a. This is primarily due to the effect of the Lužnice River, which is not as significant during drought as at normal flows. While flow in the Vltava River is augmented by reservoirs during drought, the Lužnice has a much lower Q_{355} flow under these conditions, so the pollution load from the Lužnice is substantially lower.

As at the profile downstream of Kořensko Reservoir, TOC and P_{total} remain problematic parameters at the next critical profile, Orlík Reservoir at Zvíkov Bridge. Other parameters for which the requirements were not met at the profile downstream of Kořensko Reservoir (BOD_5, $CHSK_{Cr}$, fluoranthene, and benzo[a]pyrene) could not be assessed because data were unavailable for these parameters.

Impacts on public water-supply use of surface water

At the Solenice profile, located downstream of the Orlík Reservoir dam, surface-water quality is assessed in terms of public water-supply use because the abstraction named 1. SčV Příbram Vltava is located there. The modeled concentration values show that the values for public water-supply use are not met for TOC.

Impacts on fish waters

Values for cyprinid waters are considered at the Orlík Reservoir Zvíkov Bridge profile. Although the profile itself is not located within a cyprinid-water reach, the Otava arm of Orlík Reservoir, where cyprinid water is designated, lies downstream, and this part of the reservoir may be partly affected by the backwater of Vltava water. The modeled data show, however, that the requirements for both nitrite nitrogen and ammoniacal nitrogen are met with a margin, so these requirements are not at risk of being exceeded due to backwater from the Vltava. For BOD_5, it can also be stated that the contribution of both Project capacity alternatives to any exceedance is negligible, particularly considering that the BOD_5 concentration in the wastewater is almost identical to that in water pumped from the watercourse despite its concentration in the cooling circuit, due to biological degradation of this type of pollution.

Salmonid water is designated in the section from the Štěchovice Reservoir dam to the confluence with the Sázava ("Štěchovice Vltava"). Modeled concentrations at the Štěchovice profile exceed the salmonid-water requirements for $N\text{-}NH_4^+$. The concentration of $N\text{-}NO_2^-$ meets the requirements; data are unavailable for the other parameters.

Impacts on bathing-water areas

Impacts on the bathing-water areas in Orlík and Slapy reservoirs are assessed at the profile downstream of Kořensko Reservoir and the Orlík Reservoir Zvíkov Bridge profile. The modeled concentration values at the profile downstream of Kořensko Reservoir, as affected by discharges from SMR ETE + ETE1,2 + New NPP ETE, show that P_{total} fails to meet the bathing-water requirements both at normal Q_a flow and during drought (Q_{355}). The same result is assessed at the Orlík Reservoir Zvíkov Bridge profile.

Impacts on the ecological potential of surface-water bodies

The impact on the ecological potential of surface-water bodies is monitored at the Orlík Reservoir Zvíkov Bridge and Kamýk nad Vltavou profiles, which are representative profiles for water bodies HVL_1055_J - Orlík I Reservoir on the Vltava River and DVL_0030 - Vltava River from the Orlík Reservoir dam to the Slapy Reservoir backwater. At both profiles, total phosphorus (P_{total}) fails to meet the requirements for good ecological potential; at the Kamýk nad Vltavou profile, phosphate phosphorus ($P\text{-}PO_4^{3-}$) also fails to meet them.

D.I.4.1.3.2.3. Impacts on water-quality parameters in the Strouha and Dvorčický Stream watercourses

Stormwater from the fenced part of the SMR ETE site will be conveyed through a retention basin at the northeastern tip of SMR ETE and the existing separate sewer system, together with stormwater and groundwater from ETE1,2, into the Strouha Stream. An increase in flows relative to the current condition can therefore be expected. At present, the qualitative parameters of water discharged from ETE1,2 meet the requirements of Government Decree No. 401/2015 Coll. for most parameters. However, certain parameters in the Strouha Stream, particularly total phosphorus, SS_{105}, ammoniacal nitrogen, TOC, and PAHs, show slightly impaired quality. Because no significant change in the composition of the discharged waters is anticipated, only an increase in their quantity, no fundamental change in water quality in the Strouha is expected. However, an increase in the total substance load entering the receiving water may be expected in view of the increased flow.

Groundwater pumped from beneath the reactor-building foundations and stormwater from the outer SMR ETE site will be conveyed into Dvorčický Stream. Groundwater from the SMR ETE site is of suitable quality for augmenting Dvorčice Pond and Dvorčický Stream, and conveying it will not impair surface-water quality parameters. However, stormwater runoff from the site may have impaired quality, so appropriate measures will be implemented, such as an upstream retention basin at the SMR ETE site and oil separators.

D.I.4.1.3.3. Overall summary of impacts on surface-water quality

Overall, at the profile downstream of Kořensko Reservoir and at other critical profiles farther downstream along the affected Vltava River, water quality fails to meet statutory values derived from different types of requirements. The existing surface-water quality, particularly polluted water from the Lužnice River, is the decisive influence. The SMR ETE contribution to this pollution is very small: wastewater from SMR ETE accounts for tenths of a percent to several percent of the mass flow of the parameters assessed in the receiving water.

Conveying stormwater from SMR ETE into the Strouha and Dvorčický Stream watercourses can be expected to increase the total substance load entering their surface waters. The quantity will be reduced by retention basins and oil separators.

D.I.4.1.4. Impacts on surface-water bodies

Expert studies have been prepared to assess impacts on the affected surface-water bodies; their summary is provided in Annex 4.1 to this Documentation (Assessment of impacts on surface water and groundwater), to which reference is made for details. The results and conclusions are summarized below.

In the area of interest, four lake-type surface-water bodies and two river-type surface-water bodies are delineated along the Vltava River from the Kořensko hydraulic structure to the confluence of the Vltava and Sázava Rivers. A more detailed description of the surface-water bodies, including a graphic representation, is provided in Chapter C.II.4. Surface water and groundwater (page 245 of this Documentation). The assessment summarized in that chapter shows that the overall status assessment is unsatisfactory for most of the surface-water bodies assessed; only the status of water body DVL_0095_J, Slapy Reservoir on the Vltava River, is good.

Assessment of the impact of the SMR ETE Project on the status of surface-water bodies is based on the estimate of the impact of SMR ETE operation on surface-water quality (see the preceding chapter), which models concentrations of selected substances in the receiving water for wastewater from the SMR ETE Project. Two capacity alternatives are modeled: concurrent operation of SMR ETE and the existing ETE1,2 units, and concurrent operation of SMR ETE, ETE1,2, and the future New NPP ETE (under the maximum output alternative of 2 × 1,700 MW_e). Two hydrological situations are assessed for these alternatives: normal flow (Q_a) and climate-change-affected drought conditions (Q_{355}). The modeling uses medium- and maximum-discharge scenarios.

The modeling results show that the contribution of the SMR ETE Project itself to the total load in the receiving waters is generally very small. For P_{total}, which is critical to the failure of water bodies to achieve good status, the Project contribution at the Kořensko profile accounts for only 0.5 % to 2.4 % of the total mass flow at the profile downstream of Kořensko Reservoir. When concurrent operation of the SMR ETE Project with other sources at the Temelín site (ETE1,2 and New NPP ETE) is considered, the P_{total} input ranges from 2.3 % (SMR ETE + ETE1,2, Q_a, medium discharge) to 18.2 % (SMR ETE + ETE1,2 + New NPP ETE, Q_{355}, maximum discharge). The background, meaning the mass flow conveyed by

the Vltava and Lužnice Rivers, accounts for the dominant share of pollution and represents 81.8 % to 97.7 % of the total load. The impact on temperature and O_2 saturation is minimal; current adverse values for these parameters primarily result from reservoir operations in the Vltava Cascade.

Of the specific pollutants, particular attention is paid to tritium, which is also the key parameter for impacts on the receiving water in terms of radioactivity. For tritium, however, the modeled activity concentrations remain well below the annual-average environmental quality standard (EQS-AA = 1,000 Bq/l).

At the profile downstream of Kořensko Reservoir, the SMR ETE contribution for the other specific pollutants assessed is several percent, below 4 %. When the Project is assessed concurrently with other sources at the Temelín site, the highest contribution is 28 % (AOX, SMR ETE + ETE1,2 + New NPP ETE, Q_{355}). The background, meaning the mass flow conveyed by the Vltava and Lužnice, remains the greatest source of pollution. Further dilution downstream will reduce the contribution of the discharge further, so it will not cause a failure to achieve good status in terms of specific pollutants in the downstream water bodies either.

The impact of SMR ETE on chemical-status parameters is likewise assessed as very small, contributing up to 6 % of the total mass flow at the profile downstream of Kořensko Reservoir. When assessed concurrently with other sources at the Temelín site, the maximum contribution is 38 % (benzo[g,h,i]perylene, SMR ETE + ETE1,2 + New NPP ETE, Q_{355}). In addition to benzo[g,h,i]perylene, inputs of other PAHs are also non-negligible. They arise when PAHs are scrubbed from the atmosphere into cooling water in the cooling towers and subsequently discharged to the receiving water as wastewater in the blowdown. Even so, the background pollutant mass flow from the Vltava and Lužnice Rivers exceeds the input from the SMR ETE Project, including when concurrent operation with other sources at the Temelín site is considered.

Operation of the SMR ETE Project, either alone or concurrently with other sources at the Temelín site (ETE1,2 or New NPP ETE), will therefore have no significant adverse impact on future achievement of good status in the affected surface-water bodies. Most of these bodies already fail to achieve good status, and the principal cause must be sought in the catchment upstream of the Project. In connection with assessment of the Project's impact on water status, attention should also be drawn to the lack of data on specific pollutants and chemical-status parameters in the affected water bodies.

D.I.4.2. Impacts on groundwater

D.I.4.2.1. Impacts on groundwater

Expert studies have been prepared to assess impacts on groundwater; their summary is provided in Annex 4.1 to this Documentation (Assessment of impacts on surface water and groundwater), to which reference is made for details. The results and conclusions are summarized below.

Implementation of the Project will develop approximately 29.7 ha of unpaved areas currently used for agriculture, where precipitation naturally infiltrates or runs off. The legislation, Section 5(3) of Act No. 254/2001 Coll., the Water Act, as amended, requires runoff of surface water resulting from precipitation falling on planned structures (hereinafter "stormwater") to be prevented by accumulation and subsequent use, infiltration on the site, evaporation, or similar means; if none of these methods of limiting stormwater runoff is possible or sufficient, stormwater must be retained and conveyed in a controlled manner, or a combination of these methods must be used. Hydrogeological investigation has verified unsuitable conditions at the SMR ETE site that act synergistically in combination and prevent stormwater infiltration. These include particularly the risk of waterlogging of structures and equipment, especially in combination with lowering the groundwater level to 17 m below the ground elevation to prevent contact between the deeply founded reactor building and groundwater. The risk of impairing the stability of the embankment slope at the southern edge of the SMR ETE site, after it is leveled to an elevation of 495 m above sea level, is also assessed as problematic, as are the risks posed by low permeability of the geological environment or a high groundwater level. Another important related aspect is the limited space at the SMR ETE site, which does not permit a suitable and sufficiently large infiltration area to be located far enough from buildings and equipment and from the area in which the groundwater level is being lowered.

For this reason, approximately 175,000 m^3/year of stormwater will be conveyed into surface water. Stormwater from the 18.3 ha inner fenced SMR ETE site will be conveyed through a 3,200 m^3 retention basin at the northeastern tip of SMR ETE and the existing separate sewer system of ETE1,2 into the Strouha Stream. The outer part of the site, approximately 11.2 ha, will be drained into Dvorčice Pond through a separate sewer system; the anticipated flow is approximately 1.2 l/s.

The reactor building will be founded at least 16 meters below the ground surface, and the groundwater level beneath its foundations will need to be permanently lowered by pumping from drainage wells. Groundwater from the drainage wells will be pumped into Dvorčice Reservoir and then into the adjoining Dvorčický Stream. The quantity pumped to lower the water level is expected to range from 1.5 to 2.0 l/s, with a long-term decreasing trend; hydroclimatic conditions may cause temporary upward or downward fluctuations within an overall estimated range of 1.0 to 2.5 l/s.

During SMR ETE operation, possible climate-change impacts will have a fundamental impact on the area's water balance, manifested as reduced precipitation infiltration into groundwater at the 2060 and 2080 horizons. As a result of reduced groundwater recharge, shallow groundwater levels are expected to fall by several meters below the ground surface on average compared with current measurements in the monitoring wells. Less groundwater pumping will be required (for ETE1,2, a reduction of 35–40 % relative to the current condition can be expected, with a similar reduction

in the anticipated pumping at the SMR ETE site). No future changes in groundwater-flow directions relative to the current situation are expected. The decline in groundwater levels will shift drainage locations farther downslope into local watercourse channels, which will therefore begin in lower parts of the terrain. In the local morphology, the shift will average tens of meters, estimated at 30–50 m. As climate change progresses, without further measures relatively significant adverse impacts on preservation of the water surface of Dvorčice Pond or maintenance of discharge into Dvorčický Stream could therefore be expected over the 2060–2080 horizon. Conveying stormwater from the outer part of the SMR ETE construction site and pumped groundwater into Dvorčice Reservoir and Dvorčický Stream as described above, in a total quantity of at least 2.2 l/s, can be expected to eliminate possible adverse impacts and optimally preserve the existing water regime of Dvorčice Pond and Dvorčický Stream even under climate-change conditions.

The impacts of artificially lowering the groundwater level using drainage wells at the SMR site will be local only. Based on current knowledge of the hydraulic parameters of the geological environment in hydrogeological region HGR 6320, where no significant hydrogeological structure with larger groundwater reserves is present, and experience with similar work at the neighboring ETE1,2 site, the groundwater level around the SMR ETE site may be affected to a maximum distance of 100–200 m. No used or potentially usable groundwater sources that could be adversely affected are located within this distance. Potential groundwater sources in the wider area that could be used for drinking-water supply and are more than 200 m from the SMR ETE site will not be affected in any way by the planned drainage or otherwise affected; the yield and quality of the groundwater abstracted will be determined solely by the natural characteristics of the area.

Karlovec, a small reservoir, is located southeast of the SMR ETE site within the zone potentially influenced by groundwater abstraction. A direct impact on the Karlovec Pond water level from pumping beneath the reactor-building foundations is ruled out. However, because this pond is evidently supported to a significant extent by concealed deeper-circulation groundwater springs, there is a small probability that pumping will indirectly affect this small reservoir if the pumping wells capture groundwater that would otherwise flow to and replenish Karlovec Pond. If this impact occurs, it is expected to be approximately 0.1–0.2 l/s. The impacts of climate change in the coming years and decades must also be considered, as this potentially relatively small impact may be accentuated by the general impact of climate change, particularly more pronounced and longer dry periods.

Hydrogeological conditions in the municipality of Kočín are unrelated to those in the SMR ETE area and therefore cannot be affected from there.

No protected areas of natural groundwater accumulation or surface-water or groundwater sources that could be impaired by implementation and operation of the Project are present in the affected territory.

D.I.4.2.2. Impacts on groundwater bodies

Expert studies have been prepared to assess impacts on groundwater bodies; their summary is provided in Annex 4.1 to this Documentation (Assessment of impacts on surface water and groundwater), to which reference is made for details. The results and conclusions are summarized below.

In terms of potential impacts on groundwater bodies, SMR ETE operation will primarily involve pumping groundwater from beneath the structure's foundations, conveying stormwater from impervious surfaces into surrounding watercourses, and discharging wastewater into the Vltava River.

The impact on groundwater bodies is assessed cumulatively, considering the siting and operation of SMR ETE, ETE1,2, and New NPP ETE. The impact of SMR ETE is assessed for the groundwater bodies specified in Chapter C.II.4.2. Groundwater (page 269 of this Documentation and the following pages).

According to 2019–2024 data monitored for the Upper Vltava Sub-basin Plan and Lower Vltava Sub-basin Plan for the fourth planning period, groundwater bodies 63204, Crystalline rocks in the Middle Vltava catchment - northern part, and 62500, Proterozoic and Paleozoic formations in the Vltava tributaries catchment, currently have good status. The status of groundwater bodies 63201, Crystalline rocks in the Middle Vltava catchment - southern part, and 63203, Crystalline rocks in the Middle Vltava catchment - Vltava inter-catchment from the confluence with Vápenický Stream to Slapy, is unsatisfactory.

With respect to quantitative status, even with groundwater pumping, the scale of pumping and the extent of the cone of depression mean that the impact will be local only and will not affect the status of groundwater bodies.

The impact on the chemical status of groundwater bodies is assessed in terms of potential impacts on six groundwater sources or abstraction areas for drinking-water purposes located in the area of interest where bank infiltration of surface water from the Vltava River into groundwater is possible. SMR ETE operation will not cause deterioration of the chemical status of groundwater in these wellfields. Because the individual abstractions are most sensitive to the impacts of operation of the SMR ETE Project, it follows that operation will not impair the chemical status of either the working units or the groundwater bodies.

The Project has no potential to affect the qualitative or quantitative parameters of the affected groundwater bodies.

D.I.4.3. Impacts during construction or termination of operation

During construction, topsoil and subsoil will be stripped at the site and bulk earthworks will be performed, leveling the construction area. Extensive impermeable surfaces will be created and stormwater will be drained from them. At the same time, the groundwater level will be lowered at the

construction excavations, with the most intensive pumping occurring in the construction excavation at the SMR ETE site. A local lowering of the groundwater level will therefore occur in the SMR ETE construction area, and the cone of depression may extend over an area of up to approximately 150 × 150 meters.

The restriction of water infiltration at construction site facility areas C, I, J, H, and G during SMR ETE construction will be largely offset by the drainage design in the applicable hydrological catchment, resulting in relatively minor impacts on the water balance of the area affected by SMR ETE construction. Surface drainage of stormwater captured at the SMR ETE site will be directed partly into the Strouha Stream catchment and partly into the Dvorčický Stream catchment. Drainage of areas I and H and part of the SMR ETE construction area, together with the planned discharge of groundwater pumped from the SMR ETE site to lower the water level at the reactor-building construction site into the small Dvorčice Reservoir and Dvorčický Stream, can be expected to eliminate possible adverse impacts and preserve the water regime of Dvorčický Stream and the pond approximately in its current condition. Stormwater will be pretreated before it is conveyed into surface water.

The potential to affect groundwater and surface-water quality and the risk of release of hazardous substances during construction correspond to the general risks common to any construction project, which will be eliminated by compliance with established technological procedures and operating discipline.

The impact of SMR ETE construction on groundwater bodies could be significant only for body 63201, Crystalline rocks in the Middle Vltava catchment - southern part, and the somewhat more distant body 21600, České Budějovice Basin. The boundary between these bodies runs approximately through the confluence of Temelínecký Stream with Bílý Stream; Bělohůrecký Pond already lies within groundwater body 21600. The entire SMR ETE construction area lies within two working units with areas of 38.7 and 25.9 km^2; however, neither contains an assessed monitoring point. Given the minimal significant anthropogenic pressures other than agricultural land use, it may be assumed that, as in the neighboring working units, chemical status is good except for certain pesticide metabolites. With respect to groundwater-body status, it can be stated that construction will not cause even temporary deterioration in the chemical or quantitative status of groundwater bodies or in the status of their working units. With respect to chemical status, construction will not introduce any significant quantity of pollutants. With respect to quantitative status, although water will be pumped from the construction excavation, the scale of pumping and the cone of depression mean that the impact will be local only and will not affect the status of groundwater bodies.

The need for raw water and drinking water during construction and the subsequent quantity of process wastewater and sanitary wastewater have not been specified in detail. Requirements are anticipated to be no more than several hundred thousand m^3/year for raw water and up to one hundred thousand m^3/year for drinking water. During concurrent construction of SMR ETE and New NPP ETE, a requirement to increase the contracted abstraction of drinking water for the Temelín site above the currently permitted quantity therefore cannot be ruled out. The quantity of process wastewater from construction has not been specified in greater detail and will be of little significance overall; for example, the water becomes part of building structures as mixing water, evaporates, or is reused. Potentially contaminated water, such as from process-equipment tests and flushing, will be collected in sealed sumps and managed appropriately according to physicochemical analyses. The quantity of sanitary wastewater during construction is estimated at tens of thousands of m^3/year. The Vltava River, or the catchment of the wastewater treatment plant to which mobile construction sanitation facilities will be emptied, will receive the treated sanitary wastewater from construction.

After SMR ETE is commissioned, construction site facility areas will be restored to their original condition. Runoff conditions in these areas will then be considered identical to the original condition, although the original slope conditions will not be restored exactly.

During termination of operation, water abstraction and discharge requirements will be gradually reduced.

D.I.5. Impacts on soil

5. Impacts on soil

D.I.5.1. Impacts on soil

In general, impacts on soil arise from occupation of land classified as part of the agricultural land fund (ZPF), land designated for the fulfillment of forest functions (PUPFL), or overall impacts on soil quality.

Permanent occupation by the main SMR ETE construction site, meaning the Project itself including related structures and operational areas, is conservatively specified in full, at 29.7 ha. Land protected as ZPF accounts for approximately 21.3 ha (approximately 71.7 %), while other land accounts for approximately 8.4 ha (approximately 28.3 %). Land designated for the fulfillment of forest functions is not affected by permanent occupation for the SMR site.

The existing ETE1,2 site covers approximately 123.3 ha (the permanent-occupation boundary defined by the fence of the existing power plant's guarded area, excluding the Temelínec Landfill and Sludge-Bed Site); according to the EIA documentation, total occupation for ETE1,2 + New NPP ETE will not exceed approximately 187.2 ha. The total permanent land take for the combined impact of ETE1,2, New NPP ETE, and SMR ETE will therefore not exceed 216.9 ha.

Under Decree No. 48/2011 Coll., on establishment of protection classes, as amended, the vast majority of ZPF land at the SMR ETE site is classified in protection class III (valuated soil-ecological unit 5.50.01). These soils have very low production capacity and a medium degree of protection and may be used for potential construction in spatial planning.

The corridor for the electrical connection, designated area EL in Annex 1.1, does not as a whole constitute an area of permanent occupation. Permanent occupation for the electrical connection consists only of the built-up areas of the foundations for towers of the power-evacuation line and backup power-supply line from the Kočín substation, resulting in total occupation of no more than several thousand m^2, conservatively assumed to be up to 1 ha. The occupation may affect soils in protection classes II through V and potentially forest land, including the tower footprint and the line's protection zone.

Land occupation is generally an adverse impact, but it will be justified in accordance with the requirements of Act No. 334/1992 Coll., on protection of the agricultural land fund, as amended. In view of the facts specified above, the areas within the area of interest can be considered suitable from a pedological perspective for construction of SMR ETE and the related construction site facilities. In general, the following will need to be observed during Project preparation and implementation:

- Take into account the relatively greater vulnerability of soil in certain areas:
  - soil vulnerability to water erosion in areas E2, F1, J, SE, and specific locations where the long-term average soil loss through erosion exceeds the limit, within areas EL and B3.
  - soil vulnerability due to the risk of accelerated infiltration, particularly in areas B1, F1, F2, J, and EL.
- Strip cultivable soil layers only after the results of detailed measurement of topsoil and subsoil depths are available.
- Strip and stockpile the upper layer, meaning topsoil or the turf horizon, and lower layer, meaning subsoil, separately.
- After the Project ends, return temporarily withdrawn agricultural land to its original type of use, meaning perform technical and biological reclamation.

In accordance with the requirements for ZPF protection under Act No. 334/1992 Coll., the planned permanent occupation of agricultural land is minimized to the SMR area, which is predominantly classified in ZPF protection class III (99.93 % of the area), with only 0.07 % in protection class II. If the ZPF protection principles under Act No. 334/1992 Coll. and Decree No. 271/2019 Coll. are observed, the Project can be expected to affect agricultural land around SMR ETE only to the extent strictly necessary and justifiable by the public interest in the energy sector.

D.I.5.2. Impacts during construction or termination of operation

Areas subject to permanent and temporary land take (construction site facilities) will be used for construction (movement of construction equipment and the construction work itself).

Temporary occupation consists of the area for construction site facilities. The areas for temporary construction site facilities, designated C, G, H, I, and J in Annex 1.1 to this Documentation, have a total area of approximately 74.0 ha: area C approximately 13.9 ha, area G approximately 9.5 ha, area H approximately 25.8 ha, area I approximately 5.6 ha, and area J approximately 19.2 ha. The areas consist almost entirely of ZPF land (approximately 72.4 ha), while other land accounts for approximately 1.6 ha; no PUPFL is affected. For conservative purposes, the entire area is assumed to be subject to temporary land take. Temporary occupation will affect soils in protection classes II (to a minor extent), III, IV, and V.

Areas B1 (approximately 7.7 ha), B2 (approximately 14.9 ha), B3 (approximately 4.0 ha), D (approximately 6.4 ha), E1 (approximately 17.5 ha), E2 (approximately 36.3 ha), F1 (approximately 18.5 ha), and F2 (12.6 ha) are considered reserve areas whose temporary use is not anticipated or is anticipated only to a limited and temporary extent. These reserve areas cover a total of approximately 117.8 ha, including approximately 103.6 ha of ZPF land, 2.4 ha of other land, and 11.8 ha of PUPFL (almost entirely within area F2).

Implementation of the related infrastructure areas/corridors does not require temporary occupation of ZPF land; they will use existing water-supply and drainage routes, or their construction schedule does not require a period longer than 12 months. Temporary occupation of PUPFL may occur in the power-evacuation corridor (EL) and construction-site electrical-connection corridor (SE).

Protection of the soil profile against water and wind erosion will form part of the construction management plan. Potential risks to soil outside the areas delineated for the Project will also be considered, such as water erosion of soil from surrounding land into the Project area or risks to soil quality posed by water erosion of lower-quality soils onto surrounding agriculturally managed land.

Before construction begins, the humus-rich topsoil horizon will be stripped and placed in a stockpile. The stockpile of stripped soil or other erosion-prone material will be secured in accordance with statutory requirements. After construction is completed, the original soil profile will be restored, the land will be reclaimed, and it will be returned to its original use.

During construction, soil may also potentially be contaminated by relocation of contaminated soil, if soil is transported from other locations, or by leaks of hazardous substances from the machinery used. Soil contamination caused by relocating contaminated soil can be prevented by performing laboratory analyses before the soil is used. Under normal use of construction machinery in good technical condition, there are no significant inputs of extraneous substances into the soil. In the event of an accident followed by release of hazardous substances into the soil, contaminated soil will be excavated and decontaminated or disposed of at a landfill permitted to accept such contaminated soil. Therefore, a more significant risk of contamination of soils does not occur during construction.

No further additional land occupation is anticipated during or after termination of operation.

D.I.6. Impacts on natural resources

6. Impacts on natural resources

D.I.6.1. Impacts on natural resources

Natural resources and mineral resources will not be affected by the Project. Registered geological or paleontological monuments will not be damaged. Existing construction-material deposits will be used for construction in accordance with their opening, development, and extraction plans; the Project creates no direct requirement to open new sources of construction materials.

Given the nature of the structure, protection against radon ingress from the subsoil does not need to be considered.

D.I.6.2. Impacts during construction or termination of operation

Existing construction-material deposits will be used for construction in accordance with their opening, development, and extraction plans; the Project creates no direct requirement to open new sources of construction materials. No impacts on natural resources will arise during construction or termination of operation.

D.I.7. Impacts on biodiversity

7. Impacts on biodiversity (fauna, flora, and ecosystems)

D.I.7.1. Impacts on biodiversity

Impacts on the biotic component of the environment are assessed in detail in the assessment of the impacts of a serious intervention on nature-conservation interests under Section 67 of Act No. 114/1992 Coll., on Nature and Landscape Conservation, as amended, which is provided in full in Annex 3.1 to this Documentation (biological assessment). Reference is made to this appendix for details; the results and conclusions are summarized below.

The anticipated impacts on qualifying features within the meaning of Parts Two, Three, and Five of the Nature and Landscape Conservation Act are as follows:

- direct habitat occupation,
- impacts on qualitative habitat characteristics,
- disturbance and harmful interference with natural development,
- accidental killing or injury of individuals or destruction of or damage to developmental stages,
- risk of bird collisions with the line,
- impairment of the ecological-stabilization function of a VKP,
- impacts on the water regime of surface water and groundwater,
- radiological impacts on biota,
- discharge of wastewater into the Vltava River.

The following significance scale, presented in the following table, is used to assess impacts.

Table D.65: Significance of impacts and the scale used to assess the Project's impact on biota

Impact	Value	Description
Significant adverse	-2	A significant disruptive to destructive impact on a protected area, the function of a VKP, a habitat, or a species population or a substantial part thereof; significant disruption of the ecological requirements of a habitat or species; or significant interference with the habitat or natural development of a species.
Moderate adverse	-1	Limited/moderate/insignificant adverse impact. A moderate disruptive impact on a protected area, the function of a significant landscape feature, a habitat, or a species population; moderate disruption of the ecological requirements of a habitat or species; or marginal interference with the habitat or natural development of a species.
None	0	The Project has no impact.
Moderate beneficial	+1	A moderate beneficial impact on a protected area, the function of a significant landscape feature, a habitat, or a species population; moderate improvement in the ecological requirements of a habitat or species; or moderately beneficial interference with the habitat or natural development of a species.
Significant beneficial	+2	A significant beneficial impact on a protected area, the function of a significant landscape feature, a habitat, or a species population; significant improvement in the ecological requirements of a habitat or species; or significantly beneficial interference with the habitat or natural development of a species.

D.I.7.2. Impact on specially protected areas and the Natura 2000 network

The Project is not in direct spatial conflict with any specially protected area or Natura 2000 site. The nearest large-scale specially protected areas are the Třeboňsko Protected Landscape Area, approximately 20 km to the east, and the Blanský les Protected Landscape Area, approximately 20 km to the south. The nearest small-scale specially protected area is the Lužnice Nature Monument. Given the distance and the nature of operational inputs and outputs, no impacts on specially protected areas are anticipated. The impact of Project operation on specially protected areas is assessed as nil.

In its opinion under Section 45i of the Nature and Landscape Conservation Act, ref. No.: KUJCK 102296/2026 dated August 14, 2026, the Regional Authority of the South Bohemian Region ruled out the possibility of a significant effect of the Project, either alone or in combination with other projects or plans, on the favorable conservation status of the qualifying features or the integrity of Sites of Community Importance and Special Protection Areas within the jurisdiction of the Regional Authority of the South Bohemian Region.

According to the Natura screening report, the graylag goose *(Anser anser)*, a qualifying feature of the Českobudějovické rybníky Special Protection Area, may potentially be affected. Its occurrence was also confirmed in area H in 2025. Collision of individual birds with the power-evacuation line conductors and ground wires cannot be entirely ruled out. However, overhead lines for the existing ETE1,2 units are already present in the area, and the anticipated collision risk is low. The impact of Project operation on the Českobudějovické rybníky Special Protection Area is therefore assessed as slightly adverse, while a significant effect within the meaning of Section 45i of the Nature and Landscape Conservation Act is ruled out. No impacts on other Natura 2000 sites, their qualifying features, or their integrity are anticipated.

D.I.7.3. Impact on nature parks, significant landscape features, and memorial trees

D.I.7.3.1. Impact on nature parks

The area of interest does not lie within any nature park. The impact of the Project on nature parks is assessed as nil.

D.I.7.3.2. Impact on significant landscape features

In the affected territory, watercourses, forests, ponds, and floodplains are statutory significant landscape features. The Project does not conflict with a VKP consisting of a lake or peat bog or with any registered VKP. The SMR ETE site, power evacuation, and possible hydrological impacts on Dvorčice and Karlovec ponds are relevant to assessing the impacts of Project operation.

The power-evacuation corridor covers approximately 73.5 ha, but not all of this area constitutes permanent occupation. Permanent occupation will occur only beneath tower foundations. Regular maintenance of vegetation in the line's protection zone will be a long-term impact.

D.I.7.3.2.1. Impact on watercourses, floodplains, and ponds

The permanent impact of the SMR ETE site on aquatic VKP may consist of restricted stormwater infiltration, a change in the method of conveying stormwater, and permanent lowering of the groundwater level beneath the foundations of structures. For power evacuation, a long-term impact may arise at tower foundations and from maintenance of woody vegetation in the line's protection zone. The conductors themselves passing over a watercourse do not directly occupy its channel.

Table D.66: Assessment of the significance of impacts on watercourses, floodplains, and ponds as VKP

Name of watercourse or floodplain	Location relative to Project areas	Nature of potential impact	Assessment of impact
Dvorčický Stream, its tributaries and floodplain	south of the SMR ETE site, in the direction of groundwater flow	possible reduction in hydrological recharge due to restricted infiltration, conveyance of some stormwater outside the catchment, and permanent lowering of the groundwater level beneath structure foundations; the stream is also crossed by the power-evacuation line	-1
Dvorčice Pond	south of the SMR ETE site, in the Dvorčický Stream catchment	possible reduction in surface-water and groundwater recharge and a consequent change in the water regime of the pond and its littoral habitats	-1
Karlovec Pond	east of the SMR ETE site; pond with no evident surface inflow	unlikely restriction of deeper-circulation groundwater inflow and reduced stability of the water regime	-1

Permanent development of the SMR ETE site will reduce stormwater infiltration. Conveying the stormwater into the Strouha receiving water through sewers would also transfer some water out of the Dvorčický Stream catchment. Another mechanism is the long-term lowering of the groundwater level beneath the foundations of structures.

A retention basin whose volume can be used to augment Dvorčice Pond is therefore being considered in the southeastern part of the SMR ETE site. The capacity and operating regime of the basin must preserve the maximum possible quantity of water in the Dvorčický Stream catchment.

A direct impact on Karlovec Pond from lowering of the shallow groundwater level is not anticipated. There is a small probability that deeper-circulation inflow may be reduced by no more than approximately 0.2 l/s. This impact may be intensified by prolonged dry periods. The overall permanent impact on watercourses, floodplains, and ponds is assessed as slightly adverse.

D.I.7.3.2.2. Impact on forests

Forest stands and land designated for the fulfillment of forest functions (PUPFL) are assessed for purposes of evaluating the impact on forests as VKP. However, some stands outside PUPFL perform a similar ecological-stabilization function, and the Project's impact on these stands is therefore assessed together with forests as VKP.

Permanent impacts will arise at the SMR ETE site and in the power-evacuation corridor. Part of a non-forest woody stand will be permanently occupied at the SMR ETE site. In the power-evacuation corridor, permanent occupation of forests as VKP will occur only beneath tower foundations; however, the nature of the affected stands may also be changed over the long term in the line's protection zone, where woody plants will be removed periodically or restricted in height.

Table D.67: Assessment of the significance of impacts on forests as VKP and forest stands

Stand and regime	Relationship to permanent Project components	Extent affected	Nature of permanent impact	Assessment of impact
younger woody stand of reclamation origin in the cadastral area of Křtěnov - woody stand outside PUPFL, not a forest VKP	northeastern part of the SMR ETE site, eastern part of plot No. 606	approximately 1 ha	permanent occupation and probable complete removal of the affected part of the stand	-2
two forest units in the cadastral area of Kočín on the left bank of Dvorčický Stream downstream of Dvorčice Pond - forests as VKP, PUPFL forest land	southern part of the power-evacuation corridor; forest land	conservatively, approximately 3.5 ha of spatial conflict according to the biological-assessment summary table	permanent occupation at tower locations, removal or height restriction of woody plants, and a long-term change in the nature of the forest within the line's protection zone	-2

A younger woody stand of reclamation origin, up to approximately 30 years old, is present in the northeastern part of the SMR ETE site. The stand is registered in the Cadastre of Real Estate as other land, not forest land, but by its nature it is a closed-canopy woody stand with an important habitat and ecological-stabilization function. It is therefore assessed together with forest stands in the biological assessment. The siting of structures assumes permanent occupation of approximately 1 ha and probable complete removal of the affected part of the stand. Given the direct and irreversible nature of the impact and the limited presence of larger continuous woody stands in the surrounding area, the impact is assessed as significantly adverse.

The power-evacuation corridor affects two smaller forest units in the cadastral area of Kočín. These are forest plantations of non-native conifers, volunteer pioneer woody plants, and other tree stands. Woody plants will be periodically removed or restricted in height in the protection zone, resulting in a long-term change in the spatial structure and ecological-stabilization function of the affected parts of the forest.

The extent of the impact must be minimized by appropriately locating towers, limiting permanent occupation of forest land, and preserving the maximum possible part of the existing stands. Low-growing stands and a long-term management method that allows at least some biological and ecological-stabilization functions of the affected areas to be preserved should be preferred in the protection zone.

Because part of the stand at the SMR ETE site will be permanently removed and forest stands in the power-evacuation corridor will undergo long-term change, the Project's permanent impact on forests as VKP and ecologically significant woody stands outside PUPFL is assessed as significantly adverse.

D.I.7.3.3. Impact on memorial trees

No memorial trees are present in the affected territory or its immediate vicinity. The nearest memorial tree is a small-leaved lime at Litoradlice, approximately 2.9 km away. Other memorial trees are located in Týn nad Vltavou, approximately 4 km away. Given the location and nature of the Project, no impact on memorial trees is anticipated; the impact is assessed as nil.

D.I.7.4. Impact on the territorial system of ecological stability

Regional and supraregional ÚSES elements are not in spatial conflict with the Project. Local-level ÚSES elements and interaction elements are designated around the Project. The SMR ETE site itself is not in direct spatial conflict with a local biocenter or local biocorridor, but it affects interaction element IP46 Mezi cestami. The power-evacuation corridor crosses several local ÚSES elements and interaction elements.

The assessed impacts of Project operation comprise the SMR ETE site, power evacuation, and possible hydrological impacts on elements associated with Dvorčice and Karlovec ponds.

The power-evacuation corridor covers approximately 73.5 ha but does not constitute permanent occupation over its entire area. Permanent occupation will occur only beneath tower foundations. Maintenance of woody plants in the protection zone may also be a long-term impact. Conductors and ground wires will not interrupt terrestrial ÚSES continuity; the collision risk to birds is assessed in the chapter on fauna.

Table D.68: Assessment of the significance of impacts on the ÚSES

Type of ÚSES element	Element name	Relationship to the Project	Nature of potential long-term impact	Impact assessment
functional local biocenter	LBC1a Dvorčice	south of the SMR ETE site, without direct conflict	possible long-term impact on hydrological recharge of the pond and wetland habitats	-1
partially functional local biocorridor	LBK2a Malešický Stream	south of the SMR ETE site; crossed by the power-evacuation line	possible impact on the hydrological regime; if a tower is located there, local occupation and change in woody stands within the protection zone	-1
partially functional local biocorridor	LBK3 Karlovec	includes Karlovec Pond and its riparian stands; no direct conflict with permanent areas	unlikely indirect impact on the water regime and function of littoral and wetland stands	-1
functional interaction element	IP13b Za humny	direct conflict with the power-evacuation line; already beneath an existing line	possible change in the structure of woody and shrub stands within the protection zone	0 to -1
functional interaction element	IP15b Na sádce	direct conflict with the power-evacuation line; already beneath an existing line	possible change in the structure of woody and shrub stands within the protection zone	0 to -1
functional interaction element	IP16b Náhon	direct conflict with the power-evacuation line	possible impact on linear woody vegetation; no impact on the millrace water regime is anticipated	0 to -1
functional interaction element	IP17b Velké louky	near the corridor without direct conflict	no anticipated permanent impact	0
functional interaction element	IP46 Mezi cestami	the northeastern part of the element extends into the SMR ETE site	permanent removal of part of the linear stand and local weakening of the element's function	-1
functional local biocenter	LBC 0205 Na studánkách	direct conflict with the power-evacuation corridor	possible local occupation where tower foundations are located; no loss of biocenter function is anticipated	-1
nonfunctional local biocorridor	LBK 0332 Malešovický Stream - Studánky	eastern part crossed by the power-evacuation corridor	no impact if towers are located outside the channel and floodplain; possible local impact if inappropriately located	0 to -1

Permanent impacts are associated primarily with possible changes in hydrological conditions around Dvorčice and Karlovec ponds, local occupation beneath tower foundations, and maintenance of woody plants in the line's protection zone. The crossing of an element by the power-evacuation corridor does not in itself constitute occupation of the entire overlapping area.

Provided that hydrological recharge of Dvorčice Pond is maintained, towers are located outside watercourses, banks, wetland habitats, and the most valuable parts of the elements, and low vegetation is retained in the power-evacuation protection zone, no interruption of continuity or fundamental restriction of ÚSES functionality is anticipated. The overall permanent impact of the Project on the local ÚSES is assessed as slightly adverse.

D.I.7.5. Impacts on flora, fauna, and natural habitats

D.I.7.5.1. Impacts on natural habitats

A vegetation survey was performed in the area of interest, and the vegetation units identified were classified according to the Habitat Catalog (Chytrý et al. 2010). The SMR ETE site itself and locations that may be affected over the long term by changes in the water regime, namely Dvorčice and Karlovec ponds and their immediately adjoining wetland and littoral habitats, are particularly relevant to assessing permanent Project impacts.

The area affected by the Project is predominantly anthropogenic to semi-natural in character. Habitats strongly affected by humans predominate at the SMR ETE site itself, particularly agricultural areas, ruderal vegetation, locally waterlogged depressions, and woody stands of reclamation origin. Representative natural and near-natural habitats are concentrated primarily around Dvorčice and Karlovec ponds, their littoral stands, wetland willow scrub, and adjoining wet-meadow habitats.

Table D.69: Overview of natural and near-natural habitats relevant to assessing permanent Project impacts

Location	Relevant habitats / habitat characteristics	Nature of potential permanent impact
SMR ETE site	Predominantly anthropogenic and semi-natural habitats; no representative natural habitats according to the Habitat Catalog were identified at the site. Woody stands of reclamation origin and waterlogged depressions occur locally.	Permanent occupation of the site, changes to the surface and runoff conditions; local loss of habitats strongly affected by humans and of a woody stand.
Dvorčice Pond and the adjoining wetland meadow	V1F - Macrophyte vegetation of naturally mesotrophic and eutrophic waters; M1.1 - Reeds of eutrophic standing waters; T1.5 - Wet Cirsium meadows; T1.9 - Intermittently wet Molinia meadows; K1 - Wetland willow scrub.	Possible long-term indirect impact through a change in the water regime, particularly a change in hydrological recharge of the pond, littoral stands, and adjoining wetland and wet-meadow habitats.
Karlovec Pond and adjoining littoral and riparian stands	V1F - Macrophyte vegetation of naturally mesotrophic and eutrophic waters; M1.1 - Reeds of eutrophic standing waters; K1 - Wetland willow scrub.	According to the supporting documents, no direct impact from lowering the groundwater level is anticipated; however, an indirect long-term impact on the stability of the water regime and extent of littoral stands cannot be ruled out, although its probability is low.
Power evacuation corridor	Predominantly fields and managed meadows; T1.9 - Intermittently wet Molinia meadows in the southwestern part; locally K3 - Tall mesic and xeric scrub	Possible local permanent occupation beneath tower foundations and long-term change in shrub and woody stands within the protection zone; not all of the corridor's area is permanently occupied

At the SMR ETE site itself, the permanent impact on natural habitats can be assessed as local and of little significance because no representative natural habitats according to the Habitat Catalog were identified there. Permanent occupation will affect primarily anthropogenically influenced areas and, locally, a woody stand of reclamation origin. This intervention may result in the loss of partial habitats of common or locally significant species, but no significant impact on species at the population level is anticipated.

Dvorčice and Karlovec ponds and the adjoining wetland and wet-meadow habitats must be considered the more sensitive part of the assessment. These locations contain the most valuable natural and near-natural habitats in the area assessed and support a significant proportion of the plant and animal species of conservation value identified. The permanent Project impact there may consist primarily of an indirect impact on the water regime and therefore on the extent and quality of littoral stands, wetland willow scrub, and wet-meadow habitats.

Maintenance of adequate hydrological recharge is essential to preserve the natural habitats at Dvorčice Pond. The Project must therefore be designed so that it does not cause a long-term reduction in the water balance of the pond and adjoining wetland habitats. According to the available supporting documents, no direct impact from a lowered groundwater level is anticipated at Karlovec Pond; however, an indirect impact on the stability of its water regime cannot be ruled out, although its probability is low. Any reduction in stability of the water regime could be manifested particularly as longer periods of low water levels and a change in the extent of littoral stands.

The wet meadow in the southwestern part of the power-evacuation corridor is its most valuable part. Tower foundations must be located outside this habitat and other near-natural habitats. The conductors themselves passing above the meadow habitat do not directly occupy it. Low vegetation should be retained within the protection zone, and removal of shrub stands should be limited to the extent necessary.

Overall, the permanent Project impact on natural and near-natural habitats can be assessed as locally slightly adverse (-1). Greater sensitivity applies primarily to Dvorčice and Karlovec ponds and the adjoining wetland and wet-meadow habitats. Provided that an adequate water regime is maintained at these locations, no significant adverse impact on natural habitats or significant impact on the species identified at the population level is anticipated.

D.I.7.5.2. Impacts on flora

A vegetation survey was performed in the area of interest, and the vegetation units identified were classified according to the Habitat Catalog (Chytrý et al. 2010). The SMR ETE site, power-evacuation corridor, Dvorčice and Karlovec ponds, and their immediately adjoining wetland, littoral, and wet-meadow habitats are relevant to assessing permanent impacts.

Agricultural land, ruderal vegetation, and woody stands of reclamation origin predominate at the SMR ETE site. Representative natural habitats are concentrated primarily around Dvorčice and Karlovec ponds and in the wet meadow in the southwestern part of the power-evacuation corridor.

In terms of permanent impacts, the most important species are those associated with Dvorčice and Karlovec ponds, adjoining wet meadows, littoral stands, and wetland habitats, and species identified in the wet meadow in the southwestern part of the power-evacuation corridor. Locations associated with the ponds may be affected indirectly, particularly as a result of long-term changes in the water regime; direct occupation is not anticipated. Local permanent occupation beneath tower foundations may occur in the power-evacuation corridor. In addition to specially protected species, other plant species of conservation significance were identified. A complete list, their locations, and individual assessments are presented in the assessment under Section 67 of the Nature and Landscape Conservation Act provided in Annex 3.1 to this Documentation. The conclusions of that assessment are reflected in the final impacts assessment and the proposed measures.

Table D.70: Overview of plant species relevant to assessing permanent Project impacts

English name	Scientific name	ZOPK	ČS	EU	Location of occurrence relevant to permanent impacts	Nature of potential permanent impact	Impact assessment
Siberian iris	*Iris sibirica*	SO	VU		meadow near Dvorčice, approximately 15 clumps; wet meadow in the southwestern part of the corridor, more than 110 clumps	change in the water regime near Dvorčice; possible local occupation beneath a tower in the corridor	-1
broad-leaved marsh orchid	*Dactylorhiza majalis*	O	NT		meadow near Dvorčice Pond, approximately 22 flowering individuals	possible indirect impact through a change in the water regime of the wetland meadow	-1

Note: ČS ... Red List

In terms of specially protected and threatened plant species, the key locations are the wetland meadow near Dvorčice Pond and the wet meadow in the southwestern part of the power-evacuation corridor. Two specially protected plant species were identified in the meadow near Dvorčice Pond: Siberian iris and broad-leaved marsh orchid. Direct occupation of this meadow is not anticipated; a possible impact is an indirect impact on its water regime in connection with a change in hydrological recharge of Dvorčice Pond and the adjoining area.

The wet meadow in the southwestern part of the power-evacuation corridor is the second important botanical location. More than 110 clumps of the specially protected Siberian iris were identified there. The meadow is also natural habitat T1.9 - Intermittently wet Molinia meadows. Possible direct occupation beneath tower foundations is a permanent impact. Tower foundations and other permanent technical elements must therefore be located outside sites where species of conservation significance occur. Maintenance of the protection zone must preserve the meadow character and water regime of the location.

Overall, the permanent impact on flora is assessed as locally slightly adverse. This assessment is conditional on maintaining the hydrological conditions of the wetland meadow near Dvorčice Pond, locating tower foundations outside occurrences of species of conservation significance in the southwestern part of the power-evacuation corridor, and maintaining the stability of the Karlovec Pond water regime. If these conditions are met, no significant impact on local populations of specially protected plant species is anticipated.

D.I.7.5.3. Impacts on fauna

Vertebrate, ornithological, entomological, malacological, and hydrobiological surveys were performed in the area of interest. The SMR ETE site, SMR ETE power-evacuation corridor, Dvorčice and Karlovec ponds, and their immediately adjoining wetland, littoral, and riparian habitats are relevant to assessing impacts of Project operation.

At the SMR ETE site, the permanent impact consists primarily of occupation of predominantly anthropogenically influenced habitats and local loss of a woody stand. For power evacuation, permanent occupation will occur only beneath tower foundations. Long-term impacts will include maintenance of woody plants in the protection zone and the presence of conductors and ground wires in the airspace.

Table D.71: Overview of specially protected animal species relevant to assessing permanent Project impacts

Location	English name	Scientific name	ZOPK	ČS	EU	Nature of potential permanent impact
SMR ETE site	sand lizard	*Lacerta agilis*	SO	VU	HD IV	permanent occupation of predominantly anthropogenic habitats, local loss of feeding and shelter habitats and part of a woody stand
	common toad	*Bufo bufo*	O	VU		
	partridge	*Perdix perdix*	O	NT		
	sparrowhawk	*Accipiter nisus*	SO	VU		
	gray long-eared bat	*Plecotus austriacus*	SO	VU	HD IV	
	Nathusius's pipistrelle	*Pipistrellus nathusii*	SO	LC	HD IV	
	common noctule	*Nyctalus noctula*	SO	LC	HD IV	
SMR ETE site	brown long-eared bat	*Plecotus auritus*	SO	LC	HD IV	
	Daubenton's bat	*Myotis daubentonii*	SO	LC	HD IV	
	red squirrel	*Sciurus vulgaris*	O			
	bumblebees	*Bombus* sp.	O	depending on species		
	ants	*Formica* sp.	O	depending on species		
	Scheidler's ground beetle	*Carabus scheidleri*	O			
	white-spotted rose beetle	*Oxythyrea funesta*	O			
Dvorčice Pond and the adjoining wetland meadow	smooth newt	*Lissotriton vulgaris*	SO	VU		possible indirect impact on the water regime, littoral stands, wetland meadow, and breeding, feeding, and shelter habitats; permanent collision risk to birds flying between ponds and feeding areas
	great crested newt	*Triturus cristatus*	SO	EN	HD II, IV	
	common spadefoot	*Pelobates fuscus*	SO	NT	HD IV	
	European fire-bellied toad	*Bombina bombina*	SO	EN	HD II, IV	
	agile frog	*Rana dalmatina*	SO	NT	HD IV	
	pool frog	*Pelophylax lessonae*	SO	VU	HD IV	
	edible frog	*Pelophylax esculentus*	SO	NT	HD V	
	common toad	*Bufo bufo*	O	VU		

	European green toad	*Bufotes viridis*	SO	EN	HD IV	
	European tree frog	*Hyla arborea*	SO	NT	HD IV	
	sand lizard	*Lacerta agilis*	SO	VU	HD IV	
	slow worm	*Anguis fragilis*	SO	NT		
	grass snake	*Natrix natrix*	O	NT		
	common snipe	*Gallinago gallinago*	SO	EN		
	water rail	*Rallus aquaticus*	SO	VU		
	kingfisher	*Alcedo atthis*	SO	VU	BD I	
	marsh harrier	*Circus aeruginosus*	O	VU	BD I	
	little grebe	*Tachybaptus ruficollis*	O	VU		
	great reed warbler	*Acrocephalus arundinaceus*	SO	VU		
	nightingale	*Luscinia megarhynchos*	O			
	great white heron	*Ardea alba*	SO		BD I	
	common pipistrelle	*Pipistrellus pipistrellus*	SO		HD IV	
	Nathusius's pipistrelle	*Pipistrellus nathusii*	SO		HD IV	
	common noctule	*Nyctalus noctula*	SO		HD IV	
	Daubenton's bat	*Myotis daubentonii*	SO		HD IV	
	red squirrel	*Sciurus vulgaris*	O			
	Eurasian otter	*Lutra lutra*	SO	NT	HD II, IV	
	large copper	*Lycaena dispar*	SO		HD II, IV	
	large white-faced darter	*Leucorrhinia pectoralis*	SO	NT	HD II, IV	
	narrow-mouthed whorl snail	*Vertigo angustior*		VU	HD II	
Karlovec Pond	European fire-bellied toad	*Bombina bombina*	SO	EN	HD II, IV	unlikely indirect impact on the stability of the water regime, extent of littoral stands, and suitability of breeding and feeding habitats
	agile frog	*Rana dalmatina*	SO	NT	HD IV	
	pool frog	*Pelophylax lessonae*	SO	VU	HD IV	
	edible frog	*Pelophylax esculentus*	SO	NT	HD V	
	common toad	*Bufo bufo*	O	VU		
	sand lizard	*Lacerta agilis*	SO	VU	HD IV	
	slow worm	*Anguis fragilis*	SO	NT		
	grass snake	*Natrix natrix*	O	NT		
	water rail	*Rallus aquaticus*	SO	VU		
	kingfisher	*Alcedo atthis*	SO	VU	BD I	
	nightingale	*Luscinia megarhynchos*	O			
	great reed warbler	*Acrocephalus arundinaceus*	SO	VU		
	Eurasian otter	*Lutra lutra*	SO	NT	HD II, IV	
	large white-faced darter	*Leucorrhinia pectoralis*	SO	NT	HD II, IV	
Power evacuation corridor	common toad	*Bufo bufo*	O	VU		local occupation beneath towers, long-term change in woody and shrub stands, and permanent collision risk to birds flying between ponds and feeding areas
	sand lizard	*Lacerta agilis*	SO	VU	HD IV	
	slow worm	*Anguis fragilis*	SO	NT		
	European stonechat	*Saxicola rubicola*	O	VU		
	partridge	*Perdix perdix*	O	NT		
	raven	*Corvus corax*	O			
	marsh harrier	*Circus aeruginosus*	O	VU	BD I	
	red-backed shrike	*Lanius collurio*	O	NT	BD I	
	honey buzzard	*Pernis apivorus*	SO	EN	BD I	
	bumblebees	*Bombus* sp.	O	depending on species		
	ants	*Formica* sp.	O	depending on species		
	Scheidler's ground beetle	*Carabus scheidleri*	O			
	white-spotted rose beetle	*Oxythyrea funesta*	O			
	Old World swallowtail	*Papilio machaon*	O			
	dusky large blue	*Phengaris nausithous*	SO	NT	HD II, IV	

Note: ČS ... Red List; HD ... Habitats Directive; BD ... Birds Directive

No specially protected fish species were identified. A potential permanent impact on the fish communities of Dvorčice and Karlovec ponds may consist of an indirect impact on the water regime or water quality.

For amphibians, maintenance of the water regime of the ponds and adjoining terrestrial habitats is decisive. Dvorčice is the most important amphibian breeding site in the affected territory, while Karlovec is also an important breeding habitat. No extensive permanent occupation of their habitats is anticipated in the power-evacuation corridor outside tower footprints. An impact on reptiles may arise through local habitat loss or changes in woody and shrub stands.

Two groups of impacts are relevant to birds. Aquatic and reed-bed species may be indirectly affected by a change in the ponds' water regime. The power-evacuation line will also have a permanent impact due to the presence of conductors and ground wires. Species flying between ponds and feeding areas, particularly graylag goose, water rail, black stork, and white stork, are especially collision-sensitive.

For mammals, periodic removal or restriction of woody plants in the protection zone will be a permanent, although intermittent, impact. This impact is particularly relevant to the red squirrel and potentially also to the hazel dormouse. If the shrub layer and low-growing woody plants are retained, some of the habitat function of the stands can be preserved.

In terms of invertebrates, the SMR ETE site itself is predominantly of low value, with occurrences of more common specially protected species. The wetland and littoral habitats at Dvorčice Pond are more important; species associated with well-preserved wetlands, riparian stands, and aquatic vegetation, including the shining ramshorn, narrow-mouthed whorl snail, and yellow-spotted whiteface, were recorded there. Karlovec Pond is a breeding habitat for the yellow-spotted whiteface and habitat for aquatic and reed-bed bird species. The wet meadow in the southwestern part of the corridor is its most valuable part. Among invertebrates, the dusky large blue and wart-biter were identified there in particular. Tower foundations must be located with regard to areas where the dusky large blue and other species of conservation significance occur.

Overall, the permanent Project impact on fauna is assessed as locally slightly adverse (-1). This assessment is conditional on maintaining the hydrological conditions of Dvorčice and Karlovec ponds, locating power-evacuation towers outside valuable habitats, and retaining low woody and shrub stands within the protection zone. If these conditions are met, no significant impact on local populations of specially protected or threatened animal species is anticipated.

D.I.7.6. Other biotic impacts

D.I.7.6.1. Radiological impacts

The radiological impact of normal SMR ETE operation on biota is also assessed.

According to the study of the radiological impacts of normal SMR ETE operation (see Chapter D.I.3.2.5. Results of the assessment of SMR ETE impacts of ionizing radiation on biota, page 360 of this Documentation), the SMR ETE contribution to doses is low compared with ETE1,2 and New NPP ETE, and the values remain well below the IAEA reference levels even when cumulative impacts are considered. The impact on the biological component of the environment during normal operation is therefore assessed as very small to negligible.

The radiological impacts of accident conditions (see Chapter D.II.1.2.4. Assessment of the radiological consequences of radiation extraordinary events for biota, page 455 of this Documentation) are assessed using reference animals and plants in distance bands from SMR ETE and in selected ecologically valuable areas, particularly the Zelendárky Nature Monument, Řežabinec National Nature Monument, Třeboňsko Protected Landscape Area including the Velký a Malý Tisý National Nature Reserve, Horusický Pond, and Luční National Nature Monument. In the bounding design basis accident (DBA), all calculated radiation-parameter values, including the 95th percentiles, are at least one order of magnitude below the IAEA-derived reference values. The impact of this event on flora and fauna populations can therefore be considered negligible and the level of protection of biota adequate. In the postulated severe accident (DEC-B), the calculated values for most reference organisms are below the lower bound of the derived reference values. For the reference organisms deer, rat, pine, and duck, the maximum values are at the level of the reference values; for duck, the 95th percentile in the 6–10 km band from SMR ETE and in the Zelendárky Nature Monument is briefly above the upper bound of the reference value. A more detailed analysis shows, however, that the exceedance for the duck reference organism applies only to the first day after the event; from the second day onward, the upper bound is not exceeded even for the 95th percentile. For the Luční National Nature Monument, all calculated values are below the lower bound of the reference values, and the impact on the biota of this site, including fungi, can be considered negligible.

Overall, it can be concluded that no significant radiological impact on biota is anticipated during any design basis accident (DBA). In the event of a severe accident (DEC-B), values at the level of the IAEA-derived reference values may be reached briefly for some reference organisms, or even above their upper bound briefly for duck; however, no significant long-term impact on flora and fauna populations is anticipated.

D.I.7.6.2. Discharge of wastewater into the Vltava River

According to the Documentation, treated sanitary wastewater should be discharged together with process wastewater through the existing ETE1,2 wastewater pipelines into the Vltava River receiving water at the Kořensko profile. The stormwater conveyed away should be connected to the existing system that conveys stormwater from ETE1,2 into the Strouha receiving water and then into the Vltava River. Because of the limited capacity of the pipeline conveying stormwater into the Strouha, construction of a retention basin is being considered in the southeastern part of the SMR ETE site. Its overflow would be routed downstream of Dvorčice Pond, and the stored volume could also be used to augment Dvorčice Pond.

The New NPP ETE EIA documentation (2010) concluded that discharge of heated wastewater into the Vltava River would not cause changes in water temperature beyond natural conditions and their year-to-year variation. The same assessment is performed for SMR ETE, including the interacting impact of other facilities at the Temelín site, and concludes that the proposed expansion of the Temelín site will not have serious adverse impacts on the temperature or quality of water in the Vltava River or on eutrophication of Orlík Reservoir (Juranová E. & Marešová D.

2025; see the summary of water-management studies in Annex 4.1 to this Documentation). According to this study, the modeled values for the temperature parameter at the Kořensko Reservoir profile under the SMR ETE + ETE1,2 + New NPP ETE capacity alternative will not exceed the maximum statutory limits under either the "Medium Discharge" or "Maximum Discharge" scenario. The SMR ETE contribution to warming of water in the Vltava River is very small.

D.I.7.7. Overall assessment of the impacts of the intervention on biodiversity

Biological diversity is defined under Article 2 of the Convention on Biological Diversity as the variability among all living organisms, including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems. In accordance with the Ministry of the Environment Guideline dated October 20, 2017, the following in particular must be assessed:

- the impact on maintaining species diversity, with emphasis on species of Community interest,
- the impact on maintaining habitat diversity, with emphasis on habitats of Community interest,
- the impact on maintaining the reproductive capacity of ecosystems,
- the impact on maintaining internal functional links within ecosystems,
- the impact on the diversity of qualifying features of specially protected areas,
- the impact on the spread of non-native invasive species,
- establish measures to support species essential to preserving biodiversity,
- establish measures to prevent the introduction and naturalization of new non-native invasive species,
- establish an environmental limit for the Project for preserving biodiversity.

Table D.72: Assessment of the Project's impact on biological-diversity status criteria

Parameter assessed	Impact	Justification
Species diversity	0	The Project will not affect species diversity in any way.
Habitat diversity	-1	The Project will affect habitat diversity in the surrounding area to an insignificant extent.
Reproductive capacity of ecosystems	-1	Aquatic ecosystems may be slightly affected, particularly in connection with the temperature of discharged wastewater
Functional relationships within ecosystems	-1	Functional relationships within ecosystems may be disrupted, for example by power evacuation and the extensive construction-site facility areas.
Diversity of qualifying features of specially protected areas	0	The Project will not affect the diversity of qualifying features of specially protected areas, but it will affect individual specimens of species that constitute qualifying features.
Impact on the spread of invasive species	0	The Project is not expected to have a significant impact on the spread of invasive species, but the risk of spread during construction must be addressed.
Environmental limit for the Project	0	The environmental limit relating to biological diversity will be met.

Table D.73: Summary of the Project's impact on individual biological-diversity characteristics

Characteristic	Impact
national park	0
protected landscape area	0
small-scale specially protected areas	0
Natura 2000 sites (Sites of Community Importance)	0
Natura 2000 sites (Special Protection Areas)	-1
supraregional territorial system of ecological stability	0
regional territorial system of ecological stability	0
local territorial system of ecological stability	-1
habitat of specially protected large mammal species	-1
registered significant landscape feature	0
statutory significant landscape feature	-1/-2
nature parks	0
memorial tree	0
specially protected plant species	-1
specially protected animal species	-1

D.I.7.8. Impacts during construction or termination of operation

This chapter assesses temporary impacts arising during construction of the Project site itself (SMR ETE) and power evacuation (EL), and impacts associated with use of construction site facility areas (B1–J), the connecting corridor between areas H and I (KOM), widening of Road II/138 and construction of passing bays on the ETE service road (KOM), and the construction-site electrical-supply corridor (SE). Permanent and long-term Project impacts at the SMR ETE site and the related power-evacuation corridor (EL) are assessed above in Chapters D.I.7.1 through D.I.7.6; for these Project components, this chapter assesses only their construction impacts.

Areas C, G, H, I, and J are considered primary construction site facility areas; areas B1, B2, B3, D, E1, E2, F1, and F2 are reserve areas. The impacts of reserve areas are therefore assessed conditionally in case they are actually used.

As regards the impacts of termination of operation of SMR ETE, this will occur in the distant future, and its specific procedure and related impacts therefore cannot currently be assessed reliably. The areas are anticipated to be restored to their original condition, or the measures established in the decommissioning assessment under the EIA process, to which decommissioning is subject by law, and subsequent decisions under the legislation applicable at the time of termination of operation are anticipated to be implemented. The impacts of termination of operation (decommissioning) are therefore not discussed in greater detail in this Documentation.

D.I.7.8.1. Impact of construction on specially protected areas and the Natura 2000 network

None of the construction areas, including the main construction site, construction site facilities, related roads, or the construction-site power-supply corridor, affects a specially protected area, Site of Community Importance, or Special Protection Area. Given the distance from specially protected areas and Natura 2000 sites, no direct impact through occupation, noise, dust, lighting, or construction traffic is anticipated.

The Natura screening identifies the Eurasian lynx *(Lynx lynx)* in EVL CZ0314124 Blanský les, EVL CZ0314123 Boletice, EVL CZ0314024 Šumava, and EVL CZ0724089 Beskydy and the gray wolf *(Canis lupus)* in EVL CZ0724089 Beskydy as qualifying features that may potentially be affected. Possible impacts of construction activities on these qualifying features are assessed as slightly adverse. Preventive and mitigation measures are proposed, focusing particularly on minimizing interference with large-mammal habitats and restoring temporarily affected areas.

The Natura screening did not identify a significant adverse effect on qualifying features or the integrity of Natura 2000 sites, even when cumulative, synergistic, and interacting effects are considered. The possibility of a significant effect on Sites of Community Importance and Special Protection Areas within the jurisdiction of the Regional Authority of the South Bohemian Region is also ruled out by its opinion under Section 45i(1) of the Nature and Landscape Conservation Act, ref. No.: KUJCK 102296/2026 dated August 14, 2026 (see Annex 6.1 to this Documentation).

D.I.7.8.2. Impact of construction on nature parks, significant landscape features, and memorial trees

D.I.7.8.2.1 Impact on nature parks

The area affected by construction does not extend into any nature park. The impact of Project construction on nature parks is assessed as nil.

D.I.7.8.2.2. Significant landscape features

Under Section 3(1)(b) of the Nature and Landscape Conservation Act, watercourses, floodplains, ponds, and forests are significant landscape features (VKP) in the affected territory. The Project components assessed do not conflict with a statutory VKP consisting of a lake or peat bog or with a registered VKP.

During construction, VKP may be affected by changed runoff conditions, restricted infiltration, earthwork, movement of machinery, soil erosion, turbidity, or accidental pollution. Despite the temporary nature of the area affected, removal of riparian and forest stands may have long-term consequences.

Table D.74: Assessment of the significance of construction impacts on watercourses, floodplains, and ponds as VKP

Name of watercourse or floodplain	Location relative to Project areas	Nature of potential impact	Assessment of impact
unnamed stream, tributary of Hůrecký fishpond	northern part of area G	possible change in runoff conditions and local impact on accompanying stands	-1
Dvorčický Stream, its tributaries, and floodplain	SMR ETE site, SMR ETE power evacuation corridor	short-term risk of turbidity, soil erosion, and accidental pollution during construction and removal of the bridge; possible temporary impact on runoff conditions	-1
Temelínecký Stream	southern boundary of area E2	possible change in runoff conditions and local interference with adjoining stands if area E2 is used	-1
Dubenecký Stream (left-bank tributary of Temelínecký Stream)	areas E1 and J	possible change in runoff conditions due to temporary use of areas and inappropriate stormwater conveyance	-1
Palečkův Stream and its floodplain	northern boundary of area F2	possible change in runoff conditions and local interference with riparian or adjoining stands if area F2 is used	-1
Dvorčice Pond	between area H, the SMR ETE site, and area I	possible temporary impact on hydrological recharge or water quality from runoff from construction areas, changes in temporary drainage, soil erosion, or accidental pollution	-1
Karlovec Pond	south of area G, west of area H	possible temporary impact on hydrological recharge or water quality if areas G and H are drained inappropriately	-1
ponds in the château park	southwest of the construction-site power-supply corridor	no anticipated impact on the water regime or of any other kind	0

The temporary bridge over Dvorčický Stream between areas H and I is designed with a span allowing its supports to be located outside the channel and accompanying vegetation. With this design, only a short-term, local impact is anticipated, consisting primarily of the risk of turbidity and soil erosion during construction and subsequent removal of the bridge. Repeated crossing of the watercourse by construction machinery without a bridge is prohibited.

For Dvorčice and Karlovec ponds, this chapter assesses only the impacts of construction site facility areas and the connecting corridor. It does not include changes in groundwater or the hydrological balance caused by construction and operation of the SMR ETE site itself, which are included in the assessment of the SMR site.

If the proposed measures are observed, the construction impact on watercourses, floodplains, and ponds as VKP is assessed as slightly adverse. Stormwater from each area must be conveyed or infiltrated within the applicable hydrological catchment. After use of the areas ends, the terrain, soil infiltration capacity, and runoff into the original receiving waters must be restored.

Forest stands and land designated for the fulfillment of forest functions (PUPFL) are assessed for purposes of evaluating construction impacts on forests as VKP. Although they are not forests as VKP, some woody stands outside PUPFL perform similar habitat and ecological-stabilization functions. Because of the substantive connection, construction impacts on these stands are assessed together with impacts on forests as VKP, while maintaining their different legal regimes.

The estimated gross extent of felling and vegetation removal during construction will not exceed approximately 29.6 ha. The extent is conservatively determined as the maximum possible impact on woody vegetation in all delineated Project areas and includes both forest stands on PUPFL and woody stands outside PUPFL. The actual extent of felling will be refined at subsequent design stages and limited to the minimum necessary. The impacts of reserve areas are assessed conditionally in case they are actually used.

Table D.75: Assessment of the significance of construction impacts on forests as VKP and woody stands outside PUPFL

Stand and regime	Relationship to permanent Project components	Extent affected	Nature of permanent impact	Assessment of impact
Křtěnov, north of the ETE1,2 site, along Palečkův Stream - forest as a VKP, PUPFL forest land	entire area F2 / forest land	approximately 11.7 ha	removal of a young managed pine forest	-2
Křtěnov, northwest of the ETE1,2 site - woody stand outside PUPFL, not a forest VKP	southern part of area B2 / arable land	approximately 0.6 ha	interference with the edge of a larger volunteer stand	-2
Křtěnov, northwest of the ETE1,2 site, around the rail siding - woody stand outside PUPFL, not a forest VKP	eastern part of area B3 / permanent grassland	approximately 2 ha	interference with a mixed volunteer stand and a waterlogged area with willows	-2
Březí u Týna nad Vltavou, at the Road II/105 intersection west of Vysoký Hrádek Château - forest as a VKP, PUPFL forest land	northeastern part of the construction-site power-supply corridor	approximately 0.2 ha	temporary interference with a smaller forest unit, potentially including local stand removal	-1

Use of reserve area F2 as a construction site facility area is not recommended because it is entirely covered by forest. If it were used, a significantly adverse, long-term impact would occur despite the temporary nature of the occupation.

According to the Cadastre of Real Estate, areas B2 and B3 are not forest land, and their stands are not forests as VKP. Given their closed-canopy character and habitat and ecological-stabilization functions, however, any removal is assessed as significantly adverse. In area B2, construction site facilities must be located primarily on arable land, and the southern woody edge must be retained. Use of the eastern waterlogged part of area B3 with mixed volunteer stands and willow scrub is not recommended.

A technical and spatial design that limits felling in the forest unit to the minimum necessary must be selected for the construction-site power-supply corridor. Neither widening of Road II/138 nor the passing bays on the service road are in direct conflict with forests as VKP.

After construction activities end, temporarily affected areas will be reclaimed and their vegetation restored in accordance with the imposed measures. However, impacts may be long-term because forest and non-forest woody stands take a long time to recover.

When primary construction site facility areas and the construction-site power-supply corridor are used, the overall construction impact on forests as VKP and woody stands outside PUPFL is assessed as slightly adverse. If reserve area F2 or the vegetated parts of reserve areas B2 and B3 were used and cleared, the impact would be significantly adverse.

D.I.7.8.2.3. Impact on memorial trees

No memorial trees are present in the area affected by construction or its immediate vicinity. Given the location and nature of the Project, no construction impact on memorial trees is anticipated; the impact is assessed as nil.

D.I.7.8.3. Impact of construction on the territorial system of ecological stability

Regional and supraregional ÚSES elements are not in spatial conflict with the Project components assessed. Local ÚSES elements and interaction elements delineated in the Temelín Spatial Plan may be affected during construction.

Adverse impacts may consist of temporary occupation, felling of woody plants, movement of machinery, restricted migration permeability, and changes in the water regime. Widening of Road II/138 may also result in local permanent occupation. Longer-lasting consequences may occur if woody stands or original runoff conditions are not restored.

Table D.76: Assessment of the significance of construction impacts on the ÚSES

Type of ÚSES element	Element name	Relationship to the Project	Nature of potential long-term impact	Impact assessment
functional local biocenter	LBC1a Dvorčice	between areas H and I, without direct spatial conflict	possible indirect impact on the water regime and water quality due to runoff from areas H and I	-1
partially functional local biocorridor	LBK2a Malešický Stream	crossed by temporary connecting corridor H-I	local interference during bridge construction and removal, turbidity, and possible restriction of migration if inappropriately designed	-1
partially functional local biocorridor	LBK3 Karlovec	area G affects the nonfunctional part; area H affects both functional and nonfunctional parts	temporary occupation, possible felling of woody plants, disruption of continuity, and change in the water regime	-1
nonfunctional local biocorridor	LBK26 Palečkův Stream	parallel to the northern edge of reserve area F2	if F2 is used, possible stand removal and impacts on the banks and water regime of Palečkův Stream	-1
functional interaction element	IP40 Vysoký Hrádek - park	parallel to the construction-site power-supply corridor, conflict covering approximately 0.4 ha	possible local felling or damage to woody plants depending on the technical design	-1
functional interaction element	IP42 Palečkův Stream	parallel to the northern edge of reserve area F2, conflict covering approximately 0.2 ha	possible impact on stands and the water regime if F2 is used	-1
functional interaction element	IP45 Křtěnov	parallel to the construction-site power-supply corridor, conflict covering approximately 1 ha	possible local felling or disruption of a linear woody element	-1
functional interaction element	IP46 Mezi cestami	areas E1, H, I, and J and widening of Road II/138, conflict covering approximately 4.5 ha	temporary occupation and movement of machinery; possible removal of woody plants and local permanent occupation when the road is widened	-1
functional interaction element	IP47 K Temelínu	edge of reserve area E2 and widening of Road II/138, conflict covering approximately 1.1 ha	no significant impact if linear stands are retained; possible local weakening if felling or road widening occurs	0/-1
functional interaction element	IP48 Temelínecký Stream	associated with reserve area E2, without direct interference with the watercourse	possible impact on hydrological recharge from inappropriate stormwater conveyance	-1
functional interaction element	IP49 V mokřinách	associated with area J, without direct spatial conflict	possible impact on the water regime from conveyance of stormwater from area J	-1

For LBC1a Dvorčice, only the impacts of areas H and I and their connection are assessed. Long-term hydrological changes caused by the SMR ETE site are covered in the chapter on operation.

The bridge over Dvorčický Stream within LBK2a must maintain migration space along the watercourse and have supports located outside the channel and accompanying stands. Construction machinery must not cross the watercourse without a bridge.

The most significant direct impact may arise in the LBK3 Karlovec area, where area H extends into the functional part of the biocorridor. The maximum possible extent of the woody section must be retained. After use of the area ends, removed stands must be restored through appropriate planting.

Use of reserve area F2 is not recommended. If it is used, a buffer must be maintained from Palečkův Stream, its riparian stands, and LBK26 and IP42 elements. The technical design of construction-site power supply must minimize interference with IP40 and IP45.

Linear plantings of IP47 must be retained to the maximum possible extent when area E2 is used and Road II/138 is widened. Stormwater from areas E2 and J must be conveyed within the applicable catchments so that hydrological recharge of IP48 and IP49 is not restricted.

The construction impact on the local ÚSES and interaction elements is assessed as slightly adverse. Most interventions will be local and temporary; long-term consequences may result from felling, permanent road widening, or failure to restore the original water regime. The function of the regional and supraregional ÚSES will not be affected.

D.I.7.8.4. Impact of construction on flora, fauna, and natural habitats

D.I.7.8.4.1. Impact on natural habitats

A vegetation survey was performed in the area of interest, and the vegetation units identified were classified according to the Habitat Catalog (Chytrý et al. 2010). The area affected by Project construction is predominantly anthropogenic to semi-natural in character. Agricultural crops, managed meadows, ruderal vegetation, plantings, and volunteer stands predominate. Representative natural and near-natural habitats are concentrated primarily in parts of areas B3, C, and J, around Dvorčice and Karlovec ponds, and in parts of the construction-site power-supply corridor.

Table D.77: Overview of natural and near-natural habitats that may be affected by construction

Location	Relevant habitats / habitat characteristics	Nature of potential construction impact
SMR ETE site	Predominantly anthropogenic habitats; locally woody stands of reclamation origin and waterlogged depressions	Vegetation removal, soil stripping, earthwork, movement of machinery, and temporary changes in runoff conditions; permanent occupation is assessed separately.
Power evacuation corridor	Predominantly fields and managed meadows; T1.9 - Intermittently wet Molinia meadows in the southwestern part; locally K3 - Tall mesic and xeric scrub	Temporary working areas, movement of machinery, tower construction, and line installation; risk of damage to the wet meadow and shrub stands.
Area C	T1.1 - Mesic Arrhenatherum meadows; T1.5 - Wet Cirsium meadows; L7.1 - Dry acidophilous oak forests	Temporary occupation, vegetation removal, soil stripping, movement and compaction; possible local felling; habitat recovery will depend on reclamation of the area.
Area J	T1.1 - Mesic Arrhenatherum meadows; T1.5 - Wet Cirsium meadows; T1.9 - Intermittently wet Molinia meadows	Direct impact if the lower-lying western part of the area in particular is used; possible disruption of the vegetation cover, soil profile, and water regime.
Reserve area B3	T1.5 - Wet Cirsium meadows; T1.9 - Intermittently wet Molinia meadows; K1 - Wetland willow scrub; L7.1 - Dry acidophilous oak forests	If the eastern part is used, direct impacts on wet and woody habitats, changes in microrelief and the water regime; recovery may be long-term and incomplete for woody stands.
Reserve areas F1 and F2	K3 - Tall mesic and xeric scrub in F1; T4.2 - Mesic herbaceous fringes in F2; most of F2 consists of a managed pine forest	Possible removal of scrub and herbaceous fringes; if F2 is used, also extensive removal of the forest stand with long-term consequences.
area G	K3 - Tall mesic and xeric scrub, particularly along the area's edges and the unnamed stream	Possible local removal of scrub, disruption of accompanying stream vegetation, and changes in runoff conditions.
Construction-site power-supply corridor	T1.6 - Wet Filipendula grasslands; K3 - Tall mesic and xeric scrub; L7.1 - Dry acidophilous oak forests	Local occupation, earthwork, and possible felling depending on the technical design selected; the consequences for woody habitats may be long-term.
Dvorčice Pond and the wetland meadow toward area H	V1F - Macrophyte vegetation of naturally mesotrophic and eutrophic waters; M1.1 - Reeds of eutrophic standing waters; T1.5 - Wet Cirsium meadows; T1.9 - Intermittently wet Molinia meadows; K1 - Wetland willow scrub	Possible indirect impact from runoff from areas H and I, changes in temporary drainage, turbidity, or pollution during construction of the connecting corridor; risk of direct impact on the wetland meadow if area H is delineated inappropriately.
Karlovec Pond and adjoining stands	V1F - Macrophyte vegetation of naturally mesotrophic and eutrophic waters; M1.1 - Reeds of eutrophic standing waters; K1 - Wetland willow scrub	Possible indirect temporary impact on hydrological recharge and water quality due to inappropriate drainage of areas G and H.
Other areas B1, B2, D, E1, E2, and I	Predominantly agricultural and anthropogenically influenced habitats; locally woody fringes and waterlogged edges	Temporary occupation of predominantly anthropogenic habitats; woody edges and the waterlogged eastern edge of area I are particularly sensitive.
Widening of Road II/138 and passing bays on the ETE service road	Edges of existing roads, ditches, fields, and local volunteer woody plants; the assessment identifies no representative natural habitats here	Construction occupation and disruption of road edges, potentially including removal of woody plants; no direct loss of a representative natural habitat according to the Habitat Catalog is anticipated.

In the primary construction site facility areas, the most significant direct conflicts concern areas C and J. Area C was heavily modified in the past and subsequently reclaimed. It may be used provided that grassland and woody plantings are subsequently restored. In area J, construction activities must be concentrated in the eastern part, which consists predominantly of arable land. The lower-lying western part with more species-rich meadows, a watercourse, and woody growth is to remain free of construction intervention.

In area H, neither construction site facilities nor topsoil stockpiles may extend into the wetland meadow near Dvorčice Pond. The waterlogged eastern edge of area I must be retained. In areas G and H, marginal woody stands must be retained to the maximum possible extent, and drainage that would reduce hydrological recharge of Karlovec and Dvorčice ponds must be prevented.

Of the reserve areas, the eastern part of B3 presents the greatest conflict because wet-meadow habitats, wetland willow scrub, and woody stands are concentrated there. The western part consisting of arable land may be used for construction site facilities, while the waterlogged eastern part is to be retained. Use of area F2 is not recommended because it is entirely covered by a managed forest stand and contains mesic herbaceous fringes.

In the construction-site power-supply corridor, the working strip and extent of felling must be limited to the minimum necessary. The route and construction technology should preferentially use the anthropogenically influenced parts of the corridor and avoid wet Filipendula grasslands, better-preserved woody stands, and habitat L7.1.

Construction of the temporary bridge between areas H and I may cause short-term local turbidity in Dvorčický Stream and disruption of its surroundings. Bridge supports must be located outside the channel and accompanying vegetation. Machinery must not cross the watercourse without a bridge.

Temporary construction areas, access routes, and machinery routes during tower construction must be located outside the wet meadow in the southwestern part of the power-evacuation corridor and other near-natural habitats.

After use of temporary areas ends, the original microrelief, soil infiltration capacity, runoff into the applicable hydrological catchment, and vegetation cover must be restored. Restoration must also include monitoring and control of invasive species, particularly around earthwork and the connecting corridor.

Overall, provided that interference with the most valuable parts of the areas is prevented and proper reclamation is performed, the construction impact on natural and near-natural habitats can be assessed as locally slightly adverse (-1). More significant and longer-lasting adverse consequences could arise from interference with the wetland meadow near Dvorčice Pond, the eastern part of B3, the more valuable part of area J, area F2, or better-preserved habitats in the construction-site power-supply corridor. The conclusion of a slightly adverse impact is therefore conditional on their preservation or minimization of interference.

D.I.7.8.4.2. Impact on flora

A total of three specially protected plant species within the meaning of Decree No. 395/1992 Coll. were identified in the area covered by the biological assessment. These plants occur in the wetland meadow near Dvorčice Pond, in the power-evacuation area, and in area F1. In addition to specially protected species, other plant species of conservation significance were identified. A complete list, their locations, and individual assessments are presented in the assessment under Section 67 of the Nature and Landscape Conservation Act, which forms an appendix to the Documentation (see Annex 3.1 to this Documentation). The conclusions of that assessment are reflected in the final impacts assessment and the proposed measures.

Table D.78: Overview of specially protected plant species identified in the area of interest and assessment of construction impacts

English name	Scientific name	ZOPK	ČS	EU	Location of occurrence relevant to permanent impacts	Nature of potential permanent impact	Impact assessment
Siberian iris	*Iris sibirica*	SO	VU		wetland meadow near Dvorčice Pond - approximately 15 clumps; wet meadow in the southwestern part of the power-evacuation corridor - more than 110 clumps	possible direct damage from interference with the meadow and indirect impact on its water regime from areas H and I, machinery movements, temporary working areas, and tower construction	-1
Cornelian cherry	*Cornus mas*	O			reserve area F1, approximately 45 shrubs, probably of planted origin	if F2 is used, direct removal of the recorded individuals in connection with stand felling	-2 if F1 is used
broad-leaved marsh orchid	*Dactylorhiza majalis*	O	NT		wetland meadow near Dvorčice Pond, approximately 22 flowering individuals	possible direct damage from interference with the meadow and indirect impact on its water regime	-1

During construction, vegetation may be removed, soil stripped, machinery operated, soil deposited, or woody plants felled. Indirect impacts may arise particularly from changes in the water regime, soil erosion, turbidity, or pollution of Dvorčice and Karlovec ponds and adjoining wetland habitats. During tower construction in the power-evacuation corridor, Siberian iris stands may be damaged locally by machinery movements or placement of temporary working areas or access routes.

All three specially protected plant species are relevant to the construction stage. Siberian iris occurs in the wetland meadow near Dvorčice Pond and the wet meadow in the southwestern part of the power-evacuation corridor. Broad-leaved marsh orchid was identified only in the wetland meadow near Dvorčice Pond. Cornelian cherry was identified in reserve area F1.

Overall, the construction impact on flora can be assessed as locally slightly adverse provided that the wetland meadow near Dvorčice Pond is preserved, working areas and machinery movements are excluded from occurrences of Siberian iris in the power-evacuation corridor, and area F1 is not used. No impacts on populations at the regional level are anticipated.

D.I.7.8.4.3. Impact on fauna

Construction impacts on fauna may consist particularly of temporary habitat occupation, removal of vegetation and woody plants, earthwork, disturbance by noise, vibrations, and lighting, the risk of animals being killed by construction machinery, increased road mortality, and possible impacts on the water regime or water quality. Although use of construction site facility areas is limited in time, removal of mature woody plants, deadwood, wetland stands, or other habitats that are difficult to restore may have long-term consequences.

Table D.79: Overview of locations and specially protected animal species relevant to assessing construction impacts

Location	English name	Scientific name	ZOPK	ČS	EU	Nature of potential permanent impact	Impact assessment
SMR ETE site	sand lizard	*Lacerta agilis*	SO	VU	HD IV	vegetation removal, soil stripping, earthwork, disturbance, and risk of killing individuals or destroying developmental stages	-1
	common toad	*Bufo bufo*	O	VU			
	partridge	*Perdix perdix*	O	NT			
	sparrowhawk	*Accipiter nisus*	SO	VU			
	gray long-eared bat	*Plecotus austriacus*	SO	VU	HD IV		
	Nathusius's pipistrelle	*Pipistrellus nathusii*	SO	LC	HD IV		
	common noctule	*Nyctalus noctula*	SO	LC	HD IV		
	brown long-eared bat	*Plecotus auritus*	SO	LC	HD IV		
	Daubenton's bat	*Myotis daubentonii*	SO	LC	HD IV		
	red squirrel	*Sciurus vulgaris*	O				
	bumblebees	*Bombus* sp.	O	depending on species			
	ants	*Formica* sp.	O	depending on species			
	Scheidler's ground beetle	*Carabus scheidleri*	O				
	white-spotted rose beetle	*Oxythyrea funesta*	O				
Power evacuation corridor	common toad	*Bufo bufo*	O	VU		local occupation beneath towers, long-term change in woody and shrub stands, and permanent collision risk to birds flying between ponds and feeding areas	-1
	sand lizard	*Lacerta agilis*	SO	VU	HD IV		
	slow worm	*Anguis fragilis*	SO	NT			
	European stonechat	*Saxicola rubicola*	O	VU			
	partridge	*Perdix perdix*	O	NT			
	raven	*Corvus corax*	O				
	Montagu's harrier	*Circus pygargus*	SO	EN	BD I		
	red-backed shrike	*Lanius collurio*	O	NT	BD I		
	honey buzzard	*Pernis apivorus*	SO	EN	BD I		
	bumblebees of the genus Bombus	*Bombus* sp.	O	depending on species			
	ants of the genus Formica	*Formica* sp.	O	depending on species			
	Scheidler's ground beetle	*Carabus scheidleri*	O				
	white-spotted rose beetle	*Oxythyrea funesta*	O				
	Old World swallowtail	*Papilio machaon*	O				
	dusky large blue	*Phengaris nausithous*	SO	NT	HD II, IV		
Dvorčice Pond, adjoining wetland meadow, and H-I connection	smooth newt	*Lissotriton vulgaris*	SO	VU		disturbance, killing of individuals during earthwork and transportation, disruption of migration routes, possible impacts on the littoral zone, wetland meadow, water regime, and water quality; risk during construction and operation of the temporary bridge connection	-1
	great crested newt	*Triturus cristatus*	SO	EN	HD II, IV		
	common spadefoot	*Pelobates fuscus*	SO	NT	HD IV		
	European fire-bellied toad	*Bombina bombina*	SO	EN	HD II, IV		
	agile frog	*Rana dalmatina*	SO	NT	HD IV		
	pool frog	*Pelophylax lessonae*	SO	VU	HD IV		
	edible frog	*Pelophylax esculentus*	SO	NT	HD V		
	common toad	*Bufo bufo*	O	VU			
	European green toad	*Bufotes viridis*	SO	EN	HD IV		
	European tree frog	*Hyla arborea*	SO	NT	HD IV		
	sand lizard	*Lacerta agilis*	SO	VU	HD IV		
	slow worm	*Anguis fragilis*	SO	NT			
	grass snake	*Natrix natrix*	O	NT			
	common snipe	*Gallinago gallinago*	SO	EN			
	water rail	*Rallus aquaticus*	SO	VU			
	wryneck	*Jynx torquilla*	SO	VU			
	kingfisher	*Alcedo atthis*	SO	VU	BD I		
	marsh harrier	*Circus aeruginosus*	O	VU	BD I		
	little grebe	*Tachybaptus ruficollis*	O	VU			
	great reed warbler	*Acrocephalus arundinaceus*	SO	VU			
	nightingale	*Luscinia megarhynchos*	O				
	great white heron	*Ardea alba*	SO		BD I		
	common pipistrelle	*Pipistrellus pipistrellus*	SO		HD IV		
	Nathusius's pipistrelle	*Pipistrellus nathusii*	SO		HD IV		
	common noctule	*Nyctalus noctula*	SO		HD IV		
	Daubenton's bat	*Myotis daubentonii*	SO		HD IV		
	red squirrel	*Sciurus vulgaris*	O	DD			
	Eurasian otter	*Lutra lutra*	SO	NT	HD II, IV		
	large copper	*Lycaena dispar*	SO		HD II, IV		

	large white-faced darter	*Leucorrhinia pectoralis*	SO	NT	HD II, IV		
	narrow-mouthed whorl snail	*Vertigo angustior*		VU	HD II		
Karlovec Pond and its banks	European fire-bellied toad	*Bombina bombina*	SO	EN	HD II, IV	disturbance and possible indirect impacts on breeding and feeding habitats through changed runoff, sedimentation, or accidental pollution; risk from machinery movements outside delineated areas	-1
	agile frog	*Rana dalmatina*	SO	NT	HD IV		
	pool frog	*Pelophylax lessonae*	SO	VU	HD IV		
	edible frog	*Pelophylax esculentus*	SO	NT	HD V		
	common toad	*Bufo bufo*	O	VU			
	sand lizard	*Lacerta agilis*	SO	VU	HD IV		
	slow worm	*Anguis fragilis*	SO	NT			
	grass snake	*Natrix natrix*	O	NT			
	water rail	*Rallus aquaticus*	SO	VU			
	kingfisher	*Alcedo atthis*	SO	VU	BD I		
	nightingale	*Luscinia megarhynchos*	O	LC			
	great reed warbler	*Acrocephalus arundinaceus*	SO	VU			
	Eurasian otter	*Lutra lutra*	SO	NT	HD II, IV		
	large white-faced darter	*Leucorrhinia pectoralis*	SO	NT	HD II, IV		
	dusky large blue	Phengaris nausithous	SO	NT	HD II, IV		
Area B1	quail	*Coturnix coturnix*	SO	NT		predominantly temporary occupation of agricultural areas, disturbance, and risk of killing during stripping and transportation (less mobile groups)	-1
	agile frog	*Rana dalmatina*	SO	NT	HD IV		
	pool frog	*Pelophylax lessonae*	SO	VU	HD IV		
	Nathusius's pipistrelle	*Pipistrellus nathusii*	SO		HD IV		
	brown long-eared bat	*Plecotus auritus*	SO		HD IV		
	Daubenton's bat	*Myotis daubentonii*	SO		HD IV		
	bumblebees of the genus Bombus	*Bombus* sp.	O	depending on species			
	ants of the genus Formica	*Formica* sp.	O	depending on species			
	Scheidler's ground beetle	*Carabus scheidleri*	O				
	white-spotted rose beetle	*Oxythyrea funesta*	O				
	Old World swallowtail	*Papilio machaon*	O				
Area B2	common toad	*Bufo bufo*	O	VU		predominantly temporary occupation of agricultural areas, disturbance, and risk of killing during stripping and transportation; possible local felling of marginal stands; possible interference with the large-mammal migration corridor at the edge of B2	-1
	sand lizard	*Lacerta agilis*	SO	VU	HD IV		
	slow worm	*Anguis fragilis*	SO	NT			
	grass snake	*Natrix natrix*	O	NT			
	gray long-eared bat	*Plecotus austriacus*	SO	VU	HD IV		
	common pipistrelle	*Pipistrellus pipistrellus*	SO		HD IV		
	Nathusius's pipistrelle	*Pipistrellus nathusii*	SO		HD IV		
	brown long-eared bat	*Plecotus auritus*	SO		HD IV		
	red squirrel	*Sciurus vulgaris*	O				
	bumblebees	*Bombus* sp.	O	depending on species			
	ants	*Formica* sp.	O	depending on species			
	white-spotted rose beetle	*Oxythyrea funesta*	O				
Area B3	great reed warbler	*Acrocephalus arundinaceus*	SO	VU		risk of interference with the waterlogged eastern part and woody stands, disturbance, felling, and killing of individuals during earthwork	-1
	nightingale	*Luscinia megarhynchos*	O				
	bumblebees	*Bombus* sp.	O	depending on species			
	ants	*Formica* sp.	O	depending on species			
	Scheidler's ground beetle	*Carabus scheidleri*	O				
	white-spotted rose beetle	*Oxythyrea funesta*	O				
	lesser purple emperor	*Apatura ilia*	O				
	purple emperor	*Apatura iris*	O				
Area C	agile frog	*Rana dalmatina*	SO	NT	HD IV	temporary occupation of grassland and woody habitats, killing of individuals and developmental stages, destruction of ground nests, disturbance, and potential felling of woody plants	-1
	common toad	*Bufo bufo*	O	VU			
	sand lizard	*Lacerta agilis*	SO	VU	HD IV		
	slow worm	*Anguis fragilis*	SO	NT			
	grass snake	*Natrix natrix*	O	NT			
	green sandpiper	*Tringa ochropus*	SO	EN			
	bicolored shrew	*Crocidura leucodon*	O				
	gray long-eared bat	*Plecotus austriacus*	SO	VU	HD IV		
	common pipistrelle	*Pipistrellus pipistrellus*	SO		HD IV		

	Nathusius's pipistrelle	*Pipistrellus nathusii*	SO		HD IV		
	common noctule	*Nyctalus noctula*	SO		HD IV		
	brown long-eared bat	*Plecotus auritus*	SO		HD IV		
	Daubenton's bat	*Myotis daubentonii*	SO		HD IV		
	bumblebees	*Bombus* sp.	O	depending on species			
	ants	*Formica* sp.	O	depending on species			
	Scheidler's ground beetle	*Carabus scheidleri*	O				
	green tiger beetle	*Cicindela campestris*	O				
	white-spotted rose beetle	*Oxythyrea funesta*	O				
	European mantis	*Mantis religiosa*	KO	VU			
	lesser purple emperor	*Apatura ilia*	O				
	purple emperor	*Apatura iris*	O				
	Old World swallowtail	*Papilio machaon*	O				
Retention basins adjoining areas C, B2, and F2	smooth newt	*Lissotriton vulgaris*	SO	VU		possible impacts on breeding habitats, killing during migration, and entrapment of individuals in construction excavations	-1
	agile frog	*Rana dalmatina*	SO	NT	HD IV		
	edible frog	*Pelophylax esculentus*	SO	NT	HD V		
	common toad	*Bufo bufo*	O	VU			
Area D	bumblebees	*Bombus* sp.	O	depending on species		predominantly temporary occupation of agricultural areas, disturbance, and risk of killing during stripping and transportation	-1
	ants	*Formica* sp.	O	depending on species			
	Scheidler's ground beetle	*Carabus scheidleri*	O				
	green tiger beetle	*Cicindela campestris*	O				
	white-spotted rose beetle	*Oxythyrea funesta*	O				
	Old World swallowtail	*Papilio machaon*	O				
Area E1	viviparous lizard	*Zootoca vivipara*	SO	NT		predominantly temporary occupation of agricultural areas, disturbance, and risk of killing during stripping and transportation	-1
	slow worm	*Anguis fragilis*	SO	NT			
	sparrowhawk	*Accipiter nisus*	SO	VU			
	marsh harrier	*Circus aeruginosus*	O	VU			
	bumblebees	*Bombus* sp.	O	depending on species			
	ants	*Formica* sp.	O	depending on species			
	white-spotted rose beetle	*Oxythyrea funesta*	O				
Area E2	viviparous lizard	*Zootoca vivipara*	SO	NT		predominantly temporary occupation of agricultural areas, disturbance, and risk of killing during stripping and transportation	-1
	slow worm	*Anguis fragilis*	SO	NT			
	red squirrel	*Sciurus vulgaris*	O				
	bumblebees	*Bombus* sp.	O	depending on species			
	ants	*Formica* sp.	O	depending on species			
	white-spotted rose beetle	*Oxythyrea funesta*	O				
Area F1	bumblebees	*Bombus* sp.	O	depending on species		predominantly temporary occupation of agricultural areas, disturbance, and risk of killing during stripping and transportation; possible local felling of marginal stands; possible interference with the large-mammal migration corridor in northern F1	-1
	ants	*Formica* sp.	O	depending on species			
	white-spotted rose beetle	*Oxythyrea funesta*	O				
Area F2	agile frog	*Rana dalmatina*	SO	NT	HD IV	removal of the forest stand, loss of shelter and breeding habitats, disturbance, and reduced permeability of the migration corridor; consequences may be long-term	-1
	viviparous lizard	*Zootoca vivipara*	SO	NT			
	slow worm	*Anguis fragilis*	SO	NT			
	raven	*Corvus corax*	O				
	red kite	*Milvus milvus*	KO	CR	BD I		
	red squirrel	*Sciurus vulgaris*	O				
	bumblebees	*Bombus* sp.	O	depending on species			
	ants	*Formica* sp.	O	depending on species			
	Scheidler's ground beetle	*Carabus scheidleri*	O				

	lesser purple emperor	*Apatura ilia*	O				
Area G	whinchat	*Saxicola rubetra*	O			Predominantly temporary occupation of agricultural land, disturbance, and risk of killing; possible interference with the wet meadow of conservation significance if the construction-site boundary is crossed	-1
	white stork	*Ciconia ciconia*	O	NT	BD I		
	western yellow wagtail	*Motacilla flava*	SO	VU			
	bumblebees	*Bombus* sp.	O	depending on species			
	ants	*Formica* sp.	O	depending on species			
	Scheidler's ground beetle	*Carabus scheidleri*	O				
	white-spotted rose beetle	*Oxythyrea funesta*	O				
	Old World swallowtail	*Papilio machaon*	O				
Area H	smooth newt	*Lissotriton vulgaris*	SO	VU		predominantly temporary occupation of agricultural areas, disturbance, and risk of killing less mobile groups during stripping and transportation	-1
	common spadefoot	*Pelobates fuscus*	SO	NT	HD IV		
	European fire-bellied toad	*Bombina bombina*	SO	EN	HD II, IV		
	agile frog	*Rana dalmatina*	SO	NT	HD IV		
	pool frog	*Pelophylax lessonae*	SO	VU	HD IV		
	edible frog	*Pelophylax esculentus*	SO	NT	HD V		
	European tree frog	*Hyla arborea*	SO	NT	HD IV		
	European green toad	*Bufotes viridis*	SO	EN	HD IV		
	viviparous lizard	*Zootoca vivipara*	SO	NT			
	common European adder	*Vipera berus*	KO	VU			
	red kite	*Milvus milvus*	KO	CR	BD I		
	gray long-eared bat	*Plecotus austriacus*	SO	VU	HD IV		
	common pipistrelle	*Pipistrellus pipistrellus*	SO		HD IV		
	Nathusius's pipistrelle	*Pipistrellus nathusii*	SO		HD IV		
	common noctule	*Nyctalus noctula*	SO		HD IV		
	brown long-eared bat	*Plecotus auritus*	SO		HD IV		
	Daubenton's bat	*Myotis daubentonii*	SO		HD IV		
	bumblebees	*Bombus* sp.	O	depending on species			
	ants	*Formica* sp.	O	depending on species			
	Scheidler's ground beetle	*Carabus scheidleri*	O				
	white-spotted rose beetle	*Oxythyrea funesta*	O				
	Old World swallowtail	*Papilio machaon*	O				
	large white-faced darter	*Leucorrhinia pectoralis*	SO	NT	HD IV		
Area I	European fire-bellied toad	*Bombina bombina*	SO	EN	HD II, IV	predominantly temporary occupation of agricultural areas, disturbance, and risk of killing less mobile groups during stripping and transportation	-1
	marsh harrier	*Circus aeruginosus*	O	VU	BD I		
	bumblebees	*Bombus* sp.	O	depending on species			
	ants	*Formica* sp.	O	depending on species			
Area J	European tree frog	*Hyla arborea*	SO	NT	HD IV	disturbance, habitat occupation, felling, and deadwood removal; possible long-term to permanent reduction in habitat for species associated with woody plants	-1
	viviparous lizard	*Zootoca vivipara*	SO	NT			
	sand lizard	*Lacerta agilis*	SO	VU	HD IV		
	middle spotted woodpecker	*Dendrocoptes medius*	O	VU	BD I		
	red squirrel	*Sciurus vulgaris*	O				
	bumblebees	*Bombus* sp.	O	depending on species			
	ants	*Formica* sp.	O	depending on species			
	Scheidler's ground beetle	*Carabus scheidleri*	O				
	green tiger beetle	*Cicindela campestris*	O				
	cinnabar flat bark beetle	*Cucujus cinnaberinus*	SO	VU	HD II, IV		
	white-spotted rose beetle	*Oxythyrea funesta*	O				
	lesser purple emperor	*Apatura ilia*	O				
	Old World swallowtail	*Papilio machaon*	O				
Construction-site power-supply corridor	agile frog	*Rana dalmatina*	SO	NT	HD IV	local felling or damage to woody plants, disturbance, earthwork, and killing of individuals; the extent of the impact depends on the technical power-supply design	-1
	edible frog	*Pelophylax esculentus*	SO	NT	HD V		
	European tree frog	*Hyla arborea*	SO	NT	HD IV		
	sand lizard	*Lacerta agilis*	SO	VU	HD IV		
	viviparous lizard	*Zootoca vivipara*	SO	NT			
	grass snake	*Natrix natrix*	O	NT			

	nightingale	*Luscinia megarhynchos*	O				
	red-backed shrike	*Lanius collurio*	O	NT	BD I		
	hazel dormouse	*Muscardinus avellanarius*	SO		HD IV		
	red squirrel	*Sciurus vulgaris*	O				
	bumblebees	*Bombus* sp.	O	depending on species			
	ants	*Formica* sp.	O	depending on species			
	Scheidler's ground beetle	*Carabus scheidleri*	O				
	white-spotted rose beetle	*Oxythyrea funesta*	O				
Widening of Road II/138, the ETE service road, and passing bays	sand lizard	*Lacerta agilis*	SO	VU	HD IV	sand lizard, viviparous lizard, slow worm, bumblebees of the genus Bombus sp., ants of the genus Formica sp., Scheidler's ground beetle, marbled rose chafer, and swallowtail	-1
	viviparous lizard	*Zootoca vivipara*	SO	NT			
	slow worm	*Anguis fragilis*	SO	NT			
	bumblebees	*Bombus* sp.	O	depending on species			
	ants	*Formica* sp.	O	depending on species			
	Scheidler's ground beetle	*Carabus scheidleri*	O				
	white-spotted rose beetle	*Oxythyrea funesta*	O				
	Old World swallowtail	*Papilio machaon*	O				

Note: ČS ... Red List; HD ... Habitats Directive; BD ... Birds Directive

Fish occurrence in the affected territory is associated primarily with Dvorčice and Karlovec ponds and certain retention basins. No specially protected or threatened fish species were identified. Construction impacts may consist of short-term deterioration of water quality, sediment input, accidental release of pollutants, or inappropriate conveyance of stormwater from the construction site. Construction of the temporary H-I connection across Dvorčický Stream is particularly sensitive. If bridge supports are founded outside the channel and riparian stands, repeated machinery crossings of the channel are prevented, and the construction site is secured against pollutant releases, no significant impact on the fish community is anticipated.

Dvorčice Pond is the most important amphibian breeding habitat; Karlovec Pond and, locally, retention basins adjoining areas C, B2, and F2 are also important. During construction, individuals may be killed during soil stripping, machinery movements, and construction traffic, become trapped in excavations, and have their migration routes between aquatic and terrestrial habitats interrupted. At Dvorčice and Karlovec ponds, deterioration of water quality and undesirable changes in hydrological recharge must also be prevented.

Reptiles were identified in most biologically valuable areas and along roads. Areas H, C, F2, and B3 and the surroundings of the ponds require particular attention. A single record of the common adder was also made at the edge of area H. Before stripping and felling begin, the affected areas must be inspected by biological supervision and, depending on current occurrence, the areas must be secured, temporary migration barriers installed, or individuals rescued and relocated.

Construction may affect species nesting on agricultural land, in grasslands, woody vegetation, wetlands, and pond littoral zones. In open areas, common quail, gray partridge, yellow wagtail, and other ground-nesting species are particularly relevant. Common and specially protected bird species nest or may nest in the woody stands of areas C, B3, F2, and J and in the construction-site power-supply corridor. Dvorčice and Karlovec ponds and their surroundings are used by aquatic and reed-bed species, particularly water rail, little grebe, great reed warbler, western marsh harrier, graylag goose, mute swan, and common kingfisher.

The most significant risk is destruction of active nests and clutches during felling, vegetation removal, and commencement of earthwork. Felling of woody plants and removal of scrub must be performed outside the principal nesting season. If earthwork on fields or grassland begins during the nesting season, it must be preceded by an inspection by a professionally qualified person and the establishment of protective buffers around any active nests. Construction activities must not affect pond littoral zones or valuable wetland and woody edges.

The presence of the hazel dormouse and red squirrel has been confirmed or is anticipated in woody and shrub stands; several bat species forage in the area. Before felling, trees with cavities, loose bark, and other potential roosts must be inspected. The Eurasian otter is also relevant around watercourses and ponds, particularly because of risks from construction traffic and restricted passage along aquatic elements.

Area F2 overlaps a large-mammal migration corridor that may occasionally be used by the gray wolf or Eurasian lynx. Extensive fencing, lighting, and intensive construction operations may temporarily reduce its permeability. Area F2 is therefore not recommended for use as a construction site facility area. The bridge between areas H and I must maintain migration space along Dvorčický Stream.

A predominantly common and widespread range of species was identified in most agricultural areas. During earthwork, individuals and developmental stages of bumblebees, ants, marbled rose chafers, Scheidler's ground beetles, swallowtails, and other species may be killed. If nests of ants of the genus Formica are encountered, their expert relocation can mitigate the adverse impact.

The locations of greatest conservation significance are the wet meadow near Dvorčice Pond, where the large copper and narrow-mouthed whorl snail occur; the meadow near Karlovec Pond, where the dusky large blue occurs; the woody stands of areas B3 and C; and the western part of

area J. The scarlet cucujid and other species associated with old and dead wood, including the poplar jewel beetle, whose occurrence in South Bohemia is exceptionally significant according to the supporting documents, were identified in area J. The valuable parts of these locations must be delineated as areas free of construction activities, stockpiles, machinery movements, and felling.

Overall, if the proposed measures are observed, the construction impact on fauna can be assessed as locally slightly adverse (-1). In most agricultural areas, the impacts will consist of temporary disturbance, temporary occupation, and the risk of killing individual animals, without an anticipated significant impact on their local populations. The more sensitive locations are Dvorčice and Karlovec ponds, adjoining wetland meadows, retention basins, woody stands in areas C, B3, F2, and J, and the large-mammal migration corridor (area F2, part of F1, and the edge of B2). This assessment is conditional on excluding construction activities from the most valuable parts of the areas, preserving the water regime and water quality, limiting felling, providing biological supervision, protecting animals against entry into excavations, and restoring temporarily affected habitats.

D.I.8. Impacts on landscape

8. Impacts on the landscape and its ecological functions

D.I.8.1. Impacts on landscape

D.I.8.1.1. Assessment of impacts on landscape character

D.I.8.1.1.1. Introductory information

The assessment of impacts on landscape character is provided in full in Annex 3.2 to this Documentation, to which reference is made for details. Its results and conclusions are summarized below.

The Project is located at the southeastern edge of the ETE site and, in terms of volume, represents an expansion (addition) to the existing power plant site. The resulting Project will be a technical structure similar in character to the existing structures. Under the SMR ETE Project, the dominant structure is the reactor building or protective enclosure (containment), which is not anticipated to exceed 60 m in height.

Given the Project location, its impact must be assessed in the context of the existing ETE1,2 structures, planned construction of New NPP ETE, and the spent nuclear fuel storage facility, which is currently being prepared for expansion. Given the anticipated maximum height of the tallest or dominant structure, SMR ETE will not fundamentally change the surrounding landscape character because the approximately 155 m cooling towers of the operating Temelín Nuclear Power Plant units (ETE1,2) are already located several hundred meters away, and even taller towers, up to approximately 180 m, are being considered under the New NPP ETE project. The SMR ETE Project will therefore be neither a new, previously nonexistent, nor a dominant structure at the Temelín site. It will, however, change the appearance of both the existing and future ETE site in the landscape. The anticipated impacts are assessed in the context of this change.

From a landscape perspective, the Project constitutes expansion of the existing industrial site of the Temelín power plant (ETE1,2) by a new SMR unit, including the addition of overhead power lines for power evacuation to the Kočín substation. New NPP ETE, including related infrastructure connections, is also planned in the area.

In functional terms, the SMR ETE Project is consistent with the function of the site where it is to be located and expands the site by adding another functional component. From this perspective, practically nothing new occurs in the landscape character, and it can be stated that there is no need to assess the relationship in terms of function alone. However, the Project's impact is evident and relatively contrasting in terms of relationships with other parts of the landscape and their functions. The ETE site is located in a relatively remote rural landscape characterized primarily by small and larger agricultural villages and rural towns. Their structure is determined primarily by medieval settlement of the landscape in different periods and can be said to have remained stable for centuries. Typologically, this is a forest-agricultural landscape characterized by a coarse mosaic of basic functional areas, namely forests and fields. Deforested parts of the landscape consist of intensively cultivated agricultural areas that were consolidated into extensive blocks in the second half of the 20th century. Near-natural segments are confined primarily to watercourses, where they form narrow and in places wider belts of vegetation and meadows. The landscape mosaic is supplemented in places by small forests preserved primarily on slopes and hilltops and along larger watercourses. Systems of ponds, accompanied in many locations by mature vegetation and waterlogged meadows, form a distinctive accent in the landscape. The existing ETE structures are relatively contrasting with the agricultural landscape; they have a different scale and represent a unique form of use, power generation, that is entirely exceptional in the extent of the site and size of the structures and equipment. The structures are accompanied by relatively prominent technical-infrastructure elements, particularly the Kočín substation and the large number of existing and planned VVN and ZVN overhead power lines extending from that substation in all directions, with characteristic towers of varying heights. In terms of functional relationships within the area capable of being affected, SMR ETE does not differ from the existing ETE1,2 site. Its implementation can therefore be expected to strengthen this contrast, which is manifested in the appearance of the location and the landscape in which it is situated.

Given the Project's location and nature, assessment from the perspective of landscape-character protection focuses primarily on the change in the appearance of the entire Temelín Nuclear Power Plant site, including the changes under consideration, meaning not only the existing ETE1,2 structures but also the proposed New NPP ETE and the expanded spent nuclear fuel storage facility at the Temelín Nuclear Power Plant site, which are assessed cumulatively with the Project.

D.I.8.1.1.2. Landscape-character protection criteria

From the perspective of the landscape character of the affected landscape area, the Project may affect the following values within the meaning of the criteria defined by Act No. 114/1992 Coll., on Nature and Landscape Conservation, as amended:

Aesthetic value	The appearance of the existing ETE1,2 site substantially affects perception of this value; the SMR ETE Project is located on the southern side, in the area immediately adjoining the ETE1,2 site. A change is anticipated primarily in the appearance of the site as perceived from the adjoining surroundings and in significant long-distance views from predefined viewpoints.
Natural value	Given the nature of the location and adjoining areas where the Project is situated, no visual impact on natural values is anticipated.
Harmonious scale	In the existing situation, harmonious scale is significantly affected by the existing set of technological and related service structures of ETE1,2. In view of the composition and proportions of the volumes, it can be said that the existing impact on harmonious scale will be slightly strengthened; the purpose of the assessment is to determine whether this impact will be altered to an unacceptable degree.
Harmonious relationships in the landscape	As with harmonious scale, harmonious relationships in the landscape are substantially affected by the existing ETE1,2 site. Given its nature and location, the Project should not substantially reduce perception of the existing impairment of harmonious relationships in the landscape, but it will strengthen perception of the existing scale and appearance of the Temelín site. The purpose of the assessment is to determine whether this strengthening is acceptable in the context of the changes under consideration (SMR ETE, New NPP ETE, and the spent nuclear fuel storage facility).
MZCHÚ	No small-scale protected areas are delineated in the area, nor are such protected areas delineated sufficiently nearby to be affected from the perspective of landscape-character protection.
VZCHÚ	No protected landscape area or national park is designated in the area assessed or adjoining territory.
VKP	No significant landscape features at the location concerned are affected in relation to the Project.
Cultural values	No cultural values at the location concerned are affected in relation to the Project.
Cultural landmarks	No cultural landmarks at the location concerned are affected in relation to the Project.

D.I.8.1.1.3. Impact on statutory landscape-character criteria

The assessment of impacts on the statutory criteria provides a clear summary of the Project's impact on the individual criteria specified by law in relation to landscape-character protection, including justification.

The assessment is based on the findings concerning impacts on the individual attributes of the basic characteristics. An attribute may be removed, altered, suppressed, or reinforced by the Project. Removal, alteration, or suppression of features with a positively perceived manifestation and strengthening of features with a disruptive manifestation result in a change in landscape character that reduces its quality. Interference with features creating natural or aesthetic value reduces those values; interference with features creating harmonious scale or relationships in the landscape, or undesirable impacts on a VKP, specially protected area, or cultural landmark, may threaten their preservation.

The assessment provides a clear, objective answer, based on the identified impacts on the individual characteristic attributes, as to whether the landscape character is changed through:

- a reduction in aesthetic or natural value,
- disruption of VKP, specially protected areas, cultural landmarks, harmonious scale, and harmonious relationships in the landscape.

The justification is based on the preceding assessment of the Project's impact on the features of the individual characteristics in the context of the criterion concerned.

D.I.8.1.1.3.1. Impact on aesthetic value

In the northern part of the affected landscape area (B - Temelínsko; for delineation, see Chapter C.II.8.1.4. Subareas of the affected landscape area, page 294 of this Documentation), the Project will strengthen the existing appearance of the Temelín site in the landscape. In view of the proportions and nature of the SMR ETE structures, this strengthening can be assessed as moderate.

In the southern part of the affected landscape area (A - Dříteň-Chvalešovice), the Project will be manifested primarily in direct views of the Temelín site and will strengthen the site's existing different scale and dominant visual presence. The impact arising from this change in the appearance of the Temelín site in the context of all the projects specified above can be assessed as slight and, exceptionally, moderate.

From more distant locations, SMR ETE will only have a slight visual presence in the context of the changes under consideration.

The most significant impact of SMR ETE can be expected primarily in the southern sectors of part B of the delineated affected landscape area, where the aesthetic value of the area is already substantially affected by the existing appearance of the ETE1,2 site. After the changes specified (construction of New NPP ETE and expansion of the spent nuclear fuel storage facility), the SMR ETE Project will be reflected primarily in the overall appearance of the Temelín site, which will be dominated particularly by the cooling towers of ETE1,2 and New NPP ETE. SMR ETE will thus become an integral part of the appearance of the Temelín Nuclear Power Plant site and, together with the other projects mentioned, will strengthen its overall impact on the aesthetic value of the landscape. In the context of all the changes, the strengthening can be assessed as moderate from the Temelínsko area, particularly from the south and west; from part of the Dříteň-Chvalešovice area, the impact appears slight from more distant viewpoints and exceptionally moderate in direct views from nearer locations, particularly along southern axes.

The SMR ETE impact on aesthetic value arises primarily from the accumulation of structures on a markedly different scale, strengthening of the existing appearance of the Temelín site within an agricultural rural landscape dominated by smaller villages, and, to a certain extent, suppression of natural cultural landmarks in the affected landscape area, particularly in part A.

D.I.8.1.1.3.2. Impact on natural value

The Project will not affect natural value; it is situated so that it does not change the appearance of existing natural elements in the landscape.

D.I.8.1.1.3.3. Impact on the harmonious scale of the landscape

The SMR ETE Project will strengthen the existing impact of the Temelín site on the harmony of scales in the affected landscape area. The incremental impact is expected to be moderate. From distant locations where the appearance of the Temelín site is visible, perception of the site's scale will change only slightly due to SMR ETE, and the impact is therefore assessed as slight.

In both delineated parts of the affected landscape area, harmonious scale is to some extent suppressed by locally extensive blocks of arable land that contrast with the scale of development and particularly with traditional farmsteads. This is, however, an established, generally accepted impact, unlike the markedly different scale of the Temelín site.

In the context of the changes under consideration, the SMR ETE Project will substantially strengthen this impact within the affected landscape area. From distant locations, depending on distance, the SMR ETE site will tend to blend into the overall appearance of the Temelín site, which in the context of all the changes specified will be dominated by the prominent cooling towers of ETE1,2 and the future New NPP ETE and by reactor-unit structures that are more prominent in height and proportions.

D.I.8.1.1.3.4. Impact on harmonious relationships in the landscape

The SMR ETE structures correspond in nature and function to the existing function and nature of structures at the Temelín site, including the changes under consideration from construction of New NPP ETE and expansion of the spent nuclear fuel storage facility. SMR ETE will therefore strengthen the existing impact of the ETE site on harmonious scale; this impact can be assessed as slight.

Throughout the affected landscape area, harmonious relationships are determined primarily by consistency among elements of the area's spatial scene and the consistency of their functions arising from the fact that this is an agricultural and forest-agricultural landscape at the area's edges, and an agricultural landscape substantially supplemented by ponds in the southern part of the entire affected landscape area. Consistency can also be seen in the scale of villages and their development in relation to field areas, particularly where these are divided in the traditional manner. In the southern part, ponds using a number of small watercourses form an accentuating element of this consistency. A number of streams rise in the northern part, so ponds there are isolated and smaller. The existing ETE1,2 site already differs in scale, location, and function and thus disrupts these harmonious relationships in the landscape. The SMR ETE construction Project will not be manifested directly in this respect, but together with the adjoining ETE1,2 site, including in the context of the other changes specified (construction of New NPP ETE and expansion of the spent nuclear fuel storage facility). This manifestation can be assessed as slight to moderate, particularly from the immediately adjoining locations in Temelínsko, meaning that the SMR ETE Project will strengthen the existing impact of the Temelín site on harmonious scale in the delineated affected landscape area. From more distant locations, the impact of SMR ETE on harmonious scale in the context of the current and future overall appearance of the Temelín site can be assessed as slight, given the overall extent of the changes.

D.I.8.1.1.3.5. Impact on significant landscape features

The Project will not affect significant landscape features and is situated so that it does not substantially change the appearance of existing significant landscape features in the landscape.

D.I.8.1.1.3.6. Impact on specially protected areas

The Project will not affect specially protected areas; no impact is anticipated.

D.I.8.1.1.3.7. Impact on cultural landmarks

The Project does not disrupt cultural landmarks and is situated so that it does not substantially change the appearance of existing cultural landmarks in the landscape.

D.I.8.1.1.4. Summary of impacts on landscape character

The SMR ETE Project is assessed in view of the appearance of the existing ETE1,2 units and cumulatively with the New NPP ETE construction project and the spent nuclear fuel storage facility expansion project. Based on the visibility analysis and analysis of the actual visibility of structures at the existing ETE1,2 site, the SMR ETE structures will be manifested primarily from the south and west, where they will not be screened by the existing ETE1,2 structures (northern and northeastern directions) or the structures of the New NPP ETE project under consideration (northern and northwestern directions). The spent nuclear fuel storage facility will only partially screen the SMR ETE structures from northwestern directions.

Cumulatively with the projects specified above, the SMR ETE Project site will form an integral whole that will become part of the overall appearance of the Temelín site after all the changes specified. As such, it will be manifested in the landscape together with the existing ETE1,2 structures, the New NPP ETE structures, and the expanded spent nuclear fuel storage facility. The overall appearance of the Temelín site will thus be substantially strengthened by the changes, particularly by the New NPP ETE structures, while SMR ETE itself will be partially manifested from the south and west; in other directions it will be inconspicuous (easterly directions from nearer locations and direct views from more distant locations) or not manifested at all (northern and northwestern directions). The visual analysis leads to the following conclusions:

Existing ETE1,2 units	As shown by the visibility analysis and demonstrated by significant viewpoints, the existing ETE1,2 structures completely screen the SMR ETE Project from the north and northeast and partly screen it from the east. The SMR ETE Project is only inconspicuously visible in these directions through partial views between ETE1,2 structures. The identified impact of the Project appears to be slight to negligible. The Project will be most prominent from the south and southwest because of its location at the southern edge of the existing ETE1,2 site.
New NPP ETE	New NPP ETE will almost completely suppress the potential visual presence of SMR ETE from northern and northwestern directions. In other directions, New NPP ETE will be visible together with the SMR ETE and existing ETE1,2 structures; from the west and south, the SMR ETE structures will be visible together with New NPP ETE. In the eastern direction, the SMR ETE structures will be visible alongside the existing ETE1,2 units.
SVJP	The spent nuclear fuel storage facility and its expansion will to some extent screen primarily the lower SMR ETE structures, and only from the northwest; it will not screen the taller SMR ETE structures. The storage facility will be visible together with SMR ETE primarily from the south and west, while in partial views from nearer eastern viewpoints the storage facility will be screened by the proposed SMR ETE.

As demonstrated by the visibility analysis, analysis of landscape relationships, and subsequent field survey, the Project will be manifested primarily as an integral, logically adjoining component of the overall appearance of the Temelín site in the context of the changes under consideration, meaning not only the existing ETE1,2 units but also construction of New NPP ETE and expansion of the spent nuclear fuel storage facility. The SMR ETE structures do not differ in scale or character within the overall appearance of the site and will be visually prominent primarily from the south and west, and occasionally from the east. From northern directions, the proposed SMR ETE structures will be screened primarily by the existing ETE1,2 structures and by the proposed New NPP ETE structures.

The assessment identifies the following in particular:

- the SMR ETE structures will appear together with the other structures, including those planned, at the Temelín site, changing the appearance of this site in the landscape;
- this change will be apparent primarily at the Project location and will be manifested in the landscape in the southeast-south-southwest-west sector;
- this will primarily strengthen the existing impacts of the Temelín site, currently represented by the impacts of the existing ETE1,2 site, on landscape character, meaning its aesthetic value, harmonious scale, and harmonious relationships in the landscape;
- in the context of all the changes specified above, arising from the planned construction of New NPP ETE and expansion of the spent nuclear fuel storage facility, meaning cumulatively with them, this strengthening impact is assessed as slight to moderate.

The SMR ETE Project will primarily affect the landscape character of the location represented by the delineated affected landscape area by strengthening the existing appearance of the Temelín site, and it will likewise be manifested in the context of the other proposed projects at the location concerned. This impact is assessed as slight from more distant locations and slight to moderate from immediately adjoining locations. This means that the change will primarily strengthen the existing and future presence of the industrial complex in the landscape and thereby strengthen its existing impacts on landscape character, particularly in terms of harmonious relationships and harmonious scale in the landscape and suppression of the aesthetic value of the delineated affected landscape area's landscape character.

On this basis, it can be stated that the Project is acceptable in terms of landscape-character protection within the meaning of Section 12 of Act No. 114/1992 Coll., as amended.

D.I.8.1.2. Project visualizations

Illustrative 3D massing models and visualizations have been prepared to provide a clearer idea of the visual impact of the Project in interaction with other projects at the Temelín site. The individual facilities at the site are distinguished using the following key:

- existing Temelín Nuclear Power Plant (ETE1,2) - no color treatment,
- planned SMR ETE, the subject of the Project - red,
- planned New NPP ETE (or ETE3,4) - yellow,
- planned expansion of the spent nuclear fuel storage facility - blue.

Fig. D.19: Overall composition, view from the south



Fig. D.20: Overall composition, view from the east

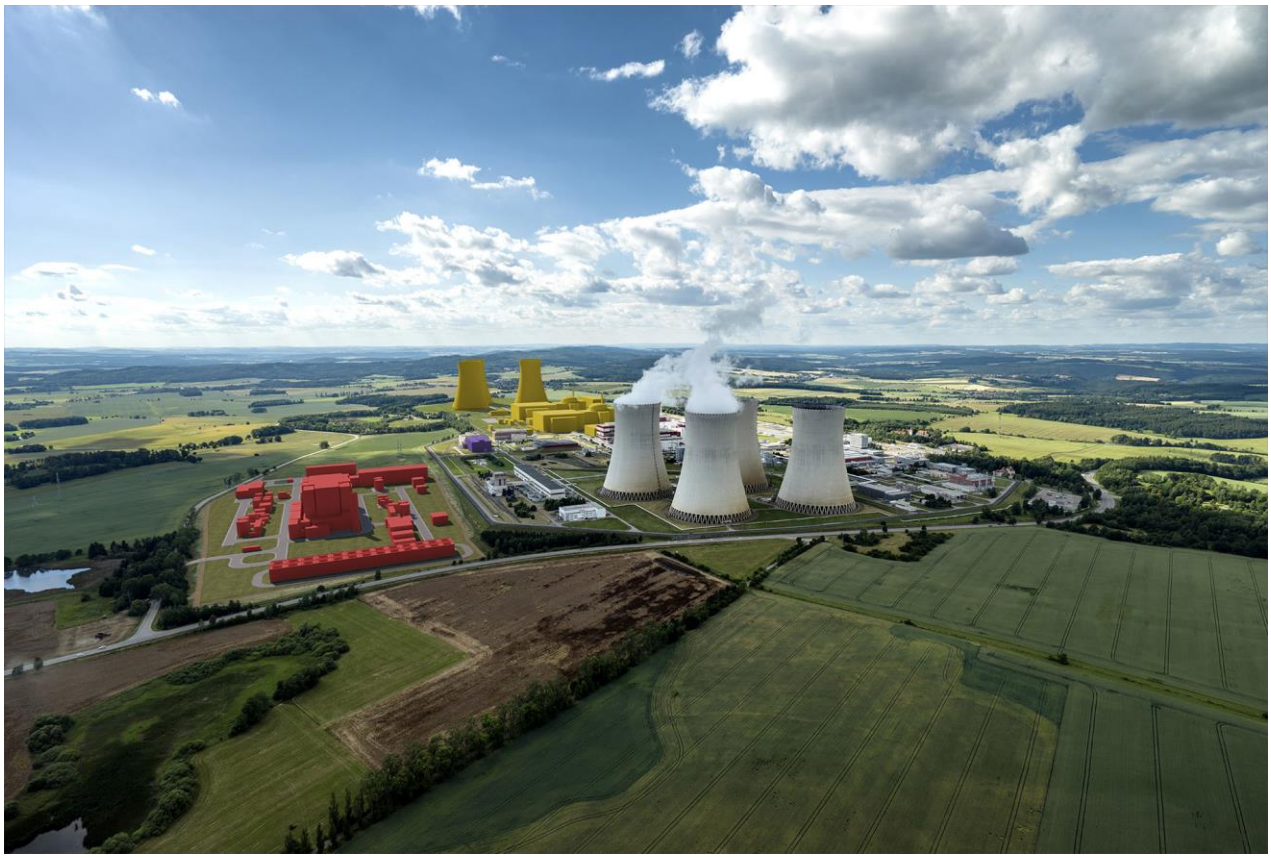


Fig. D.21: Overall composition, view from the west

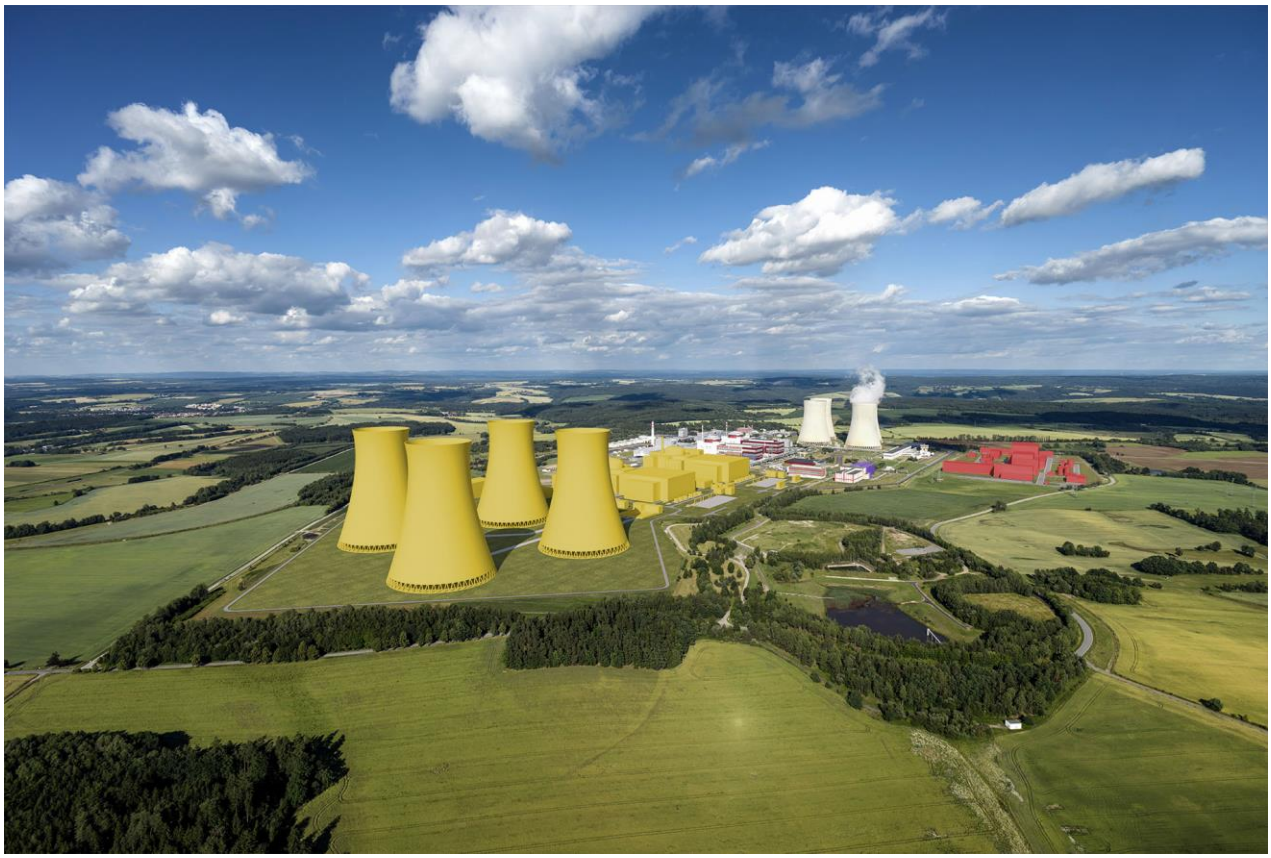


Fig. D.22: Overall composition, view from the north



Fig. D.23: Evening view of the Temelín site



D.I.8.2. Impacts during construction or termination of operation

During construction, the existing character of the area will progressively change to a new character affected by the Project, as described above.

In the main construction-site area (SMR area), the individual structures will gradually increase in height during construction, and construction will become progressively more visually apparent until it reaches the visual impact of the completed structures. During construction, however, the construction-site area will appear more disordered in urban-design and architectural terms than under the final condition: the area will be illuminated

and will change relatively dynamically; numerous machines of a markedly vertical nature (cranes) and other temporary equipment and structures will be located at the construction site; the terrain will not have been finished; and architectural finishes to structures will be incomplete. These additional impacts will gradually disappear as construction and final finishing work are completed. This also applies to the assembly hall used for construction, which will be temporary only.

Essentially the same can be said of the temporary construction site facility areas (areas C, G, H, I, and J and other reserve areas). However, no vertically dominant structures will be located there, and after construction is completed, the area will be reclaimed and returned to its original condition and purpose.

Reserve area F2 for temporary construction site facilities merits mention. It is delineated in the existing young forest in the area of the former ETE1,2 construction site facilities, now reclaimed as forest, and consists of mixed woody stands, predominantly pine and oak, that partly screen the visual impact of the existing ETE1,2 units throughout the year. If this area were used for construction site facilities, the existing stand would be felled, and the visual impacts of both the SMR ETE construction site and the existing ETE1,2 units would be more apparent from shorter distances that are currently screened by the stand. This phenomenon would persist during construction and subsequent establishment of new forest stands in area F2, but it would not be new.

No additional impacts can be expected during termination of operation; on the contrary, visual impacts will gradually decrease as a result of possible demolition.

D.I.9. Impacts on tangible assets and cultural heritage

9. Impacts on tangible assets and cultural heritage, including architectural and archaeological aspects

D.I.9.1. Impacts on tangible assets

The Project does not affect any tangible property of third parties, such as buildings. Most plots for SMR ETE construction are owned by the developer, but some plots for construction and establishment of the construction site are owned by third parties. Relation to the land involved is dealt with outside the environmental impact assessment process.

The surrounding roads are owned by the South Bohemian Region and will be used in accordance with Act No. 13/1997 Coll., on roads, as amended.

D.I.9.2. Impacts on architectural and historical monuments

No immovable architectural or historical monuments will be affected by the Project.

No direct spatial contact has been identified between the SMR siting area and immovable cultural monuments, monuments of local significance, or registered archaeological sites. Partial conflicts may arise in the case of the wayside shrine near the Kočín substation, which is located in the power-evacuation corridor, and the cast-iron cross near the pumping station, which is located in reserve construction site facility area D. Measures preventing damage or other impairment of these structures can be adopted in subsequent proceedings.

All monuments in the area of interest are already situated in the visual context of the existing Temelín power plant site and accompanying infrastructure, particularly power lines and the Kočín substation. From this perspective, future implementation of SMR ETE will not fundamentally change anything, even when the interacting impact of possible construction of New NPP ETE or other structures, such as expansion of the spent nuclear fuel storage facility, is considered. Energy infrastructure is already an integral part of the local landscape to a substantial extent. Any visual impact will therefore be partially strengthened when SMR ETE is implemented, but no new landmarks not already present will arise in the context of historical traces in the landscape. The dominant structures under the SMR ETE construction Project will not exceed the height of the existing Temelín Nuclear Power Plant cooling towers. The visual interaction of technical elements in the landscape will temporarily increase during construction of SMR ETE or New NPP ETE and their concurrent construction, particularly because of the extent of construction site facility areas and their anticipated visual impact on the overall appearance of the location during construction, including concentrations of building structures and cranes, stripping, and vegetation removal.

D.I.9.3. Impacts on archaeological monuments

The entire affected territory is an area with archaeological finds within the meaning of Section 22(2) of Act No. 20/1987 Coll., on state monument care, as amended. The Project location lies within category ÚAN III territory. This is an area where archaeological finds are not currently anticipated but cannot be definitively ruled out. Some parts of the area assessed (the northeastern quadrant of the SMR ETE construction area, the northwestern tip of area E1, and areas F1 and F2) are classified as category ÚAN IV, meaning an area without archaeological finds where overlying layers containing evidence of past human activity have been excavated.

According to the available source materials, a large Prussian army field camp was located between Temelín and Dříteň in 1744 during the War of the Austrian Succession; its precise location is not clear from the available sources. The terrain configuration, waterlogging, and historical presence

of small ponds documented on historical maps indicate a greater probability of archaeological finds in construction site facility area E2 at Velké louky.

Advance archaeological investigation is in progress in the Project areas, with completion anticipated in April 2027. Archaeological supervision will also be provided during earthwork. If archaeological structures are identified or disturbed during stripping, excavation, or other intervention in the terrain, rescue archaeological research will need to be provided within the meaning of Act No. 20/1987 Coll., on state monument care, as amended.

D.I.9.4. Impacts during construction or termination of operation

The visual interaction of technical elements in the landscape will temporarily increase during construction of SMR ETE or New NPP ETE and their concurrent construction, particularly because of the extent of construction site facility areas and their anticipated visual impact on the overall appearance of the location during construction, including concentrations of building structures and cranes, stripping, and vegetation removal. This temporary indirect impact will disappear after construction is completed.

No construction impacts other than those specified above are identified. The same applies to termination of operation.

D.I.10. Impacts on transport and other infrastructure

D.I.10.1. Impacts on transport infrastructure

D.I.10.1.1. Impacts on road transport

The transportation impacts of SMR ETE operation are assessed for the following future conditions:

- SMR ETE operation interacting with operation of ETE1,2 (2034 reference year),
- SMR ETE operation interacting with full-scale construction of New NPP ETE and operation of ETE1,2 (2040 reference year),
- SMR ETE operation interacting with operation of New NPP ETE and ETE1,2 (2042 reference year).

Note. 1: The impact of SMR ETE construction is assessed below in Chapter D.I.10.3. Impacts during construction or termination of operation.

Note. 2: Traffic volumes associated with operation of ETE1,2 occur under all the conditions specified and are not quantified separately. They form part of the total background traffic volume determined through counts and forecasting for the individual reference years (see Chapter C.II.10. Transport and other infrastructure (page 300 of this Documentation)). The road and profile numbers and their map delineation used in the following tables are also presented there.

The share of Project traffic volumes in total traffic volumes, meaning background plus Project traffic volumes, under the individual future conditions and corresponding reference years is apparent from the following tables.

Table: Comparison of traffic volumes from SMR ETE operation with total traffic volumes (2034 reference year)

Road	Profile	Annual average daily traffic volumes [vehicles/24 h] - 2034 reference year											
		Background traffic volume				SMR ETE operating traffic volume				Share of SMR ETE operation [%]			
		OV	LNV	TV	SV	OV	LNV	TV	SV	OV	LNV	TV	SV
II/105	2-1223	12,808	898	681	14,387	115	13	13	142	0.9	1.4	1.9	1.0
	2-0640	7,459	783	614	8,856	115	13	13	142	1.5	1.6	2.1	1.6
	2-0657	5,896	529	475	6,900	115	13	13	142	1.9	2.4	2.7	2.0
	2-0650	5,896	529	475	6,900	172	20	20	213	2.8	3.6	4.0	3.0
	2-0660	7,051	723	753	8,527	172	20	20	213	2.4	2.7	2.6	2.4
	2-0670	8,768	667	803	10,238	172	20	20	213	1.9	2.9	2.4	2.0
II/122	2-2050	1,694	128	242	2,065	0	0	0	0	0.0	0.0	0.0	0.0
	2-3109	1,257	100	142	1499	0	0	0	0	0.0	0.0	0.0	0.0
II/138	2-4200	546	75	89	711	12	1	1	15	2.2	1.3	1.1	2.1
	2-4680A	849	100	247	1,196	288	34	34	355	25.3	25.4	12.1	22.9
	2-4680B	849	100	247	1,196	12	1	1	15	1.4	1.0	0.4	1.2
II/141	2-2020	1,415	265	271	1,951	0	0	0	0	0.0	0.0	0.0	0.0
	2-1350	5,627	708	446	6,781	0	0	0	0	0.0	0.0	0.0	0.0
II/145	2-1610	4,770	905	617	6,291	0	0	0	0	0.0	0.0	0.0	0.0
II/147	2-2380	1,544	216	280	2,040	23	3	3	28	1.5	1.4	1.1	1.4
	2-3250	1,544	216	280	2,040	23	3	3	28	1.5	1.4	1.1	1.4
	2-2546	1,081	169	234	1,484	23	3	3	28	2.1	1.7	1.3	1.9
II/159	2-3060	1,661	156	168	1,984	12	1	1	15	0.7	0.6	0.6	0.8
III/1411	2-6220	287	31	127	445	0	0	0	0	0.0	0.0	0.0	0.0
III/14711	2-6180	587	75	42	704	0	0	0	0	0.0	0.0	0.0	0.0

Table: Comparison of traffic volumes from SMR ETE operation + full-scale New NPP ETE construction with total traffic volumes (2040 reference year)

Road	Profile	Annual average daily traffic volumes [vehicles/24 h] - 2040 reference year											
		Background traffic volume				Traffic volume from SMR ETE operation + full-scale New NPP ETE construction				Share of SMR ETE operation + full-scale New NPP ETE construction [%]			
		OV	LNV	TV	SV	OV	LNV	TV	SV	OV	LNV	TV	SV
II/105	2-1223	12,830	939	697	14,466	1527	13	485	2026	10.6	1.4	41.0	12.3
	2-0640	7,472	818	629	8,919	1527	13	485	2026	17.0	1.6	43.5	18.5
	2-0657	5,906	553	486	6,945	1527	13	485	2026	20.5	2.3	49.9	22.6
	2-0650	5,906	553	486	6,945	596	20	229	846	9.2	3.5	32.0	10.9
	2-0660	7,076	756	777	8,609	596	20	206	823	7.8	2.6	21.0	8.7
	2-0670	8,799	698	829	10,325	596	20	206	823	6.3	2.8	19.9	7.4
II/122	2-2050	1,700	134	250	2084	0	0	23	23	0.0	0.0	8.4	1.1
	2-3109	1,259	105	145	1,509	0	0	23	23	0.0	0.0	13.7	1.5
II/138	2-4200	547	79	92	717	153	1	178	333	21.9	1.3	65.9	31.7
	2-4680A	850	105	252	1,207	2124	34	715	2872	71.4	24.5	73.9	70.4
	2-4680B	850	105	252	1,207	153	1	202	357	15.3	0.9	44.5	22.8
II/141	2-2020	1416	278	278	1,972	0	0	0	0	0.0	0.0	0.0	0.0
	2-1350	5,637	740	457	6,833	0	0	23	23	0.0	0.0	4.8	0.3
II/145	2-1610	4,778	945	631	6,355	0	0	23	23	0.0	0.0	3.5	0.4
II/147	2-2380	1,546	226	287	2,059	23	3	364	389	1.5	1.3	55.9	15.9
	2-3250	1,546	226	287	2,059	23	3	364	389	1.5	1.3	55.9	15.9
	2-2546	1,083	177	239	1,499	23	3	326	351	2.1	1.7	57.7	19.0
II/159	2-3060	1,664	163	172	1,998	153	1	178	333	8.4	0.6	50.9	14.3
III/1411	2-6220	287	33	131	451	0	0	24	24	0.0	0.0	15.5	5.1
III/14711	2-6180	588	79	44	710	0	0	34	34	0.0	0.0	43.6	4.6

Table: Comparison of traffic volumes from SMR ETE operation + New NPP ETE operation with total traffic volumes (2042 reference year)

Road	Profile	Annual average daily traffic volumes [vehicles/24 h] - 2042 reference year											
		Background traffic volume				Traffic volume from SMR ETE operation + New NPP ETE operation				Share of SMR ETE operation + New NPP ETE operation [%]			
		OV	LNV	TV	SV	OV	LNV	TV	SV	OV	LNV	TV	SV
II/105	2-1223	12,785	947	702	14,433	485	34	34	554	3.7	3.5	4.6	3.7
	2-0640	7,446	825	633	8,904	485	34	34	554	6.1	4.0	5.1	5.9
	2-0657	5,885	558	489	6,932	485	34	34	554	7.6	5.7	6.5	7.4
	2-0650	5,885	558	489	6,932	726	52	52	831	11.0	8.5	9.6	10.7
	2-0660	7,051	762	783	8,596	726	52	52	831	9.3	6.4	6.2	8.8
	2-0670	8,768	704	834	10,306	726	52	52	831	7.6	6.9	5.9	7.5
II/122	2-2050	1,694	135	252	2,081	0	0	0	0	0.0	0.0	0.0	0.0
	2-3109	1,255	106	146	1,507	0	0	0	0	0.0	0.0	0.0	0.0
II/138	2-4200	545	79	92	716	52	3	3	59	8.7	3.7	3.2	7.6
	2-4680A	847	106	254	1207	1212	87	87	1385	58.9	45.1	25.5	53.4
	2-4680B	847	106	254	1207	52	3	3	59	5.8	2.8	1.2	4.7
II/141	2-2020	1411	280	280	1,971	0	0	0	0	0.0	0.0	0.0	0.0
	2-1350	5,617	746	460	6,823	0	0	0	0	0.0	0.0	0.0	0.0
II/145	2-1610	4,761	954	635	6,350	0	0	0	0	0.0	0.0	0.0	0.0
II/147	2-2380	1,541	227	289	2,057	97	7	7	110	5.9	3.0	2.4	5.1
	2-3250	1,541	227	289	2,057	97	7	7	110	5.9	3.0	2.4	5.1
	2-2546	1,079	179	241	1,498	97	7	7	110	8.2	3.8	2.8	6.8
II/159	2-3060	1,658	164	173	1,995	52	3	3	59	3.0	1.8	1.7	2.9
III/1411	2-6220	286	33	132	451	0	0	0	0	0.0	0.0	0.0	0.0
III/14711	2-6180	586	79	44	709	0	0	0	0	0.0	0.0	0.0	0.0

The data show the following:

- SMR ETE operating traffic (2034 reference year): The section most heavily affected by Project traffic is the section of Road II/138 (profile 2-4680A) that runs immediately alongside the SMR ETE site and will also provide access to the SMR ETE site. The Project's share of total traffic volume there will be up to approximately 23 %, and its share of heavy-vehicle traffic volume up to approximately 13 %. This is due primarily to the very low traffic load on this section under the baseline/background condition. However, the section does not pass through any residential area and will essentially form the principal access route to the SMR ETE site. On the next adjoining road in the affected territory (Road II/105), the Project's share of total traffic volume will be up to approximately 3 %, and its share of heavy-vehicle traffic volume up to approximately 4 %. These values are very low; the potential Project-induced change is within the range of natural traffic variability and is practically indiscernible both objectively, through traffic counts, and subjectively. On the wider road network, Project traffic will be further distributed among multiple directions, reducing the Project's share of traffic volumes. The Project will therefore cause no significant change in the traffic load there.

- SMR ETE operating traffic interacting with full New NPP ETE construction traffic (2040 reference year): The section most heavily affected by Project traffic is the section of Road II/138 (profile 2-4680A) that runs immediately alongside the SMR ETE site and will also provide access to the SMR ETE site. The Project's share of total traffic volume there will be up to approximately 71 %, and its share of heavy-vehicle traffic volume up to approximately 74 %. This is due primarily to the very low traffic load on this section under the baseline/background condition. However, the section does not pass through any residential area and will essentially form the principal access route to the SMR ETE site or the New NPP ETE construction site facility area. The conservative assumption that the New NPP ETE construction site will be accessed exclusively through this profile is considered. On the next adjoining road in the affected territory (Road II/105), the Project's share of total traffic volume will be up to approximately 23 %, and its share of heavy-vehicle traffic volume up to approximately 60 %. On the wider road network, Project traffic will be further distributed among multiple directions, reducing the Project's share of traffic volumes. The SMR ETE share of this load is relatively low; most traffic will be associated with New NPP ETE construction.
- SMR ETE operating traffic interacting with New NPP ETE operating traffic (2042 reference year): The section most heavily affected by Project traffic is the section of Road II/138 (profile 2-4680A) that runs immediately alongside the SMR ETE site and will also provide access to the SMR ETE site. The Project's share of total traffic volume there will be up to approximately 54 %, and its share of heavy-vehicle traffic volume up to approximately 26 %. This is due primarily to the very low traffic load on this section under the baseline/background condition. However, the section does not pass through any residential area and will essentially form the principal access route to the SMR ETE site. Here too, the conservative assumption that New NPP ETE will be accessed exclusively through this profile is considered. On the next adjoining road in the affected territory (Road II/105), the Project's share of total traffic volume will be up to approximately 11 %, and its share of heavy-vehicle traffic volume up to approximately 10 %. On the wider road network, Project traffic will be further distributed among multiple directions, reducing the Project's share of traffic volumes. The SMR ETE share of this load is relatively low; most traffic will be associated with New NPP ETE operation.

The impact of these traffic volumes on the individual environmental components (noise and air) is assessed within the applicable assessment areas.

From an overall perspective, the SMR ETE Project does not introduce an unforeseen traffic load into the affected territory. While the expected ordinary change in traffic volumes on the road network in the affected territory from 2020 to 2034 is approximately +7 % to +9 % for passenger cars and approximately +9 % to +11 % for heavy vehicles, depending on the road category, the expected change in traffic volumes on the road network due to the SMR ETE Project is well within the range of these expected values. In this respect, the Project does not require any special or additional measures; the road network in the affected territory is prepared for this change. This conclusion can also be generalized to transportation routes on the other adjoining road network, where the Project's share of traffic volumes will be further reduced as traffic is increasingly distributed across the wider area, meaning in additional directions.

When the interacting (cumulative) impact of the SMR ETE Project with other planned (New NPP ETE) and existing (ETE1,2)[1] facilities at the site is considered, it is clear that the Temelín site is and will remain a significant traffic destination/source. This is due to the transportation significance and requirements of this extensive industrial site, together with the area's low attractiveness to other traffic. Even in this case, however, the expected change in traffic volumes on the road network is in the low tens of percent, rising to the upper tens of percent at the peak of New NPP ETE construction, which is acceptable purely from a transportation perspective and will not affect road capacity. According to Ministry of Transport Technical Conditions TP 188, Assessment of the capacity of uncontrolled roads, the capacity of an ordinary two-lane road outside a built-up area while maintaining an acceptable level of service, meaning the quality of traffic perceived by drivers, is approximately 15,000 vehicles/24 hours. It depends on numerous factors, particularly road width and sight distance, passing opportunities, and the share of heavy vehicles. This traffic volume is not reached on the road network in the affected territory and will not be reached after implementation of other projects in the area (SMR ETE and New NPP ETE). These conclusions also apply to potential accumulation with the transportation requirements of the planned Temelín concrete mixing plant and recycling facility project (JHC1253), whose transportation requirements are relatively low, in the low tens of trucks per day, meaning within the range of ordinary changes in traffic volumes on the road network and without an impact on road capacity. The same applies to the planned Hůrka u Temelína – composting plant project (JHC1259).

Under Act No. 13/1997 Coll., on roads (the Roads Act), as amended, this constitutes general use of the public road network, meaning free use in the customary manner and for the purposes for which the roads are intended. Closure of Road II/138 and its exclusive use for construction will be subject to a permit from the road administrative authority.

D.I.10.1.2 Impacts on rail transport

For rail transportation, the impact of its use can be characterized as insignificant. The rail connection to the Temelín site has more than sufficient spare capacity, which can also be used in full for the SMR ETE Project.

[1] Service traffic for the long-standing ETE1,2 forms part of the baseline/background traffic volumes determined by traffic counts and therefore does not constitute an additional transportation requirement or contribution. It is therefore not quantified separately.

D.I.10.1.3. Impacts on air transport

The Project will not significantly affect air transportation. The existing LKP2 prohibited airspace protecting the Temelín site is anticipated to be spatially modified as appropriate to protect the newly sited nuclear facilities (SMR ETE and New NPP ETE), without further consequences for organization and management of air traffic.

D.I.10.1.4. Impacts on water transport

The Project has no impact on water transportation. It does not affect the navigable waterway along the Vltava River in any way; the anticipated water abstraction will be performed in accordance with the waterworks operating rules and will therefore not affect navigation conditions.

D.I.10.1.5. Impacts on other transport systems

The Project is located outside other transportation infrastructure in the affected territory, such as cycling and pedestrian infrastructure, and therefore does not affect it. The Project also creates conditions for its use.

D.I.10.2. Impacts on other infrastructure

Apart from the networks required for Project operation (power evacuation into the transmission system, backup auxiliary power supply from the distribution system, the water-supply system, and the wastewater-discharge system), which are systems managed either directly by the Project developer (ČEZ Group) or by other energy-infrastructure operators (ČEPS and EG.D), implementation of the Project will have no further impact on the area's infrastructure. Any changes to the affected infrastructure network will be restored to their original condition or the condition required by their owners or operators. Supply of electricity and other utilities, such as heat, water, and gas, to points of consumption will be maintained during Project implementation.

D.I.10.3. Impacts during construction or termination of operation

Two basic measures have been adopted and considered for the SMR ETE construction period:

1) During construction of the SMR ETE Project, Road II/138 will be closed to public traffic between Roads II/105 and II/141, meaning within the SMR ETE construction site and related construction site facility areas. Existing traffic will be diverted along Roads II/141 and II/105; the closed section of Road II/138 will remain accessible only to traffic associated with SMR ETE construction.
2) Construction of SMR ETE will be coordinated with construction of New NPP ETE so that the main SMR ETE and New NPP ETE construction activities do not coincide. SMR ETE construction will therefore occur concurrently with the initial/preparatory phase of New NPP ETE construction, whose heavy-truck requirements will be approximately half those of the main construction phase. The total heavy-construction-traffic volume previously assessed in the EIA process for the New NPP ETE project will therefore not be exceeded[1]. This also applies to construction traffic for expansion of the ETE spent nuclear fuel storage facility's storage capacity, which, given the relatively small scope of that project, is very low, comprising several trucks per day and briefly peaking at tens of trucks per day, and therefore practically does not change the transportation balance for construction of the new nuclear sources.

The transportation impacts of SMR ETE construction are assessed for the following future condition:

- SMR ETE construction interacting with the initial/preparatory phase of New NPP ETE construction and operation of ETE1,2 (2034 reference year).

Note: Traffic volumes associated with operation of ETE1,2 form part of the total background traffic volume determined through counts and forecasting (see Chapter C.II.10. Transport and other infrastructure (page 300 of this Documentation)). They are therefore not quantified separately.

The share of Project construction-traffic volumes in total traffic volumes, meaning background plus Project traffic volumes, during SMR ETE construction is apparent from the following table.

[1] New NPP ETE, including power evacuation to the Kočín substation. Affirmative opinion of the Ministry of the Environment, ref. No.: 2561/ENV/13, 2562/ENV/13 dated January 18, 2013; extension of the validity of the Ministry of the Environment opinion, ref. No.: MZP/2019/710/10492 dated December 16, 2020.

Table: Comparison of traffic volumes from SMR ETE construction + initial phase of New NPP ETE construction with total traffic volumes (2034 reference year)

Road	Profile	Annual average daily traffic volumes [vehicles/24 h] - 2034 reference year											
		Background traffic volume				Traffic volume from SMR ETE construction + initial phase of New NPP ETE construction				Share of SMR ETE construction + initial phase of New NPP ETE construction [%]			
		OV	LNV	TV	SV	OV	LNV	TV	SV	OV	LNV	TV	SV
II/105	2-1223	12,808	898	681	14,387	1135	0	397	1531	8.1	0.0	36.8	9.6
	2-0640	7,459	783	614	8,856	1135	0	397	1531	13.2	0.0	39.3	14.7
	2-0657	6,744	630	721	8,096	1135	0	397	1531	14.4	0.0	35.5	15.9
	2-0650	5,896	529	475	6,900	341	0	175	516	5.5	0.0	26.9	7.0
	2-0660	7,051	723	753	8,527	341	0	156	497	4.6	0.0	17.2	5.5
	2-0670	8,768	667	803	10,238	341	0	156	497	3.7	0.0	16.3	4.6
II/122	2-2050	1,694	128	242	2,065	0	0	19	19	0.0	0.0	7.3	0.9
	2-3109	1,257	100	142	1499	0	0	19	19	0.0	0.0	11.8	1.3
II/138	2-4200	546	75	89	711	113	0	149	262	17.1	0.0	62.6	26.9
	2-4680A	0	0	0	0	1475	0	572	2048	100.0	100.0	100.0	100.0
	2-4680B	0	0	0	0	113	0	169	282	100.0	100.0	100.0	100.0
II/141	2-2020	2,262	366	518	3,147	0	0	0	0	0.0	0.0	0.0	0.0
	2-1350	5,627	708	446	6,781	0	0	19	19	0.0	0.0	4.1	0.3
II/145	2-1610	4,770	905	617	6,291	0	0	19	19	0.0	0.0	3.0	0.3
II/147	2-2380	1,544	216	280	2,040	0	0	303	303	0.0	0.0	52.0	12.9
	2-3250	1,544	216	280	2,040	0	0	303	303	0.0	0.0	52.0	12.9
	2-2546	1,081	169	234	1,484	0	0	271	271	0.0	0.0	53.7	15.4
II/159	2-3060	1,661	156	168	1,984	113	0	149	262	6.4	0.0	47.0	11.7
III/1411	2-6220	287	31	127	445	0	0	20	20	0.0	0.0	13.6	4.3
III/14711	2-6180	587	75	42	704	0	0	29	29	0.0	0.0	40.8	4.0

The data show the following:

- SMR ETE construction traffic interacting with initial/preparatory New NPP ETE construction traffic (2034 reference year): The road section most heavily affected by Project traffic is the section of Road II/138 (profiles 2-4680A and 2-4680B), where the Project's share of total traffic volume will be 100 %. This is because the section will be closed to other traffic. The section does not pass through any residential area. On the next adjoining road in the affected territory (Road II/105), the Project's share of total traffic volume will be up to approximately 16 %, and its share of heavy-vehicle traffic volume up to approximately 40 %. The sections of Roads II/138 (profile 2-4200) and II/159 (profiles 2-3060) will also carry a more significant traffic load; the Project's share of total traffic volume there will be up to approximately 27 %, and its share of heavy-vehicle traffic volume up to approximately 63 %. This is due primarily to the relatively low background traffic volume on these roads. On the wider road network, Project traffic will be further distributed among multiple directions, reducing the Project's share of traffic volumes.

The roads have sufficient spare capacity, and the impact of the increased traffic volume during construction is further mitigated by the fact that SMR ETE construction traffic will not be significantly concentrated during peak traffic hours. In accordance with the requirements of Act No. 13/1997 Coll., on roads (the Roads Act), as amended, road sections where increased traffic could cause a deterioration in quality are anticipated to be repaired both before construction starts and after it is completed. The precise scope of the proposed repairs will be determined before implementation of SMR ETE on the basis of mapping of road conditions and diagnostics of pavement structures.

The impacts of construction traffic on the individual environmental components (noise and air) are assessed within the applicable assessment areas.

Transportation of oversized parts and components will comprise specific individual cases that will not statistically contribute to the traffic volumes induced by standard construction. A combined water and road route is taken into account for transport of oversized and heavy components to the construction site. A number of local technical measures or construction modifications will then be required along the selected route to ensure passage. These modifications are currently already being prepared for the New NPP ETE project under Government Resolution of the Czech Republic No. 806 of October 22, 2025, on securing financing for transportation-infrastructure modifications for transportation of oversized and heavy components in connection with construction of new nuclear sources (including small modular reactors) at the Temelín site, and can be used for the SMR ETE Project without further consequences. Given the anticipated volume of oversized components transported, in units per year, these impacts can be considered insignificant.

If rail transportation is used, rail-network capacity is not a limiting factor, so the impact of using rail transportation during construction can be considered insignificant and desirable. Other transportation systems will not be affected by Project construction.

The function of ETE1,2 infrastructure systems, including their generating capacity, will be maintained during construction of the SMR ETE Project, as will the supply of electricity and other utilities, such as heat, water, and gas, to points of consumption.

During termination of operation, a transportation arrangement similar to that during operation or construction, and therefore comparable or lower transportation impacts, can be expected.

D.I.11. Other environmental impacts

D.I.11.1. Impacts on the *geological* environment

Implementation of the Project has a minimal impact on the geological environment. The direct impact consists of intervention in the upper layers of the bedrock, primarily Quaternary and Neogene sediments and, in part, the weathering mantle, extending down to moderately weathered bedrock with sufficient bearing capacity. The impact is limited to the construction area, with no other associated impacts outside the Project site. The integrity and quality of the geological environment will not be affected during operation.

In view of the nature of the underlying rock, hydrogeological conditions at the construction site, anticipated modifications at foundation levels, and proposals for foundations of the principal structures, there is no risk of loss of stability or liquefaction of materials at the construction site or in its immediate surroundings.

The stability and support of artificial excavations (slope inclinations and shoring) will be determined individually on the basis of geotechnical calculations during the foundation-design stage.

D.I.11.2. Impacts on legacy environmental contamination

No legacy environmental contamination has been identified or registered in the Project area or its immediate vicinity.

D.I.11.3. Impacts on undermined areas

Given the absence of undermined areas, the Project has no impact on them.

D.I.11.4. Impacts on other environmental characteristics

No other significant impacts not described above are anticipated.

D.II.
CHARACTERISTICS OF RISKS TO PUBLIC HEALTH, CULTURAL HERITAGE, AND THE ENVIRONMENT

II. Characteristics of risks to public health, cultural heritage, and the environment in the event of possible accidents, disasters, and abnormal conditions and the anticipated significant impacts arising from them

D.II.1. Radiation risks

D.II.1.1. Introductory information

D.II.1.1.1. SMR safety characteristics

The safety concept of SMR technology, including the RR SMR reference design, is based on a combination of proven and advanced technologies used in large units, while also making extensive use of passive solutions and passive safety systems that help provide unit autonomy and management of accident conditions even without operator intervention or the need for an energy supply.

The basic safety characteristics of SMRs compared with large units therefore generally include a greater proportion of passive safety systems. The RR SMR reference design uses systems that require no human intervention, electricity, or pumps for reactor shutdown and long-term residual heat removal (at least 72 hours). Structures and systems that perform fundamental safety functions rely on natural laws, such as natural circulation, gravity, and evaporation.

Another characteristic of SMRs generally and the RR SMR reference design is inherent safety: the design includes features that themselves limit accident risk. Examples include self-slowing of the fission reaction as temperature rises because of the negative temperature coefficient of reactivity; resistance to internal hazards based on arranging systems, structures, and components so that a single internal event cannot affect multiple safety systems; locating systems and components to prevent their flooding (vertical profile + drainage); reactor shutdown upon loss of

power to drives, without the need for an I&C intervention; and extensive use of natural-circulation-based heat-removal principles under abnormal and accident conditions.

The defense-in-depth concept is incorporated into the SMR design from the conceptual design stage (see Chapter B.I.6.2.2.2. Requirements for nuclear safety, page 87 of this Documentation).

SMRs are also characterized by a high level of containment leak-tightness and resistance. The reactor is housed in a containment designed both to withstand external hazards, such as an aircraft crash, seismic event, and extreme meteorological conditions, and to prevent radioactive substances from escaping into the surrounding area. In terms of possible hydrogen generation as a consequence of accident conditions, the containment is equipped with design provisions to remove hydrogen from its atmosphere, up to and including severe accident conditions. Hydrogen detonation or deflagration is thereby prevented. The reference design provisions are described in detail in Chapters B.I.6.3.2.2.5.1. and B.I.6.3.2.2.5.2. of this Documentation.

SMR structures and components are manufactured at the applicable supplier plants, assembled into installation modules, and only assembled into larger interconnected units at the power plant site. This modular construction and factory production provide higher manufacturing quality, more detailed inspection, and fewer errors than a greater scope of activities performed directly at the construction site.

Because of the lower installed output of an SMR and the smaller quantity of fuel in the core compared with large units, both decay heat and the source term, meaning the quantity of radioactive substances available for release during an accident, expressed as their activity, are substantially lower than at large nuclear power plants. The smaller source term also results in a smaller radiological impact.

For the RR SMR reference design, its safety characteristics are currently being verified by the United Kingdom Office for Nuclear Regulation (ONR) in the Generic Design Assessment (GDA) process. This process is expected to be completed in 2027. The standard ONR licensing process for the RR SMR under United Kingdom law for the selected Wylfa site is subsequently anticipated. If an SMR is implemented at the Temelín site, the Project will undergo multilevel licensing processes by SÚJB under the Atomic Act and the regulations and requirements derived from it.

Despite the robust safety characteristics of SMR designs, accident conditions cannot be entirely ruled out at any industrial facility, including an SMR. The presence of radioactive substances and the associated risk of their release into the environment remain specific to nuclear technologies. Although modern safety systems minimize this risk, the risk assessment must address this possibility.

Nevertheless, in the global context, nuclear energy remains one of the safest methods of generating energy. Studies by international organizations, such as the OECD/NEA, have consistently shown that the level of risk to human health from nuclear energy is lower than or at most comparable with that from other energy sources. For SMR technologies, advanced passive-safety features further substantially reduce this risk.

D.II.1.1.2. Potential hazards affecting nuclear safety and radiation protection

An abnormal operational state or accident condition at a nuclear facility may arise from failure of one or more components due to an internal or external hazard. An internal hazard means a hazard originating at the nuclear-facility site whose occurrence is or may be influenced by the nuclear-facility operating-license holder, including a hazard, load, or internal event arising as a result. Basic internal postulated initiating events must be established taking the internal-hazard assessment into account so that they cover all internal hazards not eliminated by the technical design or an organizational measure. The SMR design basis must establish a list of internal hazards that could affect performance of functions important to nuclear safety. This list must include all locations with a permanent or temporary source of internal hazard. The procedure for establishing this list is governed by Decree No. 329/2017 Coll., on requirements for the design of a nuclear facility. An internal postulated initiating event may result from failure of systems, structures, or components due to a design or construction error; failure of quality assurance during manufacture, assembly, operation, maintenance, inspections, and tests; component failure due to erroneous personnel intervention; or failure resulting from an internal or external hazard.

Typical internal postulated initiating events include:

- failure of pressure-retaining parts, supports, and other structural parts,
- malfunction or failure of components and systems,
- failures in the electrical-power-supply system and instrumentation and control system,
- failure of a support system, such as cooling, lubrication, electrical power supply, or maintenance of environmental parameters,
- internal missiles that could arise, for example, from rupture of rotating machinery parts,
- internal flooding,
- internal fires and explosions,
- drops and impacts of heavy loads,
- electromagnetic interference between power plant equipment,
- leaks of water, gas, steam, or harmful substances,
- development of environmental-parameter conditions for which equipment is not designed,
- human-factor failure, etc.

External hazards may be of natural origin, meaning site characteristics, or originate from human activity. External hazards are manifested as external design basis events. The basic design basis must establish external design basis events for the nuclear-facility siting area. The procedure

for establishing this list is governed by Decree No. 329/2017 Coll., on requirements for the design of a nuclear facility. External design basis events of natural origin include, for example:

- climatic and meteorological phenomena (windstorms, lightning, high or low temperatures, rain and snowfall, ice formation, extreme drought, etc.),
- flooding,
- a seismic event,
- other geodynamic phenomena (volcanism, slope movements, surface subsidence and deformation, etc., if relevant to the applicable SMR site in terms of site characteristics),
- biological phenomena, or
- wildfires.

Basic external events originating from human activity include, for example:

- failure of dams on watercourses near the nuclear facility,
- explosions and fires originating from human activity,
- strong vibrations,
- electromagnetic interference,
- eddy currents,
- effects of product pipelines and power lines,
- release of toxic, explosive, or otherwise hazardous substances around the nuclear facility, such as during road transportation or storage of such substances within the site,
- accidental crash of an aircraft or other object onto the nuclear facility,
- an accident at another nuclear facility at the site involving release of radioactive or other hazardous substances.

Sabotage and a terrorist attack on the nuclear facility, including the intentional crash of an aircraft, and other specific circumstances characterized by the Atomic Act as the design-basis threat constitute a specific type of externally caused event.

All identified postulated initiating events and corresponding nuclear-facility conditions (operational states and accident conditions up to and including a severe accident) will be evaluated as part of the nuclear-facility licensing process under the Atomic Act, and the acceptability of their consequences and compliance with acceptance criteria will be demonstrated, with evaluation of the acceptance criteria for radiological consequences being of the highest importance. Demonstration of acceptability must be based primarily on deterministic principles, or on a combination of deterministic and probabilistic approaches, with quantification of the event consequence and demonstration of its acceptability for nuclear-facility safety and negligible consequences for the surrounding area. Assessment of the level of protection against terrorist attack and sabotage forms part of the physical-protection documentation approved by SÚJB and is subject to a special regime, meaning that it is classified.

Reliability of systems, structures, and components affecting nuclear-facility safety will be provided through a system ensuring their environmental qualification, resistance of systems to failures, and arrangements for their maintenance and testing. Resistance of systems to failures is provided through redundancy, diversity, and physical separation. Redundancy is provided by multiple backup of safety systems performing the same function, physical separation of the individual redundant systems, and their functional independence. Diversity is provided by ensuring that the fundamental safety functions, namely reactivity control; heat removal from the reactor core and spent fuel outside the reactor; confinement of radioactive substances; radiation shielding; control of planned discharges of radioactive substances; and limitation of radioactive releases under accident conditions, are independently performed by two or more functionally different systems, each capable of performing the safety function independently using a different principle.

D.II.1.1.3. Characteristics of operational states and accident conditions

The acceptability of the consequences of operational states and accident conditions is evaluated according to the frequency with which the condition may occur; the consequence limits for the individual conditions established by national legislation and international requirements must not be exceeded. In general, the maximum permissible consequence criteria are stricter for more probable types of operating and accident conditions than for less probable operating and accident conditions.

SMR ETE operating and accident conditions are classified as follows:

- Operational states:
  - normal operation,
  - abnormal operation.
- Accident conditions:
  - design basis accidents (DBAs),
  - design extension conditions (DEC):
    - multiple equipment failures and complex sequences without significant fuel degradation (DEC-A),

- severe accidents with severe fuel degradation (DEC-B).

- Practically eliminated conditions.

These conditions are characterized as follows:

Normal operation — is a nuclear-facility condition in which the limits and conditions for safe operation of the nuclear facility are met. This includes, in particular, steady-state operation at power and during outages, planned unit shutdown/startup, and increases and decreases in unit output, including load-following.

Abnormal operation — is a nuclear-facility condition deviating from normal operation that does not lead to severe damage to systems, structures, or components affecting nuclear safety and after which the nuclear facility is capable of normal operation. Abnormal operation includes single faults and failures expected to occur during the unit's operating life. Typical cases in this category include loss of off-site power; control-circuit failures; pump trip or spurious pump startup; failures in the reactivity-control system; spurious opening or closing of valves; short-term opening of steam-generator safety valves or atmospheric steam dump stations; and rupture of small-diameter piping (auxiliary piping and instrumentation and sampling lines). Events classified as abnormal operation must not lead to loss of function of any barrier or safety system, and their impact on the surrounding area must be minimal, meaning the radiological design acceptance criteria for abnormal operation must be met; see criterion K1 (see Chapter B.I.6.2.2.3. Radiation protection requirements, page 94 of this Documentation).

Design basis accidents (DBAs) are accident conditions in which proper operation of safety systems ensures that the applicable reference levels or exposure limits are not exceeded. By frequency of occurrence, design basis accidents can be divided into the following groups in accordance with SÚJB Decree No. 329/2017 Coll.:

- Events of moderate frequency. This category must include internal postulated initiating events that meet the radiological design acceptance criteria for less severe design basis accidents.
- Events of low frequency. This category must include internal postulated initiating events and scenarios that meet the radiological design acceptance criteria for severe design basis accidents.

Initiating events in this accident category include rupture of process piping (main feedwater, steam, and primary-circuit piping), rupture of a steam-generator tube or tubes, uncontrolled control-rod withdrawal, spurious opening of the pressurizer safety valve, and a mechanical failure in the reactor trip system. Basic criterion K2 is applied to design basis accidents (see Chapter B.I.6.2.2.3. Radiation protection requirements, page 94 of this Documentation), requiring that no accident not involving reactor-core melting or damage to irradiated nuclear fuel in storage pools lead to a radionuclide release requiring the introduction of protective measures consisting of sheltering, iodine prophylaxis, or evacuation of residents anywhere around SMR ETE.

Design extension conditions (DECs) are accident conditions caused by scenarios more severe than a design basis accident that are considered in nuclear-facility design. They are accidents not considered among design basis accidents but analyzed in the design using best-estimate methodologies and for which radiological consequences remain within the defined acceptance criteria. These are accidents and multiple failures assumed to have a very low frequency of occurrence, meaning occurrence over a period longer than one hundred times the nuclear facility's service life. Design extension conditions are divided into:

- multiple failures without severe damage to the fuel system, complex sequences (DEC-A),
- severe accidents involving significant damage to the fuel system (DEC-B).

Whereas the reactors currently in operation were not originally designed for such conditions and their robustness was increased only through modernization, the small modular reactors considered in the Project incorporate in their design the capability to manage or minimize the consequences of design extension conditions, including severe accidents. The most important characteristics include extended coping capability during a loss of all electrical power sources (station blackout), resistance to the crash of a large aircraft, and the capability to manage fuel-melting events without containment failure. Examples of multiple failures forming part of design extension conditions include abnormal conditions involving failure of the reactor scram system; loss of all electrical power sources (station blackout); rupture of the primary circuit with partial failure of the emergency core cooling system; rupture of a steam-generator tube or tubes accompanied by loss of secondary-circuit integrity; loss of cooling of the irradiated/spent nuclear fuel storage pool; multiple failures in the cooling-water, essential service-water, heat-removal, or ultimate-heat-sink systems; and multiple common-cause events of internal or external origin.

Criterion K2 applies analogously to design extension conditions that do not involve melting of the nuclear reactor core or severe damage to irradiated nuclear fuel in storage pools (see Chapter B.I.6.2.2.3. Radiation protection requirements, page 94 of this Documentation), requiring that no accident not involving reactor-core melting or damage to irradiated nuclear fuel in storage pools lead to a radionuclide release requiring the introduction of

protective measures consisting of sheltering, iodine prophylaxis, or evacuation of residents anywhere around SMR ETE.

Criterion K3 applies to severe accidents involving nuclear-reactor-core melting or severe damage to irradiated nuclear fuel in storage pools (see Chapter B.I.6.2.2.3. Radiation protection requirements, page 94 of this Documentation), requiring that evacuation of residents not be necessary and long-term restrictions on food consumption not need to be introduced in the immediate vicinity of SMR ETE. Accidents that could lead to early or large releases must be practically eliminated. Accordingly, containment functionality must be maintained during a severe accident, and the possibility of large or early releases of radionuclides from the containment into the environment must be practically eliminated.

Practically eliminated conditions are conditions, states, or events whose occurrence is considered physically impossible or, with a high degree of confidence, extremely unlikely. These are severe accident sequences involving core melting or severe damage to stored irradiated/spent nuclear fuel outside the containment that could lead to early or large releases of radioactive substances into the surrounding area. The aggregate frequency/probability of a large or early release of radioactive substances into the area surrounding the power plant must reliably be, with a margin, less than 1×10^{-6}/year. To allow mitigation of the consequences of accidents whose consequences exceed design extension conditions (DECs), the SMR ETE design will include all technical and organizational resources needed by the operator to fulfill all its obligations under the Atomic Act in the event of a radiation accident. Introduction of the applicable protective measures will be based on criteria established by the legislation of the Czech Republic and the EU and by IAEA and ICRP recommendations.

D.II.1.1.4. Approach to the assessment of the radiological consequences of extraordinary conditions in the EIA process

Demonstration of the acceptability of the consequences of possible abnormal operating conditions and accident conditions at SMR ETE will be the subject of subsequent proceedings conducted for the SMR ETE Project under the Atomic Act.

Within the environmental and public-health impact assessment (EIA) process, impacts on the surrounding area and population are evaluated for the following representative, conservatively bounding cases (scenarios) of accident conditions:

- design basis accident (DBA), and
- severe accident involving fuel melting (DEC-B).

Both scenarios are characterized by a conservatively established (bounding) source term of radionuclides released into the surrounding area, consisting of the principal and derived radionuclides, release duration, release characteristics (a ground-level release, which results in greater radiological consequences than an elevated release), and the forms of released iodine isotopes, as iodine is one of the principal radionuclides in terms of radiological impacts. The source term is based on reference-unit data concerning the composition of irradiated nuclear fuel in the reactor, maximum fuel burnup, assumptions regarding fuel-cladding failure or fuel melting, and event duration in accordance with international standards; WENRA and EUR requirements for limiting the consequences of radiation extraordinary events for new reactors; and requirements for the maximum permissible conservatively assumed volumetric containment leakage rate of 0.2 % per day. The source term is compared with available safety documentation for SMRs and large PWRs and is assessed as sufficiently conservative.

For the analysis of the radiological consequences of radiation extraordinary events (see Chapter D.II.1.2. Radiation extraordinary events, page 434 of this Documentation), a generally recognized bounding approach is used, under which both the representative source term, characterizing the magnitude of the radionuclide release into the surrounding area for assessing radiological consequences, and other parameters, such as meteorological conditions, are established so that the analyzed radiological consequences will, with a sufficient margin, be less favorable than those indicated by the results of subsequent safety analyses, with the degree of uncertainty taken into account, such as in the Preliminary Safety Analysis Report, during the licensing process under the Atomic Act. This ensures that the EIA process addresses potentially least favorable abnormal conditions.

The manner in which practically eliminated conditions are ensured, meaning technical and organizational measures to prevent an early or large radioactive release, is also discussed (see Chapter D.II.1.3. Practically eliminated conditions, page 460 of this Documentation). Demonstration of compliance with the conditions for practical elimination for the SMR ETE Project will be the subject of subsequent proceedings under the Atomic Act.

D.II.1.2. Radiation extraordinary events

D.II.1.2.1. Acceptance criteria for emergencies under accident conditions

D.II.1.2.1.1. Characteristics of environmental risk

The hazard associated with the possible consequences of a radiation extraordinary event, meaning an event resulting in a significant release of radioactive substances into the environment, can be assessed by the scope of the measures necessary to protect the population at risk and by the level of contamination of the affected environment.

Immediately following a release of radioactive substances from a nuclear facility as a result of a radiation extraordinary event, the population and the environment could be exposed to a passing plume of radioactive gases and aerosols. The plume is a source of both external and internal exposure, the latter occurring through inhalation of radioactive substances. As the plume passes, radioactive aerosols gradually deposit and contaminate the terrain. Even after the plume disperses, this contamination causes external exposure from the deposit and internal exposure through inhalation of contaminated dust.

Because radioisotopes of noble gases, iodine, and cesium make the greatest contribution to the committed effective dose, information on releases of these radionuclides is particularly important in assessing the urgency of urgent protective measures. Terrain contamination constitutes long-term environmental damage affecting all flora and fauna to varying degrees. The degree of terrain contamination also depends on the meteorological conditions after a radiation extraordinary event occurs and on whether it was raining at a given location as the plume passed. From the perspective of health risks to the population, the transport of activity through food chains is significant because it results in internal exposure through food intake (ingestion), primarily the consumption of contaminated agricultural products.

The generally recognized conservative approach used for safety analyses requires the source term (ZDČ[1]) to be established so that the radiological consequences corresponding to this ZDČ are, with a sufficient margin, more severe than those indicated by the results of future safety analyses for the specific reactor, with the degree of uncertainty taken into account. The estimate of radiological consequences for environmental-impact-assessment purposes may therefore be more general, provided that it is made with a sufficient margin and that a detailed assessment of the specific design will be performed in the Preliminary Safety Analysis Report.

The potential severity of the radiological consequences of a radiation extraordinary event is related to the inventory of fission products in the reactor and the extent of damage to the protective barriers preventing release of radioactive substances into the environment.

Fission products and other radioactive substances are present primarily in the fuel structure itself within the nuclear-reactor core, as well as beneath the fuel-rod cladding, in the gap between the fuel itself and the protective fuel-cladding tube, and, finally, in the primary-circuit coolant. The total activity of fission products during reactor operation at power depends primarily on fuel composition, the quantity of fuel in the core, and its burnup at the time of the event, and is on the order of multiples of 1E+20 Bq.

Among the fission products, only isotopes of noble gases, iodine, and cesium are present in significant quantities in the primary circuit coolant and beneath the fuel-rod cladding, but their activity in the coolant is on the order of one hundred thousand times lower than in the fuel. Isotopes of other elements relevant in terms of radiological consequences, such as Sr, Te, Ru, La, Ce, and Ba, are present in the coolant only in insignificant quantities. The radioactivity of isotopes in the gas gap beneath the cladding represents only fractions of a percent of the fuel's total activity inventory. The severity of the radiological consequences of emergencies therefore differs fundamentally depending on whether only reactor-cooling-circuit integrity is lost, the fuel-rod cladding is also damaged (gas leakage), or the fuel actually melts.

Exposure of individuals and the environment during a radiation extraordinary event is limited by implementing the following protective measures:

- urgent protective measures, including sheltering, iodine prophylaxis, and evacuation,
- subsequent protective measures, including relocation, restrictions on the consumption of food and water contaminated with radionuclides, and restrictions on the use of feed contaminated with radionuclides.

Protective measures during radiation accidents are always implemented if justified by benefits greater than the costs of the measures and the damage they cause, and must be optimized in form, scope, and duration so as to provide the greatest reasonably achievable benefit.

Within the meaning of SÚJB Decree No. 422/2016 Coll., on radiation protection and security of a radionuclide source, as amended, an urgent protective measure is always considered justified if the anticipated exposure of any individual could result in immediate injury to health. Urgent protective measures must therefore always be introduced if it can be anticipated that absorbed doses to organs or tissues could exceed, for any person over a period of less than 2 days, the levels specified in the following table.

[1] The source term means the quantity of radionuclides, their isotopic composition, and chemical form that may be released into the environment under various accident-condition scenarios and thus contribute to exposure of the population and environmental components.

Table D.80: Levels above which intervention is expected to be undertaken under any circumstances

Organ, tissue	Absorbed dose anticipated or expected to be received over a period of less than two days [Gy]
Whole body	1 *)
Lungs	6
Skin	3
Thyroid	5
Lens of the eye	1.5
Gonads	1
*) The possibility of immediate injury to the fetus at anticipated doses greater than approximately 0.1 Gy must be taken into account when justifying and optimizing the current intervention level for urgent protective measures.	

If the values specified in the preceding table are not reached, guidance values reflecting the current state of knowledge and internationally acquired experience regarding when a particular protective measure can be expected to provide more benefit than harm are applied as basic guidance for deciding whether to introduce protective measures. For individual radiation practices or ionizing-radiation sources associated with a radiation extraordinary event hazard, reference intervention levels specific to the practice or source are established in emergency plans by optimizing radiation protection on the basis of data specific to the individual case.

Data specific to establishing intervention levels include, for example, data characterizing settlement and infrastructure around the ionizing-radiation source and affecting anticipated collective effective doses and the feasibility of protective measures, particularly the presence of specific population groups, traffic conditions, and similar factors.

When deciding whether to adopt protective measures during a radiation extraordinary event, particular consideration must be given to whether the current conditions differ significantly from the conditions applied when establishing the intervention levels. If a radiation extraordinary event occurs concurrently with an emergency resulting from another accident, such as an accident involving a release of harmful chemicals or a natural disaster, consideration must also be given to whether introducing the radiation protective measure would increase the damage caused by these other accidents or disasters by more than the benefit from reduced exposure.

Under SÚJB Decree No. 422/2016 Coll., the following urgent protective measures are justified:

a) sheltering, if the averted effective dose is greater than 10 mSv over a sheltering period not exceeding 2 days,
b) iodine prophylaxis, if internal contamination with radioactive iodine is threatened and the averted committed equivalent dose to the thyroid caused by iodine radioisotopes is greater than 100 mSv,
c) evacuation, if the sum of the effective dose already received in the emergency exposure situation, taking into account the effect of protective measures already implemented, and the effective dose that could be averted by evacuation for 7 days is greater than 100 mSv.

Under SÚJB Decree No. 422/2016 Coll., the following subsequent protective measures are justified:

a) restrictions on the use of food, water, and feed contaminated with radionuclides, if the averted annual committed effective dose is greater than 1 mSv; if areas affected by a radiation accident where natural persons may continue to remain under specified conditions based on an evaluation of the radiation situation can be supplied with uncontaminated food, water, and feed, this option is preferred,
b) relocation of residents, if an effective dose to residents of less than 20 mSv over the following 12 months cannot be ensured upon their return to the affected territory.

When deciding whether to withdraw protective measures that have been introduced, the exposure that would occur after their withdrawal must be taken into account. Withdrawal of the protective measures of sheltering, evacuation, and relocation of residents is justified if the effective dose over the 12 months following withdrawal is less than 20 mSv.

The permissible radiological consequences of emergencies are limited collectively in the legislation of the Czech Republic and in WENRA and IAEA recommendations for new nuclear sources so that a release of radioactive substances during design basis accidents must not require any protective measure outside nuclear facilities and, even during severe accidents, a radioactive release must not cause significant exposure or injury to the health of residents in the immediate vicinity of the nuclear power plant or lead to the introduction of long-term, large-area restrictions on food-chain regulation or the use of land or water bodies. This limits the environmental risk of radiation extraordinary events to an acceptable level.

D.II.1.2.1.2. SÚJB criteria

Acceptance criteria for radiation protection are established in SÚJB safety guides with reference to Decree No. 422/2016 Coll., on radiation protection and security of a radionuclide source, as amended. The latest of these guides is BN-JB-3.1 (Rev. 0.0), Requirements for the Design of a Nuclear Facility, from 2023, in which the acceptance criteria for the radiological consequences of individual nuclear-facility conditions are specified in Annex No. 4.

In its statement concerning the SMR ETE Project notification, ref. No.: SÚJB/SJB/31985/2024 of December 18, 2024, SÚJB specifies the following radiological criteria:

1. No accident not involving core melt or damage to irradiated nuclear fuel in storage pools will lead to a radionuclide release requiring the implementation of protective measures consisting of sheltering, iodine prophylaxis, or evacuation of residents anywhere around the New NPP. (Criterion K2)
2. For postulated accidents involving nuclear-reactor-core melting or damage to irradiated nuclear fuel in storage pools, design provisions must be adopted so that evacuation of residents is not necessary and long-term restrictions on food consumption need not be introduced in the immediate vicinity. (Criterion K3)
3. Accidents involving core melt that could lead to early or large releases must be practically eliminated. An early release means a release that, for postulated core-melt accidents, would not allow the timely introduction of protective measures consisting of sheltering and iodine prophylaxis. A large release means a release that would require measures precluded by this criterion. (Criterion K4)

In substance, SÚJB criteria K2 and K3 correspond to the WENRA recommendations specified below concerning the impacts of accidents without fuel melting (criterion K2) and accidents with fuel melting (criterion K3).

D.II.1.2.1.3. Criteria under WENRA recommendations

For design basis accidents, as well as design extension conditions without fuel melting, the WENRA recommendations require no or only minor radiological consequences, meaning no need to implement urgent protective measures for residents around SMR ETE and no or only a minor need, limited in time and space, to implement restrictions on food and agricultural products. The requirements for implementing restrictions on food and agricultural products are interpreted in accordance with the applicable European Commission regulations specified in the tables below.

For severe accidents, meaning design extension conditions involving fuel melting, WENRA recommendations require radiological consequences limited in space and time that ensure compliance with the following requirements:

- the need for evacuation at distances greater than approximately 3 km is eliminated,
- the need for sheltering and iodine prophylaxis at distances greater than approximately 5 km is eliminated,
- agricultural produce at distances greater than approximately 5 km will be fit for consumption one year after a radiation accident,
- no permanent relocation anywhere outside the power plant site, interpreted for practical application as no permanent relocation at distances greater than 800 m from the reactor.

D.II.1.2.1.4. Intervention levels and guidance values for protective measures

The intervention levels and guidance values for protective measures used in the assessment are based on the Atomic Act and its implementing regulations, as well as the requirements of EU Council directives and ICRP recommendations, and are summarized in the following tables.

Table D.81: Intervention levels prohibiting the placing of food on the market (EC Regulations 3954/87 and 2016/52)

Radionuclide	Concentration in food [Bq/kg]				
	Infant food	Dairy products (milk, cream)	Other food except minor foodstuffs	Liquid food (juices)	Minor foodstuffs (spices, garlic)
Strontium isotopes, principally Sr-90	75	125	750	125	7500
Iodine isotopes, principally I-131	150	500	2000	500	20,000
Alpha-emitting isotopes of plutonium and trans-plutonium elements, principally Pu-239, Am-241	1	20	80	20	800
All other nuclides with a half-life of more than 10 days, principally Cs-134, Cs-137	400	1000	1250	1000	12,500

Table D.82: Intervention levels prohibiting the placing of feed on the market (EC Regulations 770/90 and 2016/52)

Animal	Concentration in feed [Bq/kg]
Pig	1250
Poultry, lamb, calf	2500
Other	5000

Table D.83: Justified levels for implementing measures (SÚJB Decree No. 422/2016 Coll. and ICRP recommendations)

Measure	Intervention level under Decree No. 422/2016 Coll.	ICRP recommended range of intervention levels
Evacuation	100 mSv, effective dose averted by evacuation for 7 days	50–500 mSv, effective dose averted over 1 week
Sheltering	10 mSv, effective dose averted by sheltering for 2 days	5–50 mSv, effective dose averted over 2 days
Iodine prophylaxis for adults and children	100 mSv, averted committed equivalent dose to the thyroid caused by inhalation of iodine	50–500 mSv, averted effective dose (thyroid)
Relocation	(for implementation) 20 mSv per year, effective dose without ingestion	100 mSv, effective dose averted in the first year or 1000 mSv, effective dose averted over a lifetime
Restrictions on the use of food, water, and feed contaminated with radionuclides	if the averted annual committed effective dose is greater than 1 mSv	10 mSv/year, averted committed effective dose

The applicable national guidelines and catalogs specified below are also applied in evaluating the consequences of radiation extraordinary events for the territories and populations of Austria and Germany.

Table D.84: Intervention measures in Austria according to BMLUK (2020)

Measure	Dose for persons <18 years of age, pregnant women [mSv]	Dose for adults [mSv]	Dose for persons
Sheltering indoors	1	10	Expected (projected) effective dose over a maximum of 2 days from external exposure and committed effective dose from inhalation
Iodine prophylaxis	10	100	Expected (projected) equivalent dose to the thyroid over a maximum of 2 days caused by inhalation of iodine, meaning the committed equivalent dose to the thyroid
Evacuation	50	50	Avertable effective dose over a maximum of 2 days from external exposure and committed effective dose from inhalation
Temporary relocation	30	30	Expected (projected) effective dose over 30 days from external exposure from deposits and committed effective dose from inhalation due to resuspension
Permanent relocation	100	100	Expected (projected) effective dose over 1 year from external exposure from deposits and committed effective dose from inhalation due to resuspension

Table D.85: Intervention measures in Germany (StrlSchG, 2017)

Measure	Dose for persons <18 years of age, pregnant women [mSv]	Dose for adults [mSv]	Dose for persons
Sheltering indoors	10	10	Expected (projected) effective dose over 7 days from external exposure and committed effective dose from inhalation
Iodine prophylaxis	50	250	Expected (projected) equivalent dose to the thyroid over 7 days caused by inhalation of iodine, meaning the committed equivalent dose to the thyroid
Evacuation	100	100	Expected (projected) effective dose over 7 days from external exposure and committed effective dose from inhalation
Relocation (the generic value under IAEA GSR Part 3 is applied)	100	100	Expected (projected) effective dose over the first year from external exposure from deposits and committed effective dose from inhalation due to resuspension

Table D.86: (Projected) values for agricultural measure A07 ("Immediate harvesting of marketable products, particularly storable products")

	I-131 [Bq.h/m^3]	I-131 [Bq/m^2]	Cs-137 [Bq.h/m^3]	Cs-137 [Bq/m^2]
Threshold for initiating the measure (BMLFUW 2014)	170	700	350	650
Threshold for initiating the measure (Massnahmenkatalog 2022)	170	700	360	650

D.II.1.2.2. Determination of the source term for assessing the radiological consequences of radiation extraordinary events

A generally recognized bounding approach[1] is used for analyses of the representative design basis accident (DBA) and severe accident (DEC-B) cases documented in the EIA Documentation for SMR ETE. Under this approach, the representative source term, characterizing the magnitude of the radionuclide release into the surrounding area for assessing radiological consequences, and other selected parameters are established so that the radiological consequences corresponding to this source term will, with a sufficient margin, be greater, meaning more conservative, than those indicated by the results of subsequent safety analyses, with the degree of uncertainty taken into account, such as in the Preliminary Safety Analysis Report, during the nuclear-facility licensing process.

The bounding source terms for both DBA and DEC-B are derived from the EUR requirements for limiting the economic consequences of accidents, which are applied as a mandatory requirement, and from US NRC recommendations in NUREG-1645, NUREG-1940, and Regulatory Guide 1.183 for modeling radionuclide behavior in the containment. Containment leakage is assumed at 0.2 % of containment volume per 24 hours, whereas the design containment leakage rate for accident conditions in the RR SMR reference design is 0.1 % of containment volume per 24 hours, meaning half that value. The ratio between the core sizes of the reference RR SMR and large units and the results for releases of radioactive substances into the containment atmosphere for large units are taken into account when establishing the source terms. When establishing the DBA source term, the duration of release from the containment into the surrounding area is assumed to be 24 hours; for modeling radiological consequences, it is then conservatively assumed that the resulting source term is released uniformly into the environment over 2 hours. Similarly, the DEC-B source term is established assuming a 7-day accident duration, and modeling of the radiological consequences assumes that the entire source term is released uniformly into the surrounding area over 24 hours.

A source term is also established for loss of integrity of fuel-assembly cladding in the storage pool. Because damage to irradiated nuclear fuel in the storage pools is assumed during this event, the same criteria as for a severe accident are applied to it. However, the source term is several orders of magnitude lower, so it is not quantified separately and is bounded by the severe accident (DEC-B) radiological-consequence analysis.

D.II.1.2.2.1. Source term for a design basis accident (DBA)

A complete rupture of primary-circuit piping inside the SMR ETE containment is selected as the representative accident that does not lead to nuclear-reactor-core melting or damage to irradiated nuclear fuel in storage pools but results in the highest radiological impacts. For this case, the source term is established using the EUR accident-consequence-limitation criteria for Cs-137 and I-131 and a conservatively increased (approx. 10×) noble-gas release value compared with EUR requirements for the permissible extent of fuel-rod-cladding loss of leak-tightness and permissible containment leakage. The total release duration is conservatively established at 2 hours, although in practice the total quantity of released radioactive substances would be discharged into the surrounding area more slowly and would therefore have lower overall consequences. Elemental iodine is conservatively assumed to be the predominant form of iodine-isotope release because it has the highest deposition rate.

Compared with events in the irradiated/spent-fuel storage pool in which the irradiated/spent nuclear fuel is not damaged, complete rupture of primary-circuit piping results in clearly greater radiological consequences and therefore also bounds this group of events. This event similarly bounds design basis accidents involving primary-coolant leakage into the secondary circuit, meaning steam-generator-tube rupture, during which only a limited quantity of primary-circuit coolant may be released into the surrounding area without concurrent nuclear-fuel damage.

When establishing the DBA source term for SMR ETE, comparison with available DBA analyses presented in the safety analysis reports for new large PWR units verified that, for all design basis accidents, releases of the decisive radionuclides I-131 and Cs-137 into the surrounding area over the full duration of DBA accident conditions are significantly lower, by at least two orders of magnitude, than the bounding source term used for SMR ETE for the same category of events.

The large margins in the bounding DBA source term for SMR ETE relative to the radiological acceptance criteria provide sufficient scope to cover the radiological consequences of the basic postulated sequences classified as DEC-A accident conditions.

The derived and applied aggregate source term for accidents that do not lead to core melting constitutes the bounding DBA source-term case, which also bounds the basic postulated DEC-A sequences for SMR ETE. It is presented in the following table.

Table D.87: Source term for a design basis accident (DBA)

Group	1		2		3	
Reference isotope	Xe-133		I-131		Cs-137	
Activity released into the surrounding area for the reference isotope [TBq]	1,000		4.4		0.5	
Activity released into the surrounding area for other isotopes in the group [TBq]	Kr-85 Kr-85m Kr-87 Kr-88	6 150 300 400	I-132 I-133 I-134 I-135	6.6 9.2 10.1 8.8	Cs-134 Cs-136	1 0.25

[1] IAEA NG-T-3.11, Managing Environmental Impact Assessment for Construction and Operation in New Nuclear Power Programmes.

	Xe-131m Xe-133m Xe-135 Xe-135m Xe-138	6 30 300 220 900				
Release duration and type:	2 hours, ground-level release					
Forms of iodine:	100 % elemental iodine					

D.II.1.2.2.2. Source term for a severe accident (DEC-B)

A severe accident involving fuel melting while the protective function of the containment is maintained is classified as a design extension condition. Complete melting of the core fuel with concurrent damage to the primary-circuit pressure boundary and release of radioactive substances from the fuel into the containment is selected as the representative accident involving nuclear-reactor-core melting. Application of in-vessel retention is anticipated for SMR ETE, meaning that reactor-pressure-vessel integrity is not lost during a severe accident and containment function is also maintained, although leakage greater than the design value is conservatively assumed.

The Cs-137 release limit for the surrounding area, intended to limit the economic impacts of a severe accident, is used as the basis for determining the bounding source term for severe accidents. Based on comparison with Cs-137 releases during severe accidents at large units, a Cs-137 release value of half that amount, meaning 15 TBq over the entire release duration, is derived for SMR ETE. This results from the smaller SMR core volume with a comparable isotopic composition and presence of radioactive substances in the irradiated fuel. Using the core inventory of fission products, the total activity of Cs-137 and each other isotope in the aerosol group released into the containment is established in accordance with US NRC NUREG-1465 for pressurized-water reactors. These isotopes are then released into the surrounding area in the same ratio as that assumed for the relative values of released activity to the total activity of Cs-137 in the core. The noble-gas release is modeled for the representative Xe-133 case and calculated proportionally for the other noble gases. The release of Xe-133 into the surrounding area is determined from the quantity of Xe-133 released into the containment, an assumed conservatively increased containment leakage rate of 0.2 % vol./24 hours, and the Xe-133 half-life over time. The release is calculated for 7 days, and the total quantity released over 7 days is subsequently simulated as a release over 24 hours. The resulting Xe-133 release value, rounded up, is 35,000 TBq. The other noble gases are released in proportion to their content in the containment relative to Xe-133. For I-131, the release is established at 50 % of the value used for large units, meaning 500 TBq; the other iodine isotopes are released in the ratio in which they occur relative to I-131 in the containment during a severe accident. In accordance with the EUR Revision E release-limitation methodology, the release duration is assumed to be 24 hours, although the actual duration is longer. It is therefore conservatively assumed that all isotopes that would actually be released over a period of up to 7 days are released into the surrounding area within 1 day[1].

In accordance with US NRC NUREG-1940, the iodine released into the surrounding area is assumed to consist of 25 % aerosols and 75 % gases, of which 30 % is elemental and 45 % is organic CH_3I. Based on comparison of source terms and assessments performed previously, this source term also bounds, in terms of radiological consequences, the consequences of a fuel-assembly-damage event during handling in the irradiated/spent-fuel storage pool.

The derived and applied aggregate source term for severe accidents involving nuclear-reactor-core melting while containment leak-tightness is maintained constitutes the bounding source-term case for this type of event (DEC-B). It is presented in the following table.

Table D.88: Source term for a severe accident (DEC-B) - ground-level release

Group	1		2		3		4	
Reference isotope	Xe-133		I-131		Cs-137		Te-131m	
Activity released into the surrounding area for the reference isotope [TBq]	35,000		500		15		9	
Activity released into the surrounding area for other isotopes in the group [TBq]	Kr-85 Kr-85m Kr-87 Kr-88 Xe-131m Xe-133m Xe-135 Xe-135m Xe-138	2.1E+02 5.3E+03 1.1E+04 1.4E+04 2.1E+02 1.1E+03 1.1E+04 7.7E+03 3.2E+04	I-132 I-133 I-134 I-135	750 1,050 1,150 1,000	Cs-134 Cs-136	30 7.5	Te-129m Te-132 Sb-127 Sb-129	3.6 90 7.2 20.7
Group	5		6		7		8	9

[1] Detailed simulations of accidents involving known reactors show that the combination of several processes occurring concurrently in the containment, particularly fission-product deposition and a decrease in containment pressure, causes a substantial proportion of the radioactive release, more than 90 %, to occur within the first 24 hours after a severe accident begins. It also generally applies that releasing the same activity into the surrounding area over a shorter time interval increases the calculated radiation doses. Although distributing the total releases over 7 days would partially reduce the doses, the numerous other uncertainties, primarily due to differing accident progressions, could raise doubts as to whether the estimates used are sufficiently conservative.

Reference isotope	Sr-90		Ru-103		La-140		Ce-141		Ba-140
Activity released into the surrounding area for the reference isotope [TBq]	2		1.5		2		2		40
Activity released into the surrounding area for other isotopes in the group [TBq]	Sr-89 Sr-91	24 30	Mo-99	2	Y-91	1.4	Ce-144 Np-239	1.6 24	---
Release duration and type:	24 hours, ground-level release								
Forms of iodine:	25 % aerosol, 30 % elemental, 45 % organic iodine								

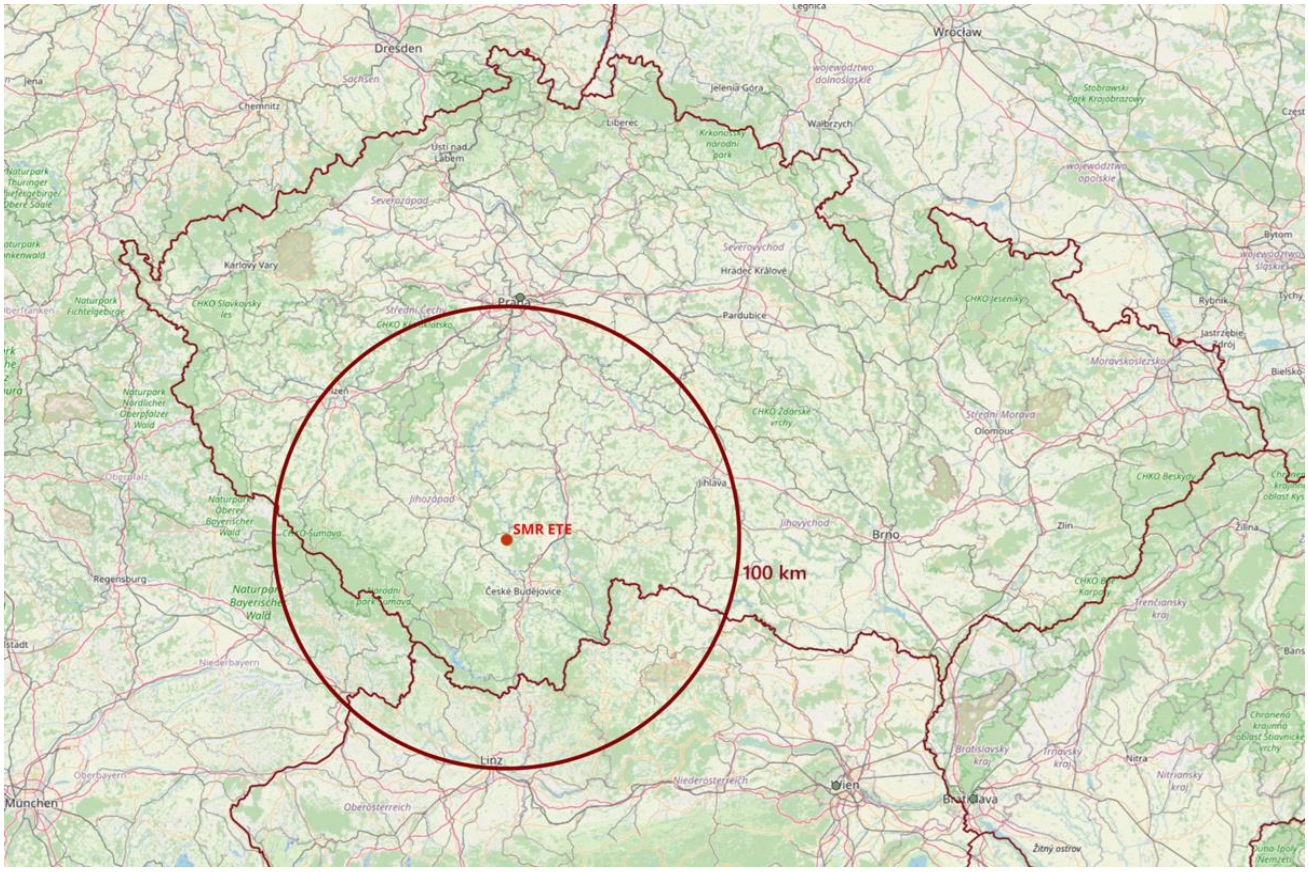
D.II.1.2.3. Assessment of the radiological consequences of radiation extraordinary events for the population

D.II.1.2.3.1. Methodological information

D.II.1.2.3.1.1. Area analyzed

The assessment of the consequences of radiation extraordinary events addresses the area within 100 km of SMR ETE, which also extends into the neighboring countries of Austria and Germany. For analysis of possible short-term impacts on agricultural production and the placing of food on the market, the area analyzed is extended to a distance of up to 400 km from SMR ETE in the cases of Slovakia and Poland.

Fig. D.24: Delineation of the area for detailed calculations of the radiological consequences of a radiation extraordinary event



The coordinates of the release location used for the calculation are: 49°10'20.2" N 14°22'32.4" E (49.172269 N, 14.375653 E), representing the anticipated location of the SMR ETE reactor.

The computational domain and grid are selected to include the area within 100 km of SMR ETE. The calculations are performed on a grid with a resolution of:

- 100 m in a square area measuring 3.7 × 3.7 km around SMR ETE, with the release location at the center of the area,
- 300 m in a square area from a distance of 3.7 km to 11.1 km from SMR ETE,
- 900 m in a square area from a distance of 11.1 km to 33.3 km from SMR ETE,
- 2.7 km in a square area from a distance of 33.3 km to 124.2 km from SMR ETE.

D.II.1.2.3.1.2. Methodology for analyzing the impacts of radiation extraordinary events

Modeling of the dispersion of radioactive substances in the environment; determination of radiation doses, the extent to which agricultural production is affected, and other parameters, such as deposits and volumetric concentrations of specific radionuclides at a specific time and in a specific sector, are presented in the report by ABmerit, s. r. o. (P. Čarný et al.: EIA SMR ETE radiological impacts of accident conditions, including a severe accident and transboundary impacts, December 2025, and its revision due to issuance of the amendment to SÚJB Decree No. 422/2016 Coll., May 2026).

The radiological consequences of selected accident conditions are modeled using the ESTE software. The ESTE software was developed and is continuously improved in accordance with the quality-assurance program implemented by its developer, ABmerit, s. r. o., under ISO 9001. The ESTE software has been validated and compared at the IAEA and OECD levels in numerous international projects, including MODARIA and FASTRUN. The ESTE software for assessing the impacts of accidents involving releases of radioactive substances into the atmosphere is implemented at numerous institutions and organizations, the principal ones being:

- Crisis Center of the State Office for Nuclear Safety (SÚJB), Prague, Czechia,
- Public Health Authority of the Slovak Republic, Bratislava, Slovakia,
- Mochovce NPP Emergency Response Center, Slovakia,
- Bohunice NPP Emergency Response Center, Slovakia,
- Kozloduy NPP Emergency Response Center, Bulgaria,
- Crisis Center of the Ministry of the Environment of the Republic of Austria, Vienna, Austria,
- Crisis Center of the Bulgarian Nuclear Regulatory Agency (NRA), Sofia, Bulgaria,
- Technical Support Center - Aramar Nuclear Complex, Brazil (note: supplied under an IAEA contract),
- OSGE (Orlen Synthos Green Energy), Warsaw, Poland.

The LPM (Lagrangian Particle Model) and PTM (Puff Trajectory Model) dispersion models are implemented in the ESTE software. The analyses for SMR ETE are performed using the PTM dispersion model. In the PTM model, the source term, meaning the release, is modeled as a discharge (puff) over the applicable time interval. A time interval of 1 hour is applied for the analysis, meaning the source term is defined by nuclide in Bq/h as specified. The discharge or release of radioactive substances, meaning the radioactive plume or "puff", propagates through the atmosphere as expanding discrete clouds, or "puffs". A Gaussian atmospheric-dispersion model is used to describe atmospheric diffusion in the horizontal direction. A numerical solution of the semi-empirical atmospheric-diffusion equation is used to describe vertical atmospheric diffusion of the puff. The mathematical model takes into account the mechanisms of radioactive transformation, washout by precipitation, and dry deposition.

Determination of the plume dose is based on the calculated volumetric concentration of the nuclide, for all nuclides in the source term, in the ground-level atmospheric layer, meaning the lowest box in the PTM computational model in ESTE. Dose coefficients according to the NRPB Emergency Data Handbook (N. P. McColl and S. L. Prosser, 2001) and the US NRC Response Technical Manual (RTM), 1995, are applied to convert activity concentration to plume dose. For plume-dose calculations at the shortest distances, up to 5 km, a specific algorithm using conservatively established dose coefficients is applied to prevent underestimation of the plume dose in the immediate vicinity of the release source. Such underestimation could occur when there is still no or only a low concentration of radioactive substances in the ground-level atmospheric layer and, in the model, all plume activity is still located more or less along the plume centerline. At distances of up to 5 km from the release location and during the first hour of plume movement, the resulting plume dose at a given point in the ESTE models is therefore equal to the higher of the values calculated using the two modeling procedures. After the first hour or at distances greater than 5 km from the release location, only the basic model (PTM) is used in ESTE.

Based on the calculated deposition on the terrain, the ESTE software determines the dose rate from terrain deposits and the integrated dose from deposits over 2 days, 7 days, 30 days, and 1 year. Dose coefficients established according to the NRPB Emergency Data Handbook (N. P. McColl and S. L. Prosser, 2001) and the US NRC Response Technical Manual (RTM), 1995, are applied to calculate the exposure dose from deposits. For persons sheltering indoors, the ESTE software applies a building shielding factor of 0.14 when calculating the dose from terrain deposits, meaning that the indoor dose equals the dose from terrain deposits in the open multiplied by a coefficient of 0.14.

Calculation of the committed effective dose from inhalation is based on the activity concentration of the nuclide, for all nuclides in the source term, in the ground-level atmospheric layer, meaning the lowest box in the PTM computational model in ESTE. Dose coefficients for intake by inhalation of radioactive aerosols or vapors by a member of the public under Annex No. 3 to Decree No. 422/2016 Coll., on radiation protection and security of a radionuclide source, are applied to convert activity concentration to the committed dose from inhalation. In accordance with Annex No. 5 to Decree No. 422/2016 Coll., the calculation is performed for the following age categories:

- 0–5 years, using dose coefficients for the age of 1 year,
- 6–15 years, using dose coefficients for the age of 10 years,
- 16–70 years, using dose coefficients for an adult.

The lung absorption type for each nuclide follows the table Lung Absorption Types for Various Chemicals and Compounds under Annex No. 3 to Decree No. 422/2016 Coll. The volume of air inhaled in ESTE for each age category is considered in accordance with Section 67(2) of Decree No. 422/2016 Coll. For persons sheltering indoors, the ESTE software applies a factor of 0.55 when calculating the inhalation dose, meaning that the indoor inhalation dose equals the inhalation dose in the open multiplied by a coefficient of 0.55.

The ESTE software determines resuspension on the basis of the calculated deposition on the terrain. The dose coefficients and methodology in the US NRC Response Technical Manual (RTM), 1995, are applied to calculate the inhalation dose, meaning the committed effective dose from inhalation, from aerosols entering the air through resuspension of particles deposited on the surrounding terrain.

When calculating the dose to the fetus, the ESTE modeling approach assumes that the expectant mother lives at the given location within the computational domain throughout her pregnancy. A pregnant woman, meaning an expectant mother, has the characteristics of an adult. The ESTE model assumes the volume of air inhaled, meaning the breathing rate, by a pregnant woman in accordance with the ICRP 88 model. The fetus is exposed through the mother's inhalation of air, external exposure from the plume, and deposits on the terrain. The procedure for calculating the dose to the fetus is established on the basis of the procedure in ICRP 88 and the following UK Health Protection Agency document: Guidance on the Application of Dose Coefficients for the Embryo, Fetus and Breastfed Infant in Dose Assessment for Members of the Public (HPA, 2008). The calculated dose to the fetus includes the dose to the embryo, the fetus in the mother's body, and the newborn's 70-year committed effective dose caused by nuclides present in its body at birth.

The following exposure pathways are considered for both bounding accident-condition cases, DBA and DEC-B: external exposure from the plume, external exposure from deposits, inhalation from the plume, inhalation from resuspension, and ingestion, by age category and using national consumption baskets. For each event, the following are evaluated: doses over 2 days and 7 days; thyroid doses from iodine inhalation; effective doses over 1 year and 50 years, including ingestion; effective doses over 365 days after the release ends; exposure from deposits; and the committed effective dose from inhalation due to resuspension. For a design basis accident (DBA), it is assumed that the persons for whom doses are calculated spend the entire time outdoors. For a severe accident (DEC-B), it is assumed that persons spend two-thirds of the time indoors and one-third outdoors and, in the case of children, that they spend no more than 2 hours per day outdoors during the first 7 days after the event.

The ESTE ingestion model considers the following internal-exposure pathways:

- deposition on plants and soil, due to dry deposition and washout from the atmosphere by rain, of activity dispersed through the atmosphere,
- transfer into fruits and other plant parts used for consumption or feed as a result of direct deposition on plants,
- transfer from the soil into fruits and other plant parts used for consumption or feed,
- direct human consumption of plants,
- transfer into animal products through the use of plants as feed, followed by human consumption of the animal products.

The ingestion-dose calculation conservatively assumes that all consumption, meaning 100 % of the food considered in the consumption basket, comes from local production. Statistical data obtained from the applicable statistical offices of the Czech Republic (Czech Statistical Office), Austria, and Germany are used in calculating ingestion doses for three age categories: 0–5 years, 5–15 years, and over 15 years. Consumption baskets are compiled from the available current data for 2024 and are used to calculate ingestion doses. Doses in Poland and Slovakia are calculated only for 2 and 7 days, when ingestion is not applied. Evaluation of the highest possible contamination of agricultural products in these countries shows that ingestion doses will be very low because, with the exception of goat's and sheep's milk during a severe accident, the intervention levels prohibiting the placing of a commodity on the European Union market are not exceeded.

Table D.89: Annual consumption of locally produced food for calculating ingestion doses - adult category

Annual food consumption		Czech Republic	Austria	Germany
		2024/over 15 years	2024/over 15 years	2024/over 15 years
Cow's milk	[l/year]	255	115	79
Goat's milk	[l/year]	0.7	1	0.7
Beef	[kg/year]	9	15	9
Pork	[kg/year]	42	46	28
Poultry	[kg/year]	30	13	14
Eggs	[kg/year]	13	14	15
Cereals	[kg/year]	137	91	104
Potatoes	[kg/year]	70	49	38
Other vegetables	[kg/year]	88	121	105
Leafy vegetables	[kg/year]	16	17	20
Fruit	[kg/year]	49	78	67

The computational model in ESTE is based on the algorithms and procedures of the ECOSYS model. The ESTE model considers the following pathways for transfer of specific activity through the food chain:

- deposition on plants and soil, due to dry and wet deposition, of activity present in the air,
- transfer into fruits and other plant parts used for consumption or feed as a result of direct deposition on plants,
- transfer from the soil into fruits and other plant parts used for consumption or feed,
- transfer into animal products through the use of plants as feed.

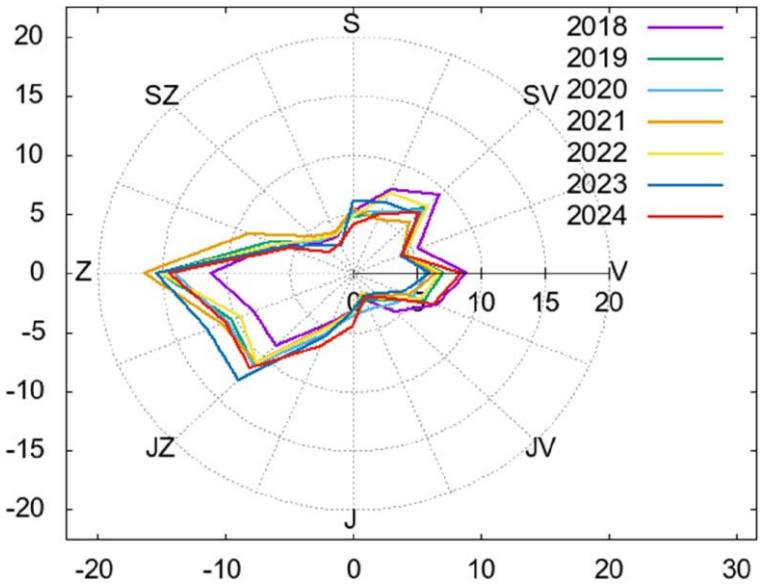
In terms of modeling meteorological conditions and dispersion of the plume of radioactive substances from the release, meaning the source term, the probabilistic analyses of radiological impacts are performed using the following procedure:

- The analyses use a combination of meteorological data measured at the Temelín site and numerical forecast data from the Global Forecast System (GFS) of the US National Oceanic and Atmospheric Administration (NOAA).

- Before the analyses are performed, actual meteorological data for the Temelín site for 2018–2024 are evaluated; their characteristics are presented below. Locally measured data, meaning data measured at the Temelín site, with a 1-hour time step for calendar years 2022–2024, were used to model the dispersion of radioactive substances in the air in the individual sequences. The data measured at the Temelín site are inserted as an additional point in the GFS numerical-forecast data grid.
- GFS numerical-forecast data consist of model data with a 3-hour time step for calendar years 2022–2024.
- The probabilistic analysis covers the full calendar years 2022–2024. The total number of meteorological-data sequences, meaning the statistical-analysis samples, is 431 for the DBA source term and 317 for the DEC-B source term.

Local meteorological conditions from ČHMÚ data for 2018–2024 are presented in the following overview.

Fig. D.25: Wind rose, distribution of wind direction at a height of 10 m at the Temelín site in 2018–2024 [m/s]



Note: The wind-direction distribution in the rose shows the direction from which the wind blows.

Table D.90: Basic wind-speed statistics - speed at a height of 10 m above ground level

Year	Average speed	Median	Maximum speed	Upper 95 % interval	Standard deviation of average speed
	[m/s]				
2018	3.1	2.9	12.2	6.5	1.7
2019	3.3	3.0	14.3	6.9	1.9
2020	3.2	2.8	17.8	6.9	1.9
2021	3.0	2.7	17.3	6.2	1.7
2022	3.1	2.7	13.9	6.2	1.9
2023	3.2	3.0	11.9	6.9	1.9
2024	3.0	2.7	12.3	7.0	1.9
2018–2024	3.1	2.8	17.8	6.7	1.8

Table D.91: Basic statistics for total precipitation and precipitation intensity

Year	Total precipitation	Precipitation intensity - average nonzero precipitation			
	Annual total	Average nonzero precipitation	Median	Maximum precipitation	Upper 95 % interval
	[mm]	[mm/h]			
2018	502	0.77	0.3	15.7	2.7
2019	486	0.60	0.2	10.3	2.4
2020	690	0.83	0.4	30.6	2.8
2021	558	0.77	0.3	24.8	2.5
2022	623	0.80	0.3	27.0	3.1
2023	568	0.68	0.4	18.8	2.1
2024	715	0.87	0.4	38.0	3.1
2018–2024	592 ± 82	0.76	0.3	38.0	2.6

Table D.92: Probability of occurrence of individual Pasquill atmospheric-stability categories

Year	Category A	Category B	Category C	Category D	Category E	Category F
	[%]					
2018	11.0	7.3	14.1	33.4	9.7	24.5
2019	6.5	6.9	11.9	6.6	27.6	40.5
2020	6.3	5.0	11.9	5.1	27.1	44.6
2021	5.9	5.7	11.6	3.8	27.4	45.6
2022	6.7	6.4	13.7	29.0	11.6	32.5
2023	5.5	5.3	13.3	25.2	14.3	36.4
2024	6.4	5.3	11.2	24.5	15.2	37.4
2018–2024	6.9 ± 1.7	6.0 ± 0.8	12.5 ± 1.1	18.2 ± 11.6	19.0 ± 7.4	37.4 ± 6.8

Dispersion of radioactive substances is modeled using the ESTE software for actual meteorological conditions and also deterministically for constant meteorological conditions in specific atmospheric-stability categories. Doses and contamination of agricultural products are evaluated for the Czech Republic, Austria, and Germany to a distance of 100 km and for Poland and Slovakia to a distance of 400 km. The computational domain is divided into individual square sectors at a resolution providing a denser grid for the nearer area and a sparser grid for the more distant area.

The probabilistic analyses take the event date into account and distinguish whether the impacts occur during or outside the growing season. The growing season is assumed to extend from April 1 through October 31. The specific effect of this parameter is determined by the methodology for calculating radionuclide activity in food and forage.

For each calculation sequence, in this case from the total of 431 or 317 sequences, and at each monitored distance from SMR ETE or in each monitored area of interest, the maximum values of the monitored radiological parameter, such as Cs-137 surface activity on the terrain, are established. These are then used for statistical calculations, and the 50th and 95th percentiles are calculated.

Values are established for the time-integrated activity concentration in the ground-level air layer (TIC), surface deposits, effective doses over 2, 7, and 30 days, and annual effective doses that, with a specified probability, such as 95 %, will not be exceeded beyond a given distance from the release location, meaning from SMR ETE.

To assess whether exceedance of an intervention level prohibiting the placing of a commodity on the European Union market can be ruled out in the applicable area assessed or its individual sectors, the actual distribution of land-cover types and agricultural-crop types within 100 km of SMR ETE, including the territories of Austria and Germany, is identified in the software.

The following categories of agricultural crops and land cover are identified within the computational domain and are then used to determine the areas of commodities prohibited from being placed on the market.

Category 1 – cereals: This category includes agricultural areas sown with cereals, particularly barley, oats, buckwheat, wheat, triticale, rye, and millet.

Category 2 – potatoes: This category includes agricultural areas planted with potatoes.

Category 3 – vegetables: This category includes agricultural land used to grow vegetables such as kale, dill, lettuce, arugula, spinach, cabbage, broccoli, celery, asparagus, peas, cauliflower, eggplant, melon, cucumber, peppers, leeks, tomatoes, squash, and other species. For conservative purposes, these areas are included in the calculations as both leafy and non-leafy vegetables.

Category 4 – fruit and grapevines: This category includes all orchards and vineyards.

Category 5 – pastures (permanent grassland - forage crops): This category includes permanent-grassland areas. This category is used to analyze potential specific activity in cow's, goat's, and sheep's milk, with the conservative assumption that cows, goats, or sheep may graze on all permanent-grassland areas.

These five categories of agricultural land can be divided by the temporal dynamics of changes in crops on the land into static and dynamic categories, as follows:

Static categories: The static categories are pastures, fruit, and grapevines. These crops grow in the same locations for multiple years without the need for annual renewal. Permanent grassland usually remains on the same land for decades, while fruit trees and grapevines have service lives of several decades.

Dynamic categories: The dynamic categories are potatoes, cereals, and vegetables. These crops are grown in annual or short-term cycles, and their distribution may change annually as part of crop planning and crop rotation on individual plots. The principal source of data in the Czech Republic is the Land Parcel Identification System (LPIS), a geographic information system consisting primarily of agricultural-land-use records. The system was developed under Act No. 252/1997 Coll., on agriculture, at the turn of 2003 and 2004. The system was launched on March 21, 2004. LPIS serves as the primary tool for recording agricultural land and its use in the Czech Republic. The system contains detailed information on the types of crops grown. LPIS data are regularly updated and provide accurate

information on the current state of agricultural production in individual areas of the Czech Republic. Dynamic data for Austria and Germany are processed from multiple sources, with the EuroCrops database used as the primary source. For Poland and Slovakia, it is assumed that the applicable crop could be present in a given sector regardless of whether it actually occurs there.

QGIS, ENVI, and Google Earth Engine software tools are used for data analysis and preparation of all map materials.

As an example, the figures below show pastures, vegetables, and orchards (fruit) together with grapevines around SMR ETE throughout the entire area of interest, meaning a circle with a radius of 100 km, in 2024.

Fig. D.26: Permanent-grassland (pasture) areas within 100 km of SMR ETE



Fig. D.27: Vegetable-growing areas within 100 km of SMR ETE

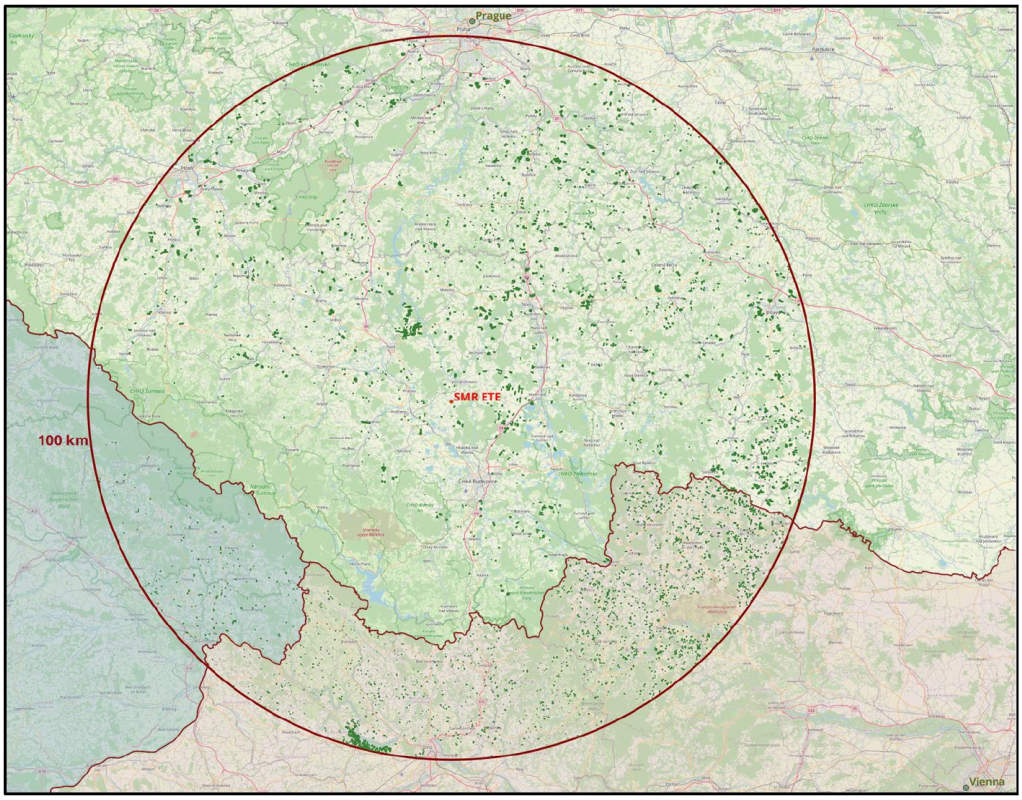
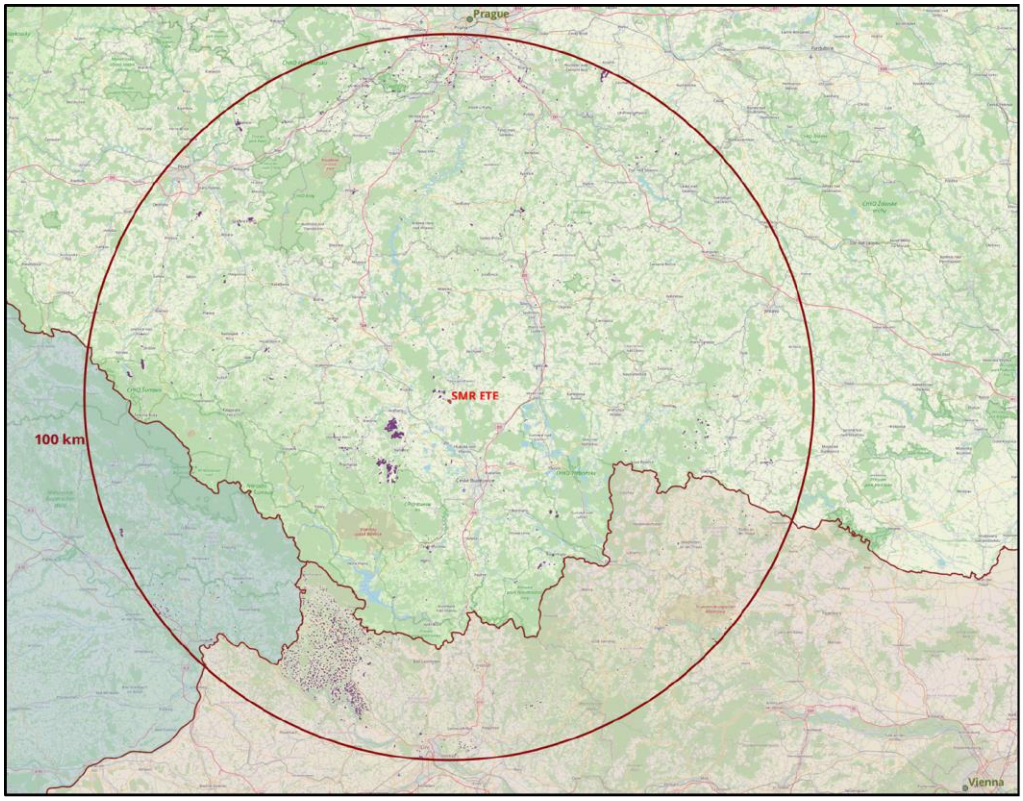


Fig. D.28: Fruit and grapevine areas within 100 km of SMR ETE



Deterministic analyses are also performed to evaluate short-term doses, over 2 and 7 days, deposits, and the time-integrated activity concentration in the ground-level air layer (TIC) for Cs-137, Cs-134, Sr-90 (DEC-B only), and I-131. The deterministic analyses use three atmospheric-stability categories (A, D, and F), for which the corresponding average wind speeds and precipitation amounts that actually occurred on average at the site were established from measurements at the Temelín site over the past 7 years and are assumed to remain constant throughout the calculation.

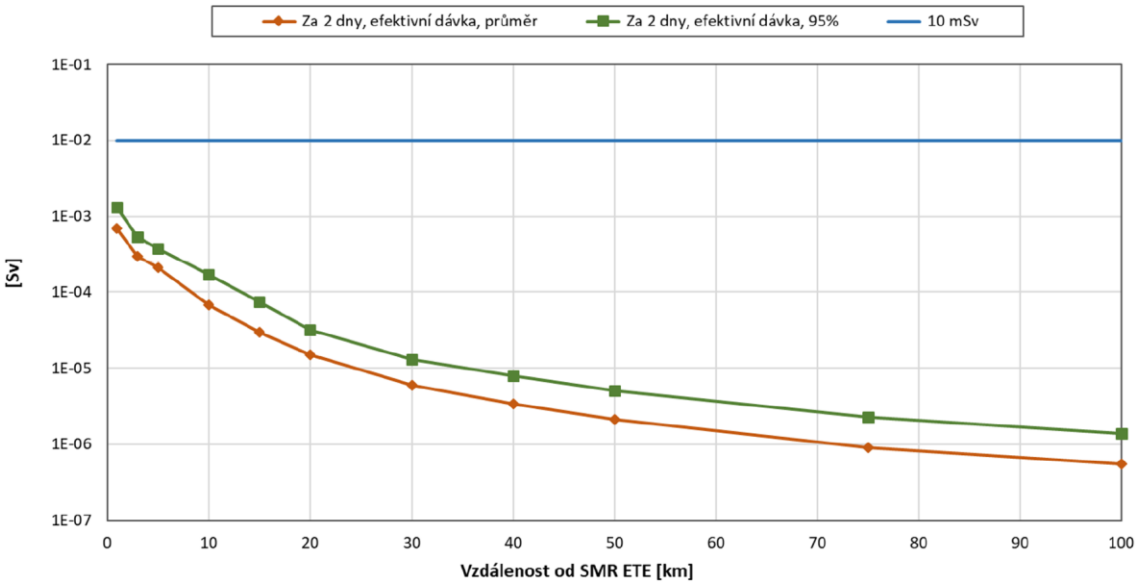
The deterministic calculations are performed for both the DBA and DEC-B source terms for each atmospheric-stability category and assume that the applicable atmospheric-stability category occurs under alternatives with and without rain.

D.II.1.2.3.2. Results of the assessment of the radiological consequences of radiation extraordinary events

D.II.1.2.3.2.1. Design basis accident (DBA)

The results of the analysis of the radiological consequences of the bounding design basis accident (DBA) case for SMR ETE are presented in the following charts and tables[1].

Fig. D.29: DBA – effective individual dose over 2 days (age 6–15 years)



Za 2 dny, efektní dávka, průměr	Over 2 days, effective dose, average
za 2 dny, efektní dávka, 95%	over 2 days, effective dose, 95%
10 mSv	10 mSv
Vzdálenost od SMR ETE [km]	Distance from SMR ETE [km]

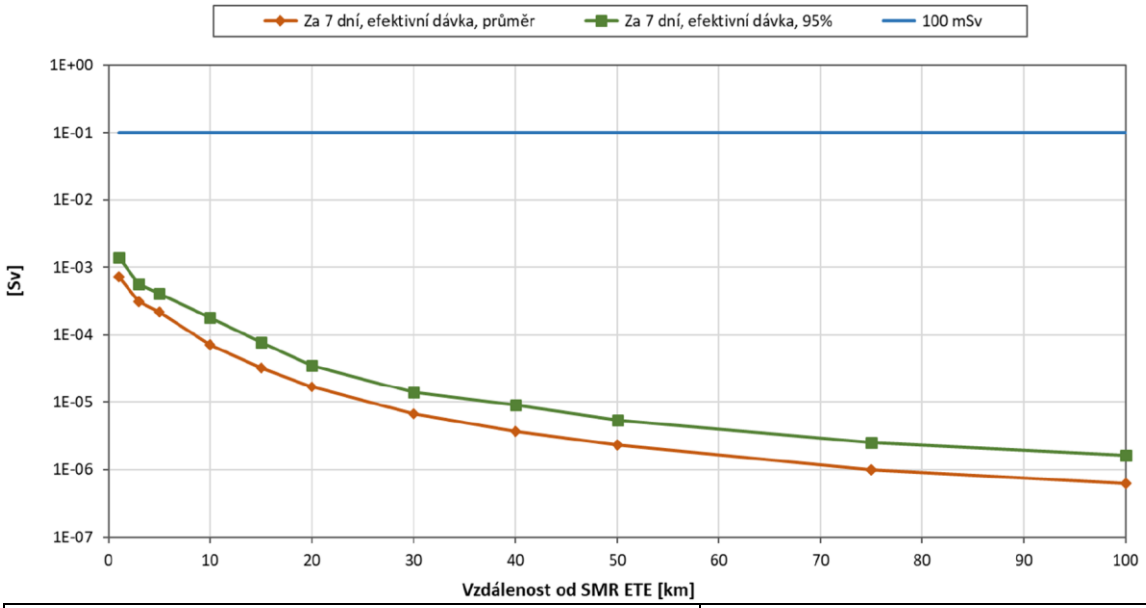
Table D.93: DBA – effective individual dose over the first 2 days

Over 2 days, effective dose [Sv] (exposure from the plume, deposits, and inhalation)								
Age category	adults (>16 years)		6–15 years		0–5 years		fetus	
Distance	mean	95%	mean	95%	mean	95%	mean	95%
1 km	6.5E-04	1.2E-03	7.0E-04	1.3E-03	6.6E-04	1.2E-03	7.6E-04	1.5E-03
3 km	2.7E-04	4.9E-04	3.0E-04	5.4E-04	2.8E-04	5.0E-04	3.3E-04	6.0E-04
5 km	1.9E-04	3.5E-04	2.1E-04	3.8E-04	1.9E-04	3.5E-04	2.3E-04	4.2E-04
10 km	6.0E-05	1.6E-04	6.7E-05	1.7E-04	6.1E-05	1.6E-04	7.4E-05	1.9E-04
15 km	2.7E-05	6.9E-05	3.0E-05	7.4E-05	2.7E-05	6.9E-05	3.3E-05	7.9E-05
20 km	1.4E-05	2.9E-05	1.5E-05	3.2E-05	1.4E-05	2.9E-05	1.7E-05	3.6E-05
30 km	5.4E-06	1.2E-05	6.0E-06	1.3E-05	5.5E-06	1.2E-05	6.8E-06	1.5E-05
40 km	3.1E-06	7.2E-06	3.4E-06	8.0E-06	3.1E-06	7.4E-06	3.8E-06	9.0E-06
50 km	1.9E-06	4.7E-06	2.1E-06	5.1E-06	1.9E-06	4.7E-06	2.3E-06	5.6E-06
75 km	8.1E-07	2.1E-06	9.0E-07	2.3E-06	8.1E-07	2.1E-06	1.0E-06	2.5E-06
100 km	5.0E-07	1.3E-06	5.5E-07	1.4E-06	5.0E-07	1.3E-06	6.2E-07	1.5E-06

The Czech intervention level for sheltering, 10 mSv over 2 days, is not exceeded anywhere around SMR ETE. No intervention levels are exceeded in Austria, at distances greater than 40 km from SMR ETE, for any intervention measure, meaning sheltering (“staying indoors”) or evacuation.

[1] The values presented are interpreted as follows: Average means the average of the maximum values identified in the given zone across all meteorological sequences analyzed. It is not the average value in the given zone, but the average of the maximum values. 95% means the 95th percentile, meaning that there is a 95 % probability that the value of the applicable radiological parameter presented will not be exceeded anywhere in the given distance zone from SMR ETE and within the given time interval after the event. This meaning of the terms average and 95% also applies to all subsequent tables and charts, including the severe accident evaluation and the assessment of accident impacts on biota.

Fig. D.30: DBA – effective individual dose over 7 days (age 6–15 years)



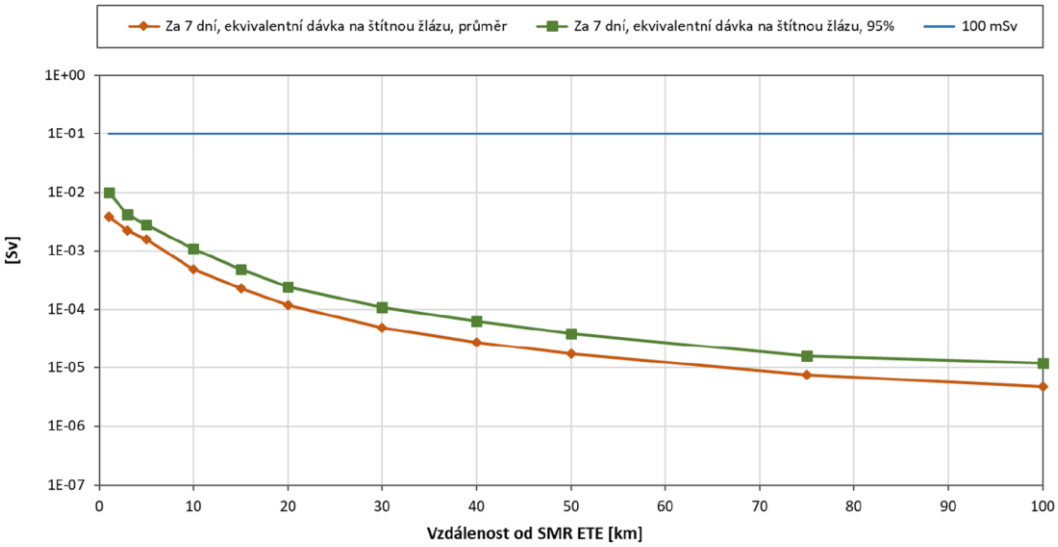
Za 7 dní, efektní dávka, průměr	Over 7 days, effective dose, average
za 7 dní, efektní dávka, 95%	over 7 days, effective dose, 95%
10 mSv	10 mSv
Vzdálenost od SMR ETE [km]	Distance from SMR ETE [km]

Table D.94: DBA – effective individual dose over the first 7 days

Over 7 days, effective dose [Sv] (exposure from the plume, deposits, and inhalation)								
Age category	adults (>16 years)		6–15 years		0–5 years		fetus	
Distance	mean	95%	mean	95%	mean	95%	mean	95%
1 km	6.8E-04	1.3E-03	7.3E-04	1.4E-03	6.9E-04	1.3E-03	7.9E-04	1.6E-03
3 km	2.9E-04	5.2E-04	3.1E-04	5.7E-04	2.9E-04	5.3E-04	3.5E-04	6.3E-04
5 km	2.0E-04	3.7E-04	2.2E-04	4.1E-04	2.1E-04	3.8E-04	2.5E-04	4.4E-04
10 km	6.5E-05	1.7E-04	7.1E-05	1.8E-04	6.6E-05	1.7E-04	7.8E-05	2.0E-04
15 km	2.9E-05	7.3E-05	3.2E-05	7.8E-05	2.9E-05	7.3E-05	3.5E-05	8.3E-05
20 km	1.5E-05	3.1E-05	1.7E-05	3.5E-05	1.5E-05	3.2E-05	1.8E-05	3.9E-05
30 km	5.9E-06	1.3E-05	6.6E-06	1.4E-05	6.0E-06	1.3E-05	7.3E-06	1.6E-05
40 km	3.4E-06	8.3E-06	3.7E-06	8.9E-06	3.4E-06	8.4E-06	4.1E-06	9.6E-06
50 km	2.1E-06	5.0E-06	2.3E-06	5.4E-06	2.1E-06	5.0E-06	2.5E-06	6.1E-06
75 km	9.2E-07	2.2E-06	1.0E-06	2.5E-06	9.2E-07	2.3E-06	1.1E-06	2.7E-06
100 km	5.7E-07	1.4E-06	6.2E-07	1.6E-06	5.6E-07	1.4E-06	6.9E-07	1.7E-06

Neither the Czech nor German intervention level for evacuation, 100 mSv over 7 days, is exceeded anywhere around SMR ETE. The German intervention level for sheltering, 10 mSv over 7 days, is not exceeded anywhere around SMR ETE. The Austrian intervention levels apply to the dose over 2 days.

Fig. D.31: DBA – equivalent dose to the thyroid from inhalation of iodine over the first 7 days after the event (age 6–15 years)



Za 7 dní, efektní dávka na štítnou žlázu, průměr	Over 7 days, equivalent dose to the thyroid, average
za 7 dní, ekvivalentní dávka na štítnou žlázu, 95%	over 7 days, equivalent dose to the thyroid, 95%
10 mSv	10 mSv
Vzdálenost od SMR ETE [km]	Distance from SMR ETE [km]

Table D.95: DBA – equivalent dose to the thyroid from inhalation of iodine over the first 7 days after the event

Over 7 days, equivalent dose to the thyroid from inhalation of iodine [Sv]						
Age category	adults (>16 years)		6–15 years		0–5 years	
Distance	mean	95%	mean	95%	mean	95%
1 km	2.3E-03	5.9E-03	3.9E-03	1.0E-02	2.4E-03	6.0E-03
3 km	1.3E-03	2.5E-03	2.2E-03	4.2E-03	1.3E-03	2.5E-03
5 km	9.3E-04	1.7E-03	1.6E-03	2.8E-03	9.4E-04	1.7E-03
10 km	2.9E-04	6.3E-04	4.9E-04	1.1E-03	2.9E-04	6.4E-04
15 km	1.3E-04	2.9E-04	2.3E-04	4.9E-04	1.4E-04	2.9E-04
20 km	7.2E-05	1.4E-04	1.2E-04	2.4E-04	7.3E-05	1.4E-04
30 km	2.9E-05	6.2E-05	4.9E-05	1.1E-04	3.0E-05	6.3E-05
40 km	1.6E-05	3.7E-05	2.7E-05	6.2E-05	1.6E-05	3.7E-05
50 km	9.8E-06	2.3E-05	1.7E-05	3.9E-05	9.9E-06	2.3E-05
75 km	4.4E-06	9.7E-06	7.4E-06	1.6E-05	4.4E-06	9.8E-06
100 km	2.8E-06	6.8E-06	4.7E-06	1.2E-05	2.8E-06	6.9E-06

The Czech intervention level for administering iodine prophylaxis, 100 mSv, is not exceeded anywhere around SMR ETE. No intervention level for the intervention measure of iodine prophylaxis is exceeded in any age category in Austria, at distances greater than 40 km from SMR ETE, or Germany, at distances greater than 50 km from SMR ETE.

Table D.96: DBA – effective individual dose over the first 365 days after the release ends (deposits + inhalation from resuspension)

Over 365 days, effective dose (deposits + inhalation from resuspension) [Sv]						
Age category	adults (>16 years)		6–15 years		0–5 years	
Distance	mean	95%	mean	95%	mean	95%
1 km	8.1E-05	1.8E-04	8.1E-05	1.8E-04	8.1E-05	1.8E-04
3 km	5.1E-05	1.1E-04	5.1E-05	1.1E-04	5.1E-05	1.1E-04
5 km	4.4E-05	9.6E-05	4.4E-05	9.6E-05	4.4E-05	9.6E-05
10 km	1.8E-05	5.3E-05	1.8E-05	5.3E-05	1.8E-05	5.3E-05
15 km	9.4E-06	2.9E-05	9.4E-06	2.9E-05	9.4E-06	2.9E-05
20 km	5.6E-06	1.7E-05	5.6E-06	1.7E-05	5.6E-06	1.7E-05
30 km	2.5E-06	6.4E-06	2.5E-06	6.4E-06	2.5E-06	6.4E-06
40 km	1.7E-06	4.3E-06	1.7E-06	4.3E-06	1.7E-06	4.3E-06
50 km	1.2E-06	3.5E-06	1.2E-06	3.5E-06	1.2E-06	3.5E-06
75 km	6.9E-07	1.8E-06	6.9E-07	1.8E-06	6.9E-07	1.8E-06
100 km	4.8E-07	1.4E-06	4.8E-07	1.4E-06	4.8E-07	1.4E-06

The relocation reference level under Czech legislation, 20 mSv over 365 days assuming that 8/10 of the time is spent indoors and 2/10 outdoors, is not exceeded anywhere around SMR ETE.

Table D.97: DBA – time-integrated activity concentration in the ground-level air layer (TIC) and terrain deposits, Cs-137, Cs-134, and I-131, 7 days after the event

Distance	TIC Cs-137 [Bq.s/m³]		Cs-137 deposit [Bq/m²]		TIC Cs-134 [Bq.s/m³]		Cs-134 deposit [Bq/m²]		TIC I-131 [Bq.s/m³]		I-131 deposit [Bq/m²]	
	mean	95%	mean	95%	mean	95%	mean	95%	mean	95%	mean	95%
1 km	1.5E+06	3.6E+06	3.6E+03	7.7E+03	2.9E+06	7.1E+06	7.1E+03	1.5E+04	1.2E+07	2.9E+07	1.4E+05	3.4E+05
3 km	9.9E+05	2.0E+06	2.3E+03	4.9E+03	2.0E+06	4.0E+06	4.6E+03	9.8E+03	6.4E+06	1.2E+07	7.6E+04	1.4E+05
5 km	8.8E+05	2.1E+06	2.0E+03	4.5E+03	1.8E+06	4.2E+06	4.0E+03	9.0E+03	4.6E+06	8.3E+06	5.5E+04	1.0E+05
10 km	3.5E+05	1.1E+06	8.4E+02	2.5E+03	6.9E+05	2.2E+06	1.7E+03	5.0E+03	1.5E+06	3.2E+06	1.8E+04	4.3E+04
15 km	1.7E+05	5.1E+05	4.4E+02	1.4E+03	3.5E+05	1.0E+06	8.7E+02	2.7E+03	6.8E+05	1.5E+06	9.1E+03	2.0E+04
20 km	9.6E+04	2.0E+05	2.6E+02	8.2E+02	1.9E+05	3.9E+05	5.2E+02	1.6E+03	3.7E+05	7.3E+05	5.1E+03	1.1E+04
30 km	4.1E+04	8.0E+04	1.2E+02	3.0E+02	8.1E+04	1.6E+05	2.4E+02	6.0E+02	1.5E+05	3.1E+05	2.2E+03	4.7E+03
40 km	2.5E+04	5.2E+04	8.1E+01	2.1E+02	5.0E+04	1.1E+05	1.6E+02	4.1E+02	8.4E+04	1.9E+05	1.3E+03	2.9E+03
50 km	1.7E+04	3.5E+04	5.9E+01	1.7E+02	3.4E+04	7.0E+04	1.2E+02	3.3E+02	5.1E+04	1.2E+05	8.1E+02	1.9E+03
75 km	9.1E+03	1.8E+04	3.3E+01	8.8E+01	1.8E+04	3.7E+04	6.6E+01	1.7E+02	2.3E+04	5.1E+04	3.9E+02	8.7E+02
100 km	6.9E+03	1.5E+04	2.3E+01	6.9E+01	1.4E+04	3.0E+04	4.7E+01	1.4E+02	1.5E+04	3.6E+04	2.4E+02	5.9E+02

The following conclusions arise from the analysis of the bounding design basis accident (DBA) case:

- Exceedance of the intervention level for sheltering, 10 mSv over 2 days, can be ruled out at any location around SMR ETE for all age categories.
- Exceedance of the intervention level for evacuation, 100 mSv over 7 days, can be ruled out at any location around SMR ETE for all age categories.
- Exceedance of the intervention level for administering iodine prophylaxis, 100 mSv over 7 days, can be ruled out at any location around SMR ETE for all age categories.
- The relocation reference level, 20 mSv over 365 days, is not exceeded anywhere around SMR ETE.

The SÚJB criteria for this category of events are therefore met.

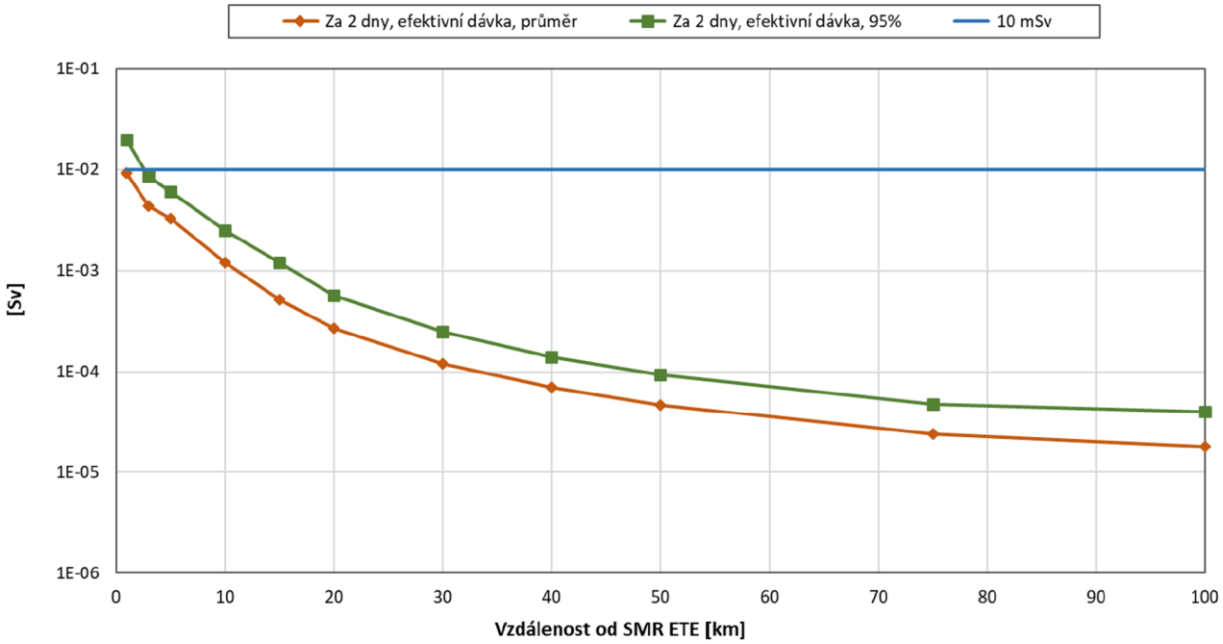
The analysis of the bounding DBA case further shows that:

- In the deterministic analysis, meaning atmospheric-stability categories A, D, and F with or without rain, none of the intervention levels for protective measures is exceeded in any of the cases assessed, whether for sheltering (“staying indoors”), evacuation, or iodine prophylaxis.
- No intervention level for any Austrian intervention measure is exceeded in Austria, whether for sheltering (“staying indoors”), evacuation, or iodine prophylaxis.
- The Austrian intervention level for temporary relocation, 30 mSv over 30 days, is not exceeded anywhere around SMR ETE, including in Austria.
- The Austrian intervention level for permanent relocation, 100 mSv over 365 days, is not exceeded anywhere around SMR ETE, including in Austria.
- The Austrian criterion for initiating an agricultural measure, represented by the time-integrated activity concentration in the ground-level air layer (TIC), which is 360 Bq.h/m³, meaning 1.3E+06 Bq.s/m³, for Cs-137 and 170 Bq.h/m³, meaning 6.1E+05 Bq.s/m³, for I-131, is not exceeded anywhere in Austria.
- The Austrian criterion for initiating an agricultural measure, represented by a Cs-137 deposit of 650 Bq/m², is not exceeded anywhere in Austria. The criterion of an I-131 deposit of 700 Bq/m² is not exceeded in Austria, except in a small area along the border with the Czech Republic, 50 km from SMR ETE, where a possible minor exceedance of the Austrian reference level is identified with a probability of 5 %.
- All the criteria specified above are also met for Germany.
- In the Czech Republic, exceedance of the intervention levels prohibiting the placing of a commodity on the European Union market cannot be fully ruled out for the individual food commodities monitored based on the calculated potential specific activity. This concerns periods of 2 and 7 days after the event at distances of up to 50 to 100 km from SMR ETE and, exceptionally, 30 days after the event, in the case of iodine activity in goat's and sheep's milk within 50 km of SMR ETE. One year after the event, exceedance of the intervention levels prohibiting the placing of a commodity on the European Union market is ruled out throughout the area analyzed around SMR ETE.
- No prohibitions on placing food on the market are identified in Austria, with one exception: with a probability of 5 %, impacts exceeding the criterion prohibiting the placing of goat's and sheep's milk on the market are identified in Austria within 100 km of SMR ETE at 2 and 7 days after the release. The same result is identified for Germany.
- No exceedance of the intervention levels prohibiting the placing of food on the European Union market is identified in Slovakia or Poland, within 400 km of SMR ETE.

D.II.1.2.3.2.2. Severe accident (DEC-B)

The results of the analysis of the radiological consequences of the bounding severe accident (DEC-B) case assessed for SMR ETE are presented in the following charts and tables.

Fig. D.32: DEC-B – effective individual dose over 2 days (age 6–15 years)



Za 2 dny, efektní dávka, průměr	Over 2 days, effective dose, average
za 2 dny, ekvivalentní dávka, 95%	over 2 days, equivalent dose, 95%
10 mSv	10 mSv
Vzdálenost od SMR ETE [km]	Distance from SMR ETE [km]

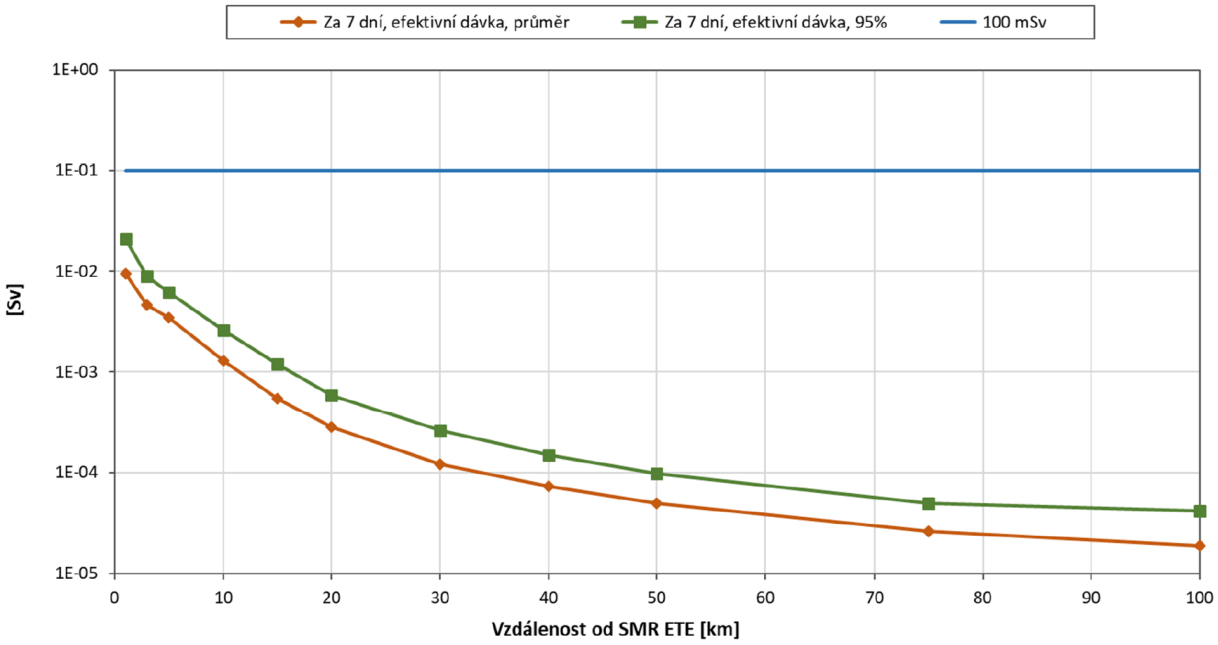
Table D.98: DEC-B – effective individual dose over the first 2 days

Over 2 days, effective dose [Sv] (exposure from the plume, deposits, and inhalation)								
Age category	adults (>16 years)		6–15 years		0–5 years		fetus	
Distance	mean	95%	mean	95%	mean	95%	mean	95%
1 km	7.4E-03	1.5E-02	9.2E-03	2.0E-02	7.9E-03	1.7E-02	1.2E-02	2.6E-02
3 km	3.4E-03	6.7E-03	4.4E-03	8.6E-03	3.7E-03	7.3E-03	5.8E-03	1.2E-02
5 km	2.5E-03	4.7E-03	3.3E-03	6.0E-03	2.8E-03	5.1E-03	4.5E-03	8.1E-03
10 km	9.3E-04	1.9E-03	1.2E-03	2.5E-03	1.0E-03	2.1E-03	1.7E-03	3.5E-03
15 km	3.8E-04	8.7E-04	5.2E-04	1.2E-03	4.2E-04	9.7E-04	7.2E-04	1.7E-03
20 km	2.0E-04	4.3E-04	2.7E-04	5.7E-04	2.2E-04	4.7E-04	3.8E-04	8.1E-04
30 km	8.4E-05	1.8E-04	1.2E-04	2.5E-04	9.4E-05	2.0E-04	1.7E-04	3.4E-04
40 km	5.1E-05	1.0E-04	7.0E-05	1.4E-04	5.7E-05	1.2E-04	1.0E-04	2.0E-04
50 km	3.4E-05	6.6E-05	4.7E-05	9.3E-05	3.8E-05	7.5E-05	6.8E-05	1.3E-04
75 km	1.7E-05	3.3E-05	2.4E-05	4.8E-05	1.9E-05	3.8E-05	3.6E-05	7.2E-05
100 km	1.2E-05	2.9E-05	1.8E-05	4.0E-05	1.4E-05	3.2E-05	2.7E-05	5.8E-05

At a distance of 1 km from SMR ETE, the Czech intervention level for sheltering, 10 mSv over 2 days, is exceeded for the fetus age category and, exceptionally, in 5 % of the meteorological-condition sequences analyzed, for all other age categories as well. At a distance of 3 km, the intervention level for sheltering may exceptionally be exceeded for the fetus age category in 5 % of the meteorological-condition sequences analyzed. The Czech intervention level for sheltering is not exceeded anywhere else around SMR ETE.

No intervention levels are exceeded in Austria, at distances greater than 40 km from SMR ETE, for any intervention measure, meaning sheltering ("staying indoors") or evacuation. Germany does not establish intervention levels for the effective dose over 2 days.

Fig. D.33: DEC-B – effective individual dose over 7 days (age 6–15 years)



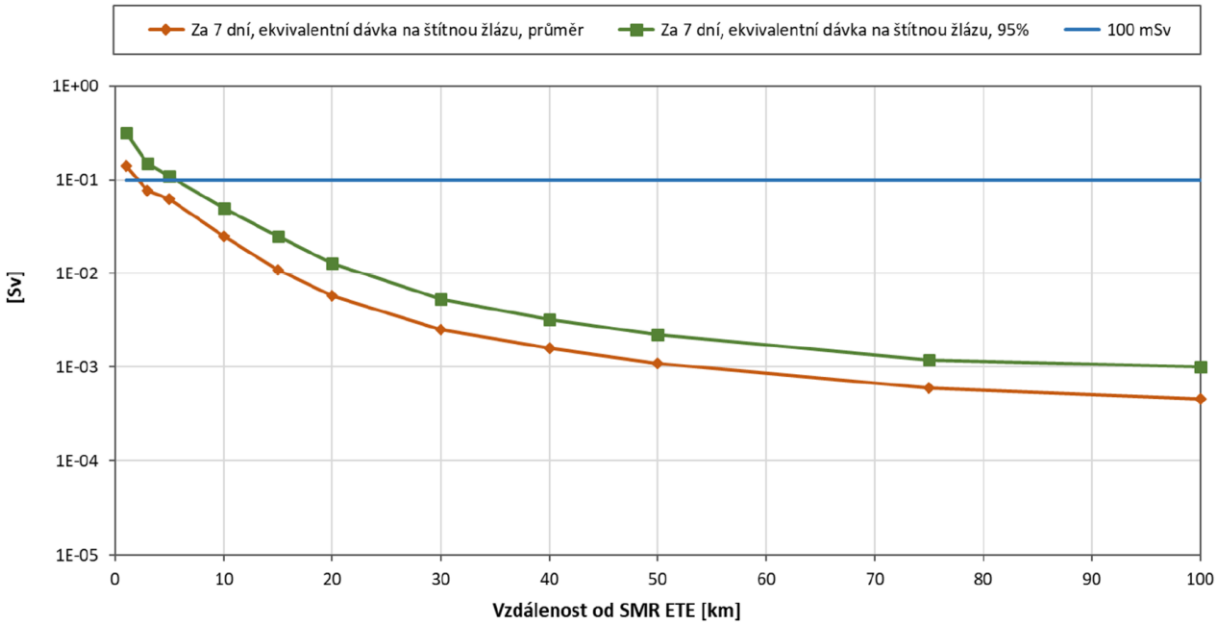
Za 7 dní, efektivní dávka, průměr	Over 7 days, effective dose, average
za 7 dní, efektivní dávka, 95%	over 7 days, effective dose, 95%
10 mSv	10 mSv
Vzdálenost od SMR ETE [km]	Distance from SMR ETE [km]

Table D.99: DEC-B – effective individual dose over the first 7 days

Over 7 days, effective dose [Sv] (exposure from the plume, deposits, and inhalation)								
Age category	adults (>16 years)		6–15 years		0–5 years		fetus	
Distance	mean	95%	mean	95%	mean	95%	mean	95%
1 km	7.7E-03	1.6E-02	9.5E-03	2.1E-02	8.3E-03	1.7E-02	1.2E-02	2.7E-02
3 km	3.6E-03	6.9E-03	4.6E-03	8.9E-03	3.9E-03	7.5E-03	6.0E-03	1.2E-02
5 km	2.7E-03	4.9E-03	3.5E-03	6.2E-03	2.9E-03	5.3E-03	4.6E-03	8.3E-03
10 km	9.7E-04	1.9E-03	1.3E-03	2.6E-03	1.1E-03	2.1E-03	1.8E-03	3.5E-03
15 km	4.0E-04	9.1E-04	5.4E-04	1.2E-03	4.4E-04	1.0E-03	7.4E-04	1.7E-03
20 km	2.1E-04	4.5E-04	2.8E-04	5.9E-04	2.3E-04	5.0E-04	3.9E-04	8.3E-04
30 km	9.0E-05	1.9E-04	1.2E-04	2.6E-04	9.9E-05	2.1E-04	1.7E-04	3.5E-04
40 km	5.4E-05	1.1E-04	7.3E-05	1.5E-04	6.0E-05	1.2E-04	1.0E-04	2.1E-04
50 km	3.6E-05	7.1E-05	5.0E-05	9.7E-05	4.0E-05	7.9E-05	7.1E-05	1.4E-04
75 km	1.9E-05	3.6E-05	2.6E-05	5.0E-05	2.1E-05	4.0E-05	3.8E-05	7.5E-05
100 km	1.4E-05	3.1E-05	1.9E-05	4.2E-05	1.5E-05	3.4E-05	2.8E-05	6.2E-05

Neither the Czech nor German intervention level for evacuation, 100 mSv over 7 days, is exceeded anywhere around SMR ETE. The German intervention level for sheltering, 10 mSv over 7 days, is not exceeded anywhere at distances greater than 50 km from SMR ETE. The Austrian intervention levels apply to the dose over 2 days.

Fig. D.34: DEC-B – equivalent dose to the thyroid from inhalation of iodine over the first 7 days after the event (age 6–15 years)



Za 7 dní, ekvivalentní dávka na štítnou žlázu, průměr	Over 7 days, equivalent dose to the thyroid, average
za 7 dní, efektivní dávka na štítnou žlázu, 95%	over 7 days, equivalent dose to the thyroid, 95%
10 mSv	10 mSv
Vzdálenost od SMR ETE [km]	Distance from SMR ETE [km]

Table D.100: DEC-B – equivalent dose to the thyroid from inhalation of iodine over the first 7 days after the event

Over 7 days, equivalent dose to the thyroid from inhalation of iodine [Sv]						
Age category	adults (>16 years)		6–15 years		0–5 years	
Distance	mean	95%	mean	95%	mean	95%
1 km	8.0E-02	1.9E-01	1.4E-01	3.2E-01	7.3E-02	1.7E-01
3 km	4.5E-02	8.8E-02	7.7E-02	1.5E-01	4.1E-02	8.0E-02
5 km	3.6E-02	6.4E-02	6.3E-02	1.1E-01	3.3E-02	5.8E-02
10 km	1.4E-02	2.9E-02	2.5E-02	5.0E-02	1.3E-02	2.6E-02
15 km	6.2E-03	1.4E-02	1.1E-02	2.5E-02	5.6E-03	1.3E-02
20 km	3.3E-03	7.2E-03	5.8E-03	1.3E-02	3.0E-03	6.6E-03
30 km	1.5E-03	3.0E-03	2.5E-03	5.3E-03	1.3E-03	2.8E-03
40 km	9.0E-04	1.8E-03	1.6E-03	3.2E-03	8.3E-04	1.7E-03
50 km	6.3E-04	1.3E-03	1.1E-03	2.2E-03	5.7E-04	1.2E-03
75 km	3.4E-04	7.0E-04	6.0E-04	1.2E-03	3.1E-04	6.4E-04
100 km	2.6E-04	5.9E-04	4.6E-04	1.0E-03	2.4E-04	5.4E-04

At a distance of 1 km from SMR ETE and, exceptionally, in 5 % of the meteorological-condition sequences analyzed, up to a distance of 5 km, the Czech intervention level for iodine prophylaxis, 100 mSv over 7 days, is exceeded for the 6–15-year age category. The same applies at a distance of 1 km, in 5 % of the meteorological-condition sequences analyzed, for the adult and 0–5-year age categories. No intervention level for the intervention measure of iodine prophylaxis is exceeded in any age category in Austria, at distances greater than 40 km from SMR ETE, or Germany, at distances greater than 50 km from SMR ETE.

Table D.101: DEC-B – effective individual dose over the first 365 days after the release ends (deposits + inhalation from resuspension)

Over 365 days, effective dose (deposits + inhalation from resuspension) [Sv]						
Age category	adults (>16 years)		6–15 years		0–5 years	
Distance	mean	95%	mean	95%	mean	95%
1 km	1.4E-03	3.4E-03	1.4E-03	3.4E-03	1.4E-03	3.4E-03
3 km	8.1E-04	1.7E-03	8.1E-04	1.7E-03	8.1E-04	1.7E-03
5 km	6.7E-04	1.3E-03	6.7E-04	1.3E-03	6.7E-04	1.3E-03
10 km	2.7E-04	5.9E-04	2.7E-04	5.9E-04	2.7E-04	5.9E-04
15 km	1.3E-04	2.7E-04	1.3E-04	2.7E-04	1.3E-04	2.7E-04
20 km	7.2E-05	1.6E-04	7.2E-05	1.6E-04	7.2E-05	1.6E-04

30 km	3.4E-05	7.9E-05	3.4E-05	7.9E-05	3.4E-05	7.9E-05
40 km	2.3E-05	5.4E-05	2.3E-05	5.4E-05	2.3E-05	5.4E-05
50 km	1.7E-05	4.0E-05	1.7E-05	4.0E-05	1.7E-05	4.0E-05
75 km	1.0E-05	2.6E-05	1.0E-05	2.6E-05	1.0E-05	2.6E-05
100 km	7.9E-06	2.0E-05	7.9E-06	2.0E-05	7.9E-06	2.0E-05

The relocation reference level under Czech legislation, 20 mSv over 365 days assuming that 8/10 of the time is spent indoors and 2/10 outdoors, is not exceeded anywhere around SMR ETE.

Table D.102: DEC-B – time-integrated activity concentration in the ground-level air layer (TIC), Cs-137, Cs-134, Sr-90, and I-131, 7 days after the event

Distance	TIC Cs-137 [Bq.s/m^3]		TIC Cs-134 [Bq.s/m^3]		TIC Sr-90 [Bq.s/m^3]		TIC I-131 [Bq.s/m^3]	
	mean	95%	mean	95%	mean	95%	mean	95%
1 km	2.4E+07	5.5E+07	4.8E+07	1.1E+08	3.2E+06	7.4E+06	7.8E+08	1.8E+09
3 km	1.4E+07	2.7E+07	2.8E+07	5.5E+07	1.9E+06	3.6E+06	4.4E+08	8.6E+08
5 km	1.2E+07	2.1E+07	2.4E+07	4.2E+07	1.6E+06	2.8E+06	3.7E+08	6.3E+08
10 km	5.0E+06	1.0E+07	9.9E+06	2.0E+07	6.6E+05	1.4E+06	1.5E+08	3.0E+08
15 km	2.2E+06	5.1E+06	4.3E+06	1.0E+07	2.9E+05	6.8E+05	6.5E+07	1.5E+08
20 km	1.2E+06	2.6E+06	2.4E+06	5.2E+06	1.6E+05	3.5E+05	3.5E+07	7.7E+07
30 km	5.3E+05	1.1E+06	1.1E+06	2.1E+06	7.1E+04	1.4E+05	1.6E+07	3.2E+07
40 km	3.3E+05	6.6E+05	6.6E+05	1.3E+06	4.4E+04	8.8E+04	9.8E+06	1.9E+07
50 km	2.3E+05	4.7E+05	4.7E+05	9.4E+05	3.1E+04	6.3E+04	6.9E+06	1.4E+07
75 km	1.3E+05	2.8E+05	2.6E+05	5.5E+05	1.8E+04	3.7E+04	3.9E+06	8.1E+06
100 km	1.0E+05	2.3E+05	2.0E+05	4.5E+05	1.4E+04	3.0E+04	3.0E+06	6.8E+06

Table D.103: DEC-B – terrain deposits, Cs-137, Cs-134, Sr-90, and I-131, 7 days after the event

Distance	Cs-137 deposit [Bq/m^2]		Cs-134 deposit [Bq/m^2]		Sr-90 deposit [Bq/m^2]		I-131 deposit [Bq/m^2]	
	mean	95%	mean	95%	mean	95%	mean	95%
1 km	5.9E+04	1.4E+05	1.2E+05	2.8E+05	7.8E+03	1.9E+04	3.1E+06	7.2E+06
3 km	3.4E+04	7.2E+04	6.8E+04	1.4E+05	4.6E+03	9.6E+03	1.5E+06	3.1E+06
5 km	2.9E+04	5.5E+04	5.7E+04	1.1E+05	3.8E+03	7.3E+03	1.1E+06	2.0E+06
10 km	1.2E+04	2.7E+04	2.4E+04	5.3E+04	1.6E+03	3.5E+03	3.8E+05	7.3E+05
15 km	5.6E+03	1.2E+04	1.1E+04	2.4E+04	7.5E+02	1.6E+03	1.6E+05	3.2E+05
20 km	3.2E+03	7.4E+03	6.4E+03	1.5E+04	4.3E+02	9.9E+02	8.8E+04	1.7E+05
30 km	1.5E+03	3.6E+03	3.1E+03	7.2E+03	2.1E+02	4.8E+02	3.9E+04	7.6E+04
40 km	1.1E+03	2.5E+03	2.1E+03	5.1E+03	1.4E+02	3.4E+02	2.5E+04	4.9E+04
50 km	7.9E+02	1.9E+03	1.6E+03	3.8E+03	1.1E+02	2.5E+02	1.7E+04	3.4E+04
75 km	4.8E+02	1.2E+03	9.5E+02	2.4E+03	6.4E+01	1.6E+02	8.7E+03	1.8E+04
100 km	3.7E+02	9.3E+02	7.3E+02	1.8E+03	4.9E+01	1.2E+02	5.9E+03	1.2E+04

The following conclusions arise from the analysis of the representative bounding severe accident (DEC-B) case:

- Exceedance of the intervention level for evacuation, 100 mSv over 7 days, can be ruled out at any location around SMR ETE for all age categories. This conclusion applies to both probabilistic and deterministic analyses with respect to the modeling of meteorological conditions. The basic SÚJB criterion for this category of events is therefore met.
- Under actual meteorological conditions, the Czech intervention level for sheltering, 10 mSv over 2 days, is exceeded at a distance of 1 km from SMR ETE for all age categories and at a distance of 3 km for the 6–15-year age category. The Czech intervention level for sheltering is not exceeded anywhere else around SMR ETE. The results of the deterministic analyses are slightly less favorable for atmospheric-stability categories D and F; however, the deterministic-analysis assumption that one meteorological condition persists throughout the 24-hour release and throughout calculation of the impacts can be considered excessively conservative and therefore unrealistic.
- The relocation reference level, 20 mSv over 365 days, assuming that time is spent predominantly indoors rather than outdoors, is not exceeded anywhere around SMR ETE.

The analysis of the representative DEC-B case further shows that:

- No intervention level for any Austrian intervention measure is exceeded anywhere in Austria, whether for sheltering (“staying indoors”), evacuation, or iodine prophylaxis. Neither the Austrian intervention level for temporary relocation, 30 mSv over 30 days, nor that for permanent relocation, 100 mSv over 365 days, is exceeded anywhere around SMR ETE or anywhere in Austria. The same conclusions also apply to Germany.
- No intervention levels for sheltering, evacuation, or iodine prophylaxis are exceeded anywhere in Poland or Slovakia.
- The Austrian criterion for initiating an agricultural measure, represented by the time-integrated activity concentration in the ground-level air layer (TIC), which is 360 Bq.h/m^3, meaning 1.3E+06 Bq.s/m^3, for Cs-137, is not exceeded anywhere in Austria. For I-131, a value of 170 Bq.h/m^3, meaning 6.1E+05 Bq.s/m^3, is exceeded throughout the Austrian territory analyzed within 100 km of SMR ETE.

- For the Austrian criterion for initiating an agricultural measure, represented by a Cs-137 deposit of 650 Bq/m^2, a minor exceedance of the Austrian reference level is identified with a probability of 5 % within 75 km of SMR ETE. For an I-131 deposit of 700 Bq/m^2, exceedance of the Austrian reference level is identified throughout the area analyzed within 100 km of SMR ETE.
- In the Czech Republic, exceedance of the intervention levels prohibiting the placing of a commodity on the European Union market cannot be ruled out for the individual food commodities monitored based on the calculated potential specific activity. This concerns numerous commodities and periods of 2, 7, and 30 days after the event. One year after the event, exceedance of the intervention levels prohibiting the placing of a commodity on the European Union market is ruled out throughout the area analyzed around SMR ETE. Long-term restrictions on agricultural production are therefore also ruled out, and the second basic SÚJB criterion for this type of event is thus met.
- No prohibitions on placing food on the market are identified in Austria, subject to the following short-term exceptions:
  - With a probability of 5 %, impacts exceeding the criterion prohibiting the placing of leafy vegetables on the market are identified in Austria within 100 km of SMR ETE at 2 and 7 days after the release.
  - With a probability of 5 %, impacts exceeding the criterion prohibiting the placing of cow's milk on the market are identified in Austria within 100 km of SMR ETE at 2 and 7 days after the release.
  - With a probability of 5 %, impacts exceeding the criterion prohibiting the placing of sheep's and goat's milk on the market are identified in Austria within 100 km of SMR ETE at 30 days after the release.
  - Prohibitions on sheep's and goat's milk at 2 and 7 days after the event are probable throughout the Austrian territory analyzed (50th percentile).
- No prohibitions on placing food on the market are identified in Germany, subject to the following short-term exceptions:
  - With a probability of 5 %, impacts exceeding the criterion prohibiting the placing of leafy vegetables on the market are identified in Germany within 100 km of SMR ETE at 2 days after the release.
  - With a probability of 5 %, impacts exceeding the criterion prohibiting the placing of cow's milk on the market are identified in Germany within 100 km of SMR ETE at 2 days after the release.
  - With a probability of 5 %, impacts exceeding the criterion prohibiting the placing of sheep's and goat's milk on the market are identified in Germany within 100 km of SMR ETE at 2 and 7 days after the release.
- No prohibitions on placing food on the market are identified in Poland, with the short-term exception that, with a probability of 5 %, impacts exceeding the criterion prohibiting the placing of goat's and sheep's milk on the market are identified in Poland within 400 km of SMR ETE at 2 and 7 days after the release.
- No prohibitions on placing food on the market are identified in Slovakia, with the short-term exception that, with a probability of 5 %, impacts exceeding the criterion prohibiting the placing of goat's and sheep's milk on the market are identified in Slovakia within 400 km of SMR ETE at 2 and 7 days after the release.

D.II.1.2.4. Assessment of the radiological consequences of radiation extraordinary events for biota

The radiological consequences of radiation extraordinary events for the biotic component are also evaluated for SMR ETE. The assessment is presented in the report by ABmerit, s. r. o. (P. Čarný et al.: SMR ETE EIA Analysis. Radiological Impacts of SMR ETE Accident Conditions on Biota, April 2026).

D.II.1.2.4.1. Methodological information

The assessment is performed for the same representative radiation extraordinary event cases, including source terms, the time sequence of radionuclide releases into the environment, and consideration of meteorological conditions, used to assess impacts on the population and agricultural production. The assessment is performed using the ESTE computational software.

The results are processed as dose rates [Gy/day] 1 day after the event, 2 to 7 days after the event, and the average dose rate over the monitored 7-day interval after the event. The reference values [Gy/day] under IAEA General Safety Guide No. GSG-10: Prospective Radiological Environmental Impact Assessment for Facilities and Activities, IAEA, 2018 are used as evaluation criteria.

For purposes of the methodology applied in the ESTE software, reference animals and plants mean:

- deer (large mammal),
- rat (small mammal),
- duck (waterbird, living on water and land),
- frog (amphibian, living in water and on land),
- bee (insect),
- earthworm (annelid),
- pine (large plants),
- grass (small plants),

- trout (freshwater fish).

The applicable derived reference levels for reference animals and plants under IAEA General Safety Guide GSG-10 are used to assess radiological impacts on flora and fauna.

Table D.104: Reference animals and plants and derived reference levels

Reference animal or plant	Derived reference value according to the IAEA [Gy/day]
Deer (large mammals)	1E-04 to 1E-03
Rat (small mammals)	1E-04 to 1E-03
Duck (waterbirds)	1E-04 to 1E-03
Frog (amphibians)	1E-03 to 1E-02
Bee (insect)	1E-02 to 1E-01
Earthworm (annelids)	1E-02 to 1E-01
Pine (large plants)	1E-04 to 1E-03
Grass (small plants)	1E-03 to 1E-02
Trout (fish)	1E-03 to 1E-02

Table D.105: Exposure pathways considered in the ICRP dose-coefficient tables and in the ESTE methodology

Exposure pathways considered in the ICRP dose-coefficient tables and in the ESTE methodology						
Reference animals and plants	Aquatic environment (external exposure)	Terrestrial environment (external exposure)				Internal exposure
	In water	In soil	On the ground surface	Above the ground surface	In air	
Deer			x	x	x	x
Brown rat		x	x		x	x
Duck	x		x	x	x	x
Frog	x		x		x	x
Bee			x	x	x	x
Earthworm		x				x
Pine			x			x
Grass			x		x	x
Trout	x					x

The modeled exposure pathways for the individual biological species are characterized in greater detail below:

Deer: Internal exposure (dose) caused by intake of activity originally deposited on the terrain; external exposure on the ground surface from deposits on the terrain; external exposure above the ground surface from deposits on the terrain; external exposure from activity in the air; and internal exposure from inhalation of activity in the air.

Brown rat: Internal exposure (dose) caused by intake of activity in and on the soil originally deposited on the terrain; external exposure on the ground surface from deposits on the terrain; external exposure from activity in the soil while in a burrow; external exposure from activity in the air; and internal exposure from inhalation of activity in the air. It is assumed that half the day is spent on the ground and half in a burrow.

Duck: Internal exposure (dose) caused by intake of activity in and on the soil originally deposited on the terrain; external exposure on the ground surface while on the ground from deposits on the terrain; external exposure from activity in the air; external exposure from activity in water while in or on the water, originally deposited on the surface of the water body; and internal exposure caused by intake of activity in water while in or on the water, originally deposited on the surface of the water body. It is assumed that half the day is spent on land and half in or on the water.

Frog: Internal exposure (dose) caused by intake of activity in and on the soil originally deposited on the terrain; external exposure on the ground surface from deposits on the terrain; external exposure from activity in the air; external exposure from activity in water while in or on the water, originally deposited on the surface of the water body; and internal exposure caused by intake of activity in water while in or on the water, originally deposited on the surface of the water body. It is assumed that half the day is spent on land and half in or on the water.

Bee: Internal exposure (dose) caused by intake of activity in and on the soil originally deposited on the terrain; external exposure on the ground surface from deposits on the terrain; external exposure above the ground surface from deposits on the terrain; and external exposure from activity in the air.

Earthworm: Internal exposure (dose) caused by intake of activity in and on the soil originally deposited on the terrain; external exposure from activity in the soil while within the soil.

Pine: Internal exposure (dose) caused by intake of activity in the soil originally deposited on the terrain; external exposure on the ground surface from deposits on the terrain. (Note: External exposure of pine from activity in the air is not

considered because dose coefficients are not available in ICRP documents; based on expert judgment, this exposure pathway can be considered negligible.)

Grass: Internal exposure (dose) caused by intake of activity in the soil originally deposited on the terrain; external exposure on the ground surface from deposits on the terrain; external exposure from activity in the air.

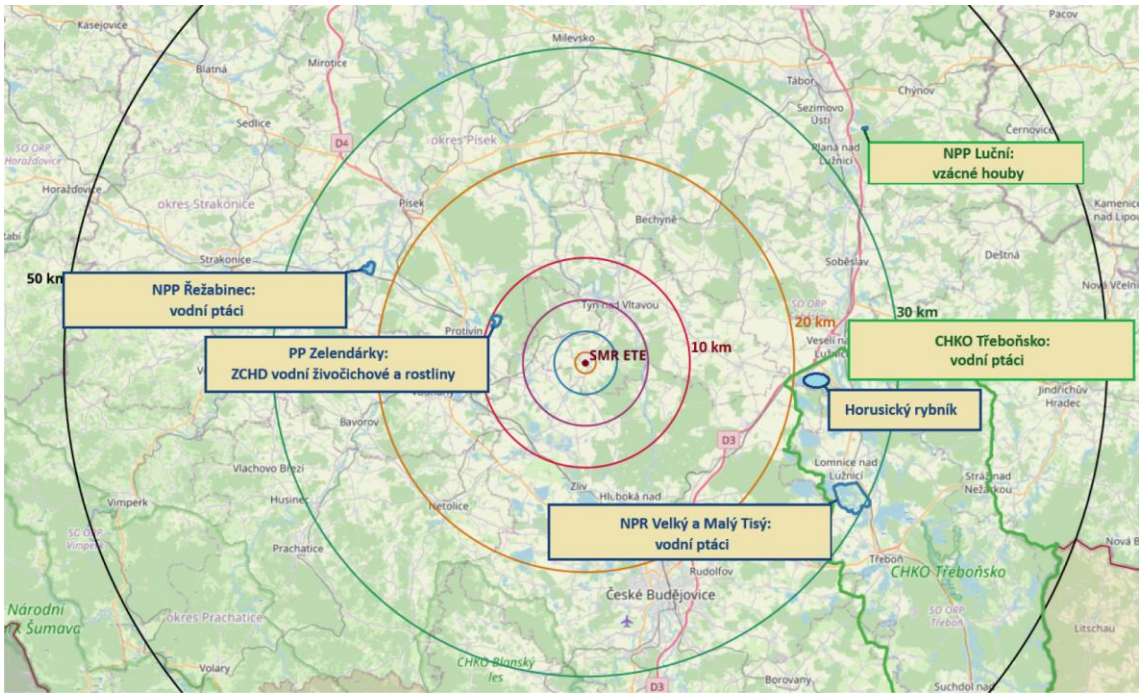
Trout: Internal exposure caused by intake of activity in water originally deposited on the surface of the water body; external exposure from activity in the water while within the water, originally deposited on the surface of the water body.

The analysis assumes that a design basis accident or severe accident results in a release of radionuclides into the surrounding atmosphere, followed by their dispersion through the atmosphere and environmental components, including the aquatic environment. At locations containing water bodies, radioactive fallout onto the water surface is considered and modeling assumptions are applied that allow the contribution of activity deposited on the surfaces of water bodies to be included in the analysis results. It is assumed that radionuclides from fallout onto a water body are dispersed relatively quickly, within several hours, through the water in the applicable reservoir and contribute to exposure of waterbirds, frogs, and fish. The concentration of radionuclides in water contributes to external exposure while animals are in or on the water and, in particular, to internal exposure through absorption of radionuclides from the aquatic environment.

The assessment is performed within 100 km of SMR ETE, with specific evaluation of radiological impacts on nearby protected areas selected by the author of the biological assessment, specifically:

- Zelendárky Nature Monument - specially protected aquatic animals and plants,
- Řežabinec National Nature Monument - waterbirds,
- Velký and Malý Tisý National Nature Reserve - waterbirds,
- Třeboňsko Protected Landscape Area - waterbirds,
- Luční National Nature Monument - rare fungi.

Fig. D.35: Location of the areas of interest specifically addressed by the analyses of radiological impacts on biota



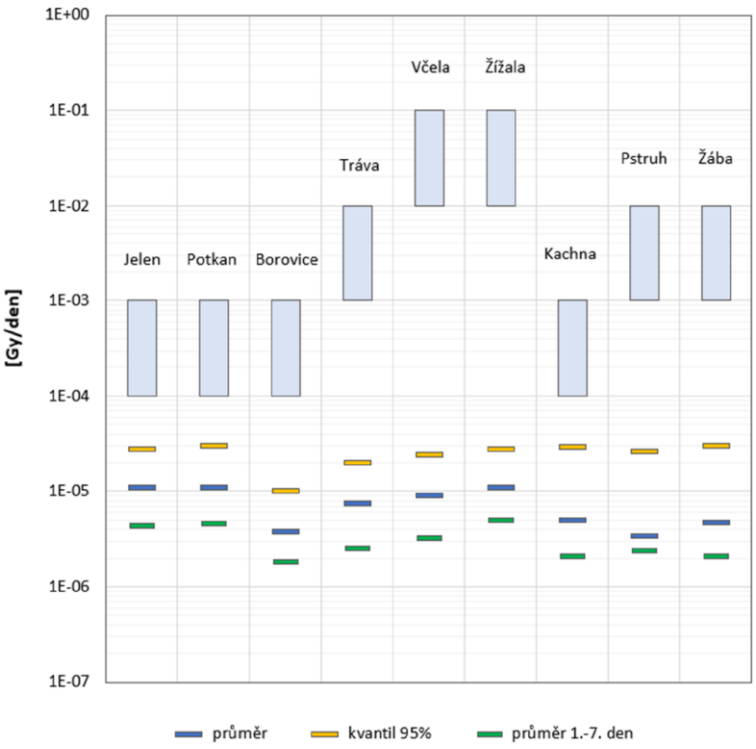
NPP Luční: vzácné houby	Luční National Nature Monument: rare fungi
NPP Řežabinec: vodní ptáci	Řežabinec National Nature Monument: waterbirds
PP Zelendárky: ZCHD vodní živočichové a rostliny	Zelendárky Nature Monument: Specially protected aquatic animals and plants
CHKO Třeboňsko: vodní ptáci	Třeboňsko Protected Landscape Area: waterbirds
Horusický rybník	Horusický fishpond
NPR Velký a Malý Tisý: vodní ptáci	Velký and Malý Tisý National Nature Reserve: waterbirds

D.II.1.2.4.2. Results of the assessment of the radiological consequences of radiation extraordinary events for biota

D.II.1.2.4.2.1. Design basis accident (DBA) - impacts on biota

The results of the analysis of the radiological consequences of the bounding design basis accident (DBA) case for biota are presented in the following chart.

Fig. D.36: DBA – dose rate to reference animals and plants, maximum values calculated for the first day after the event (average of maximum values and 95th percentile) and average of the average maximum values calculated for the first 7 days after the event



Včela	Bee
Žížala	Earthworm
Tráva	Grass
Pstruh	Trout
Žába	Frog
Jelen	Deer
Potkan	Brown rat
Borovice	Pine
Kachna	Duck
průměr	mean
kvantil 95%	95th percentile
průměr 1.-7.den	average, days 1–7
[Gy/den]	[Gy/day]

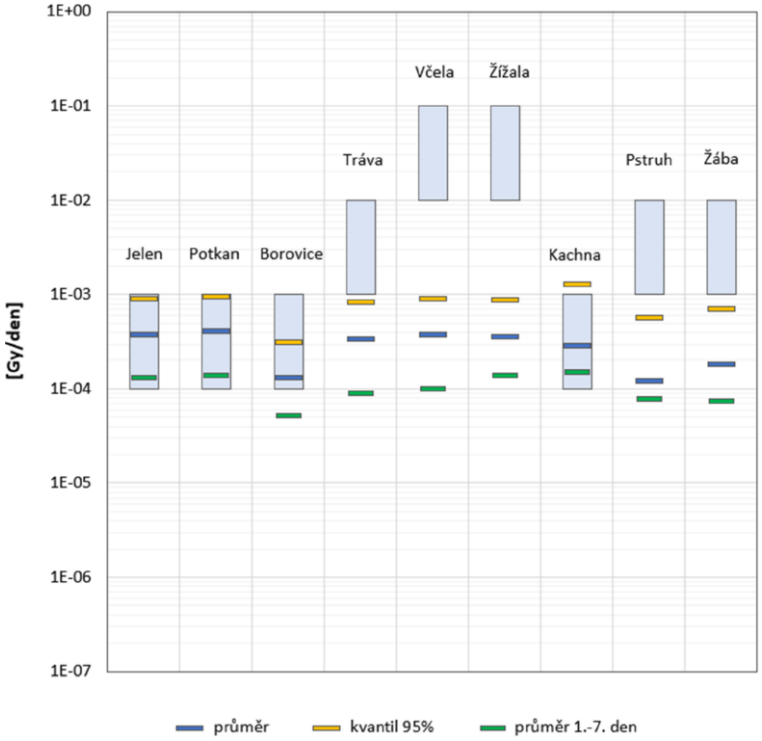
All calculated values of the radiological parameters, including the 95th percentiles expressing the radiological impact on reference animals and plants under the ICRP and IAEA approach, are at least one order of magnitude lower than the IAEA derived reference values.

Within the meaning of the procedure recommended by the IAEA in GSG-10, Prospective Radiological Environmental Impact Assessment for Facilities and Activities (2018), the impact of the bounding DBA event for SMR ETE on flora and fauna populations can be considered negligible and the level of protection of flora and fauna adequate. This conclusion also applies to the specific protected areas selected and their protected features.

D.II.1.2.4.2.2. Severe accident (DEC-B) - impacts on biota

The results of the analysis of the radiological consequences of the bounding severe accident (DEC-B) case for biota are presented in the following chart.

Fig. D.37: DEC-B – dose rate to reference animals and plants, maximum values calculated for the first day after the event (average of maximum values and 95th percentile) and average of the average maximum values calculated for the first 7 days after the event



Včela	Bee
Žížala	Earthworm
Tráva	Grass
Pstruh	Trout
Žába	Frog
Jelen	Deer
Potkan	Brown rat
Borovice	Pine
Kachna	Duck
průměr	mean
kvantil 95%	95th percentile
průměr 1.-7.den	average, days 1–7
[Gy/den]	[Gy/day]

For the reference animals and plants Deer, Rat, and Pine, the maximum calculated values of the radiological parameters, both averages and 95th percentiles, expressing radiological impacts on reference animals and plants under the ICRP and IAEA approach are at the level of the IAEA derived reference values. For Deer, Rat, and Pine, the maxima are found within 3 km of SMR ETE; for Duck, they are in the zone containing the nearest water body considered, meaning 6–10 km from SMR ETE, which also includes Zelendárky Nature Monument. For Duck, within 6–10 km of SMR ETE, the 95th percentile is slightly above the upper bound of the IAEA derived reference value. The upper bound of the derived reference value is not exceeded for any other protected area or any species living in such areas, and even the lower bound of the reference value is not reached for Luční National Nature Monument.

Under the procedure recommended by the IAEA, if estimated dose rates are between the lower and upper bounds, the level of protection may be considered acceptable, but the regulatory authority could determine whether additional factors, meaning a more detailed assessment, or practical mitigation measures should be considered, given that the derived reference levels are reference values, not limits. Because this is not a radiological impact on Duck, meaning waterbirds generally, from an operating discharge into the air or watercourse, but a radiological impact from a postulated DEC-B severe accident, a requirement to apply practical mitigation measures is inappropriate, except for requiring the SMR ETE operator to use every realistically available effort to prevent a DEC severe accident at SMR ETE.

A more detailed analysis shows that, for the reference animal Duck, including at the 95th percentile within 6–10 km of SMR ETE, which also includes Zelendárky Nature Monument, the upper bound of the IAEA derived reference value is exceeded slightly only on the first day after the event. It is not exceeded for the average value even on the first day, and from the second day onward it is not exceeded at the 95th percentile

either. The average value for the first seven days is only slightly above the lower bound of the derived reference value for Duck. The reference values were established primarily for assessing long-term radiological exposure. IAEA-TECDOC-1986, Radiation Protection of Wildlife: Modelling the Exposure and Effects (2021) states that dose rates of approximately 10 mGy/day (1E-02 Gy/day) for 5 years cause a significant reduction in large-mammal populations, while 80–100 % of the control population survives in small-mammal populations. Although the document does not present results for Duck, it can be assumed that they would be similar because comparable modeling assumptions are applied to mammals and birds. The stated value of 10 mGy/day is one order of magnitude above the upper bound of the IAEA derived reference value for birds and mammals, and such a value was not reached anywhere around SMR ETE for any species assessed for the DEC-B event.

Table D.106: DEC-B – duck, dose rate on days 1 through 7 after the event

Dose rate, Duck [Gy/day]							
Distance from SMR ETE (zone)	Day 1		Day 2		Day 7		Days 1–7
	mean	95%	mean	95%	mean	95%	mean
1–3 km	3.2E-04	8.0E-04	5.5E-05	1.3E-04	2.1E-05	5.0E-05	7.4E-05
3–6 km	1.8E-04	3.1E-04	2.8E-05	5.1E-05	1.1E-05	2.0E-05	4.0E-05
6–10 km	2.9E-04	1.3E-03	1.7E-04	9.4E-04	1.1E-04	6.6E-04	1.5E-04
10–20 km	1.3E-04	3.6E-04	8.5E-05	2.9E-04	6.1E-05	2.2E-04	7.8E-05
20–30 km	1.7E-04	4.9E-04	1.4E-04	3.5E-04	1.0E-04	2.7E-04	1.2E-04
30–50 km	7.7E-05	2.2E-04	6.3E-05	2.0E-04	4.8E-05	1.5E-04	5.7E-05
50–100 km	1.8E-05	1.0E-04	1.4E-05	9.5E-05	1.1E-05	6.9E-05	1.3E-05
Zelendárky	2.3E-04	1.3E-03	1.6E-04	9.4E-04	1.1E-04	6.6E-04	1.4E-04
Řežabinec	5.5E-05	2.7E-04	4.5E-05	2.0E-04	3.2E-05	1.6E-04	3.9E-05
Třeboňsko (including Velký and Malý Tisý and Horusický fishpond)	1.3E-04	4.2E-04	1.0E-04	3.5E-04	7.7E-05	2.6E-04	9.3E-05
Luční	1.5E-05	7.0E-05	1.3E-05	6.0E-05	9.6E-06	4.5E-05	1.2E-05

For Grass, Bee, Earthworm, Trout, and Frog, all calculated values of the radiological parameters, including the 95th percentiles expressing the radiological impact on reference animals and plants under the ICRP and IAEA approach, are below the lower bound of the IAEA derived reference values. The impact of the DEC-B event on flora and fauna populations represented by these reference animals or plants can be considered negligible and the level of protection of flora and fauna adequate. This applies to the level of protection of flora and fauna generally; in this sense, the reference animals and plants are intended to represent flora and fauna as such.

Neither IAEA nor ICRP documentation contains guidance, methodology, sets of dose coefficients, or reference levels for assessing radiological impacts on fungi. In view of the results and the fact that not even the lower bound of the derived reference value was reached under severe accident conditions for any biological species assessed at Luční National Nature Monument, where rare fungi are the protected feature, the generally adequate level of protection of flora and fauna may also be applied to fungi.

D.II.1.3. Practically eliminated conditions

Under Decree No. 329/2017 Coll., on requirements for the design of a nuclear facility (Section 4(1)), the following conditions must be practically eliminated:

- a radiation accident in which there is insufficient time to introduce urgent protective measures for the population (an "early radiation accident"),
- a radiation accident requiring urgent protective measures for the population that cannot be limited in space or time (a "large radiation accident").

To eliminate these conditions, the design of a nuclear facility with a nuclear reactor must, under Section 7(5) of Decree No. 329/2017 Coll., provide reasonably practicable technical and organizational measures for managing design extension conditions so as to achieve a level of nuclear-facility robustness under which:

- a severe accident that could lead to an early radiation accident or a large radiation accident is a practically eliminated condition,
- a severe accident that is not a practically eliminated condition and that could lead to a radiation accident will be managed so that, at most, limited protective measures under Section 104(1)(a) and Section 104(1)(b)(2) and (3) of Act No. 263/2016 Coll., the Atomic Act, as amended, will be required.

According to the reference RR SMR design documentation (Environment, Safety, Security and Safeguards Case Version 3, Tier 1, Chapter 15: Safety Analysis)[1], the objective of the practical-elimination concept will be adequate implementation of defense-in-depth. Appropriate analyses will be performed of conditions that may ultimately lead to unacceptable radiological consequences. The analyses will demonstrate that event sequences or phenomena that could lead to an early or large release are either physically impossible because of inherent safety characteristics

[1] The Rolls-Royce E3S Case documentation is available at: https://gda.rolls-royce-smr.com/documents

incorporated into the design or are extremely unlikely. The following frequency values will apply when demonstrating practical elimination of event sequences:

- the aggregate frequency of events leading to an early or large release (LERF, Large Early Release Frequency) must be less than 1E-06/year,
- an individual phenomenon or event/failure sequence leading to an early or large release must have a frequency of less than 1E-07/year.

If phenomena or sequences that cast doubt on the practical-elimination objectives for early or large releases are identified, adequate design provisions will be adopted so that these objectives can be met. Overall risks will be in accordance with the ALARP (As Low as Reasonably Practicable) principle.

The following three steps will be used to demonstrate the robustness of SMR ETE:

- Step 1 - identification of relevant phenomena or event sequences that could lead to an early or large release.
- Step 2 - identification and assessment of the safety provisions applied, including risk analysis. The safety provisions will be identified in relation to the list of PIEs (postulated initiating events). These safety provisions will be assessed for their ability to prevent an early or large release, and outputs from the PSA (probabilistic safety assessment) will be used in the assessment.
- Step 3 - demonstration that sequences leading to an early or large release are either physically impossible or can be considered extremely unlikely with a high degree of confidence.

For severe accidents that are not practically eliminated by the design, it will be demonstrated that application of safety provisions will achieve a nuclear-facility condition that does not require protective measures to be introduced around SMR ETE. Both probabilistic analyses, based on the frequency objectives specified above, and deterministic analyses, based on the safety provisions applied, will be prepared for event sequences/phenomena considered practically eliminated. All demonstrations specified below, including probabilistic and deterministic safety analyses, component-robustness calculations, research reports, and similar documents, will form part of the supporting documents for licensing SMR ETE under Act No. 263/2016 Coll., the Atomic Act, as amended.

The following sequences will be used in the SMR ETE design as generic events/failure sequences that could result in an early or large release:

- rupture of a large primary-circuit pressure-retaining component,
- direct containment heating,
- accidents involving rapid reactivity insertion,
- large steam explosions in the reactor pressure vessel,
- detonation of combustible gases,
- containment overpressurization as a consequence of long-term loss of heat removal from the containment,
- penetration of the basemat or containment bypass as a result of molten-fuel-concrete interaction,
- severe accident involving containment bypass,
- severe damage to nuclear fuel in the irradiated-fuel storage pool.

Brief descriptions of the individual failure sequences/phenomena, taken from the generic RR SMR design description and to be used as the basis for demonstrations of practical elimination of an early or large SMR ETE release, are presented below.

Rupture of a large primary-circuit pressure-retaining component

Event phenomenology: A large reactor-coolant leak due to rupture of a large primary-circuit component followed by containment failure, for example because of a missile from the initial failure, could lead to reactor-core damage and consequently contribute to a large and/or early release. Such events are difficult to address by designing sufficiently capable safety systems, so a demonstration of practical elimination will be required, with high confidence that the probability of occurrence of such an initiating event is sufficiently low for it to be ruled out.

Safety measures: Rupture of large primary-circuit components will be prevented through high manufacturing and installation quality, including assignment of the appropriate safety classification. The safety classification of these components will also determine the required scope of nondestructive examinations and tests.

The analyses will demonstrate achievement of the practical-elimination objectives, meaning extremely unlikely occurrence with a high degree of confidence, or <1E-7. The analysis results will be confirmed by a Level 2 PSA.

Direct containment heating

Event phenomenology: Rapid progression of the initial accident could increase pressure in the primary circuit. If the primary circuit were not depressurized, the condition could lead to reactor-pressure-vessel failure. If the pressure vessel failed, molten fuel could be ejected violently into the containment interior, creating excessive pressure and temperature in the containment atmosphere. Because high-temperature fragments of debris could come into direct contact with the inner steel surface of the containment, its integrity could be jeopardized. This could lead to an early or large release. Such a scenario is possible only if the reactor core is damaged (melted).

Safety measures: Proper application of the individual levels of defense-in-depth (DiD 1 through DiD 3b) will ensure performance of all three fundamental safety functions: reactivity control, cooling of irradiated fuel, and confinement of radioactive substances. Diverse systems, meaning severe accident management provisions, will be designed to provide the fundamental safety functions in scenarios involving a threat to the reactor core and will ensure safety even if the safety systems fail. The SMR ETE design will prevent high-pressure sequences corresponding to a severe accident (DEC-B) by means of primary-circuit depressurization systems. These systems will be designed with appropriate redundancy, segregation, and diversity. The following strategies and systems will be used:

- Primary-circuit depressurization by cooling the steam generator, causing steam and the steam-water mixture inside the primary circuit to condense and thereby reduce pressure.
- Rapid primary-circuit depressurization by means of emergency reactor-core cooling.
- Use of a diverse system for rapid primary-circuit depressurization into the containment.

Sequences that would lead to core melting with direct containment heating will be demonstrated to be extremely unlikely with a high degree of confidence (<1E-7), because multiple mutually independent strategies will be available for primary-circuit depressurization. Deterministic analyses will be prepared for all methods.

Accidents involving rapid reactivity insertion

Event phenomenology: Accidents involving rapid reactivity insertion could significantly damage the fuel cladding, a barrier against release of radioactive substances, and potentially another primary-circuit barrier. A reactivity-insertion accident could occur during reactor-refueling activities, when the reactor is shut down, or during scenarios such as withdrawal of control rods from the reactor core, steam-line rupture with subsequent primary-circuit subcooling, or spurious actuation or failure of reactor-protection systems.

Safety measures: The RR SMR design limits the potential for positive reactivity insertion through the reactor-core design and the use of adequate features for safe reactivity control. A fundamental design requirement for the reactor-core design is to ensure a negative temperature coefficient of reactivity at DiD 1 through DiD 3a. The nuclear characteristics of the core are established by design so that, under all possible combinations of core pressure, temperature, and output, a potential increase in output during fault conditions caused by physical properties is suppressed. The reactor trip systems will provide highly reliable features allowing the reactor to be shut down under any condition.

During normal operation, the RR SMR will operate with boron-free coolant and shutdown by boration of the reactor will not be required. However, reactor boration is used as a diverse shutdown method, meaning an alternative shutdown method, so faults involving dilution of boron in the primary circuit will also form part of the safety analyses, but only under conditions in which the alternative reactor-shutdown method has been used. Accidents involving dilution of boric acid in the primary-circuit coolant are not possible in the RR SMR design because boric acid will not be used for reactivity control during operation. However, if a design other than the generic RR SMR is used for SMR ETE, this issue will also be subject to demonstration of practical elimination.

Sequences involving rapid reactivity insertion, such as failure to trip the reactor or steam-line rupture, will be demonstrated to be extremely unlikely with a high degree of confidence (<1E-7). Deterministic analyses will also be performed for possible fault conditions.

Reactivity faults during normal operation will be practically eliminated as physically impossible on the basis of the core design.

Large steam explosions in the reactor pressure vessel

Event phenomenology: Steam explosions are phenomena arising from the rapid transition of water from the liquid to the vapor phase. This occurs upon contact with surfaces having a temperature significantly above the boiling point of water. The water begins to boil rapidly, resulting in rapid expansion. Continued expansion generates a pressure wave containing enough energy to damage or deform surrounding structures.

During a DEC-B condition, steam explosions may occur in the reactor pressure vessel during fuel-melting scenarios if relocation of molten nuclear-fuel debris into the still-flooded lower portion of the reactor pressure vessel causes rapid evaporation of the remaining vessel inventory. This condition would result in pressure expansion that could exceed the capacity of primary-circuit venting features and could jeopardize reactor-pressure-vessel integrity. If the reactor pressure vessel were breached, melt (corium) could flow into the reactor cavity, and subsequent interaction between the molten corium and the flooded reactor cavity could potentially result in a steam explosion presenting a significant threat to the containment.

Safety measures: DEC-A-level safety systems and safety provisions will be designed to prevent core damage. If these DEC-A safety provisions failed and the reactor core melted, the SMR ETE design would include diverse DEC-B-level systems and safety provisions to mitigate progression of the event and maintain the reactor in a safe condition.

Steam explosions outside the reactor pressure vessel will be eliminated by applying an IVR (In-Vessel Retention) strategy, for which a portion of the containment will be allocated to severe accidents together with other associated systems for mitigating accident consequences during severe accidents. The IVR strategy will be based on the high quality of the reactor pressure vessel, which will be designed so that core debris does not jeopardize its integrity. It will also be based on external cooling of the vessel through passive flooding with water from a tank located inside the containment and on heat removal from the reactor cavity into the containment interior. The safety provisions adopted will be sufficient to prevent damage to the reactor pressure vessel and will ensure that the melt is retained inside the vessel. This will prevent melt-through of the reactor pressure vessel and the core melt from falling into water in the reactor cavity, thereby also preventing a steam explosion.

Sequences resulting in a steam explosion will be extremely unlikely with a high degree of confidence. This will be confirmed by deterministic safety analyses. Although a steam explosion inside the reactor pressure vessel is possible under a DEC-B condition, reactor-pressure-vessel-robustness safety analyses indicate that such an explosion would, with high probability, not directly jeopardize reactor-pressure-vessel integrity.

Sequences involving steam explosions outside the reactor pressure vessel and inside the containment will be demonstrated to be extremely unlikely with a high degree of confidence (<1E-7).

Detonation of combustible gases

Event phenomenology: During severe accidents at a PWR, the presence of hydrogen in the containment presents a major risk associated with severe accident management. High concentrations of hydrogen in the containment can ignite or detonate, creating high-pressure conditions that may subsequently threaten the containment. The most common hydrogen-generation mechanism is the exothermic oxidation of zirconium nuclear-fuel cladding by steam, producing zirconium dioxide, hydrogen, and heat. The reaction takes place under high-temperature conditions, and the oxidation rate accelerates as the temperature increases. As the reaction progresses, the heat it generates accelerates it further, creating a positive feedback loop. During severe accidents, hydrogen is generated from several other sources, such as iron oxidation, water radiolysis, or primary-circuit-coolant degassing. Hydrogen and carbon monoxide may also be generated by molten-fuel-concrete interaction; however, because a severe accident involving reactor-pressure-vessel failure followed by melt discharge will be practically eliminated, this source of combustible gases will not be considered. Generation of other combustible gases is not physically or chemically possible.

Safety measures: The primary means of preventing a hydrogen detonation that could jeopardize containment integrity in the SMR ETE design will be the large volume of open free space, or air, in the containment system. Another means will be the deliberate arrangement of systems, structures, and components to eliminate dead spaces, such as corridors, where realistically practicable. These provisions, by promoting circulation within the containment atmosphere, will suppress local accumulations of high hydrogen concentrations or possible hydrogen stratification. The SMR ETE design will also include hydrogen igniters and passive catalytic recombiners, collectively referred to as the Hydrogen Reduction System. The SMR ETE design will minimize the probability of a severe accident involving fuel damage. Even in the event of a very unlikely severe accident involving hydrogen generation and release into the containment, the Hydrogen Reduction System will prevent a concentration from being reached that could result in detonation or slow combustion (deflagration) followed by damage to the containment pressure vessel.

The design conditions for safety provisions associated with the presence of hydrogen in the containment are determined by the conditions expected during DEC-B. The risks associated with hydrogen combustion during DEC-B can be divided into two aspects:

- The overall risk of slow deflagration[1], assuming that hydrogen is well mixed in the containment.
- The local risk of combustion acceleration followed by detonation.

Practical elimination of a large or early release associated with potential hydrogen detonation or deflagration will be demonstrated to be extremely unlikely with a high degree of confidence (<1E-7).

Containment overpressurization (consequence of long-term loss of heat removal from the containment)

Event phenomenology: Containment overpressurization is an accident condition caused by possible failure of certain systems, structures, or components during severe accident scenarios. The increase in containment pressure will be most significant as a consequence of a primary-coolant leak, meaning a loss-of-coolant accident (LOCA), involving release of steam or a steam-water mixture and hydrogen directly into the containment. Another cause may be rupture of other high-energy piping, such as a steam line or feedwater line, or use of the in-vessel retention (IVR) strategy involving cooling of the reactor pressure vessel by external flooding followed by steam generation. If heat is not removed

[1] In the case of deflagration, the flame-propagation rate is lower than the speed of sound. The opposite applies in the case of detonation.

from the containment under these conditions, the containment will be progressively pressurized. Complete loss of heat removal during DEC-B would eventually result in failure of the containment vessel.

Safety measures: A threat to the containment from overpressure will arise only during a severe accident involving reactor-core melting. However, the SMR ETE reactor will be designed to effectively prevent such a condition. If a severe accident nevertheless occurs, heat will be removed from the containment by a passive, independent heat-removal system. Sequences that would lead to containment overpressurization will be extremely unlikely with a high degree of confidence because of design provisions that prevent core melting. Nevertheless, two different methods of heat removal from the containment that could be used during a DEC-B condition will be incorporated into the SMR ETE design. A passive containment heat-removal system (PCHR) using internal heat exchangers to cool the steam-air mixture inside the containment will be used as the primary system. An active containment heat-removal system (ACHR) using part of the spray system will be designed as the secondary system. Both systems, which can be used during DEC-B, will be qualified for DEC-B accident conditions inside the containment vessel. The adequacy of these safety provisions will be demonstrated by deterministic safety analyses. Practical elimination of containment overpressurization will be demonstrated to be extremely unlikely with a high degree of confidence (<1E-7).

Basemat penetration or containment bypass due to molten-fuel-concrete interaction

Event phenomenology: Interaction of the core melt with concrete and other materials in the reactor cavity is an ex-vessel scenario. If the debris is not adequately cooled by water, heat is removed by melting and erosion of the surrounding materials, damaging or penetrating the containment and also producing noncondensable gases. These gases would contribute to further containment pressurization and would be difficult to remove. Additional combustible gases, such as hydrogen or carbon monoxide, may be generated by interaction of noncondensable gases with unoxidized metals from reactor parts and other components.

Safety measures: Under the SMR ETE design, the core melt will be retained in the reactor pressure vessel during DEC-B using an in-vessel retention (IVR) strategy forming part of the safety provisions for prevention and mitigation of severe accidents. For successful application of the IVR strategy, the reactor will be depressurized and the pressure vessel will be flooded externally with water. The reactor vessel will be designed to maintain the structural integrity of the lower portion of the pressure vessel even if molten-core debris forms inside the reactor, with the reactor flooded and depressurized. This will eliminate the possibility of core debris melting through the lower portion of the reactor pressure vessel.

The SMR ETE design incorporates provisions to prevent reactor-core melting, and even in a core-melting scenario, melt-through of the reactor pressure vessel would be possible only if the IVR strategy failed. The SMR ETE design will include sufficient safety provisions to ensure the IVR strategy, including high-quality reactor-pressure-vessel design and manufacture, sufficient water within the containment to flood the vessel, and several diverse methods of heat removal from the containment. Melt-through of the reactor pressure vessel will therefore be extremely unlikely with a high degree of confidence.

Deterministic safety analyses will be prepared for the safety demonstrations and will confirm sufficient SMR ETE design margins for all scenarios that could lead to a DEC-B condition. Structural analyses will also be prepared to confirm sufficient robustness of the reactor pressure vessel and containment when the IVR strategy is used.

Severe accident involving containment bypass

Event phenomenology: Containment bypass is a condition in which the leak-tightness of the containment vessel is impaired, potentially allowing radiation to escape into the surrounding environment. During a severe accident, such a bypass could theoretically occur in several ways:

- Containment bypass as a result of a loss-of-coolant accident (LOCA). In such a case, the active medium, meaning primary coolant, would leak into the containment interior. If another line penetrating the containment then failed, for example as a result of pipe whip from the ruptured circulation-loop piping that caused the LOCA, radioactive substances could escape outside the containment through this secondarily damaged line. An additional prerequisite for such a scenario is secondary damage to piping between an isolation valve and the containment wall or failure of isolation valves to close during the event.
- Containment bypass during a steam-generator-tube-rupture event (SGTR). This condition would result in penetration of active primary medium into the secondary medium. In the event of subsequent failures, meaning damage or failure of a fast-acting steam-line isolation valve or opening and failure to close of a steam-generator safety valve, containment bypass and release of radioactive substances outside the containment would occur.
- Containment bypass while the containment is open. During a refueling outage, the containment is open, and a radiation release inside the containment could therefore escape into the surrounding environment.

Safety measures: The SMR ETE design will reduce the risk of containment bypass due to a LOCA by means of design provisions ensuring containment isolation. SMR ETE will be designed to minimize the number of containment penetrations. During accident conditions, the containment will be isolated automatically by closing the applicable fast-acting isolation valves installed on all routes penetrating the containment. The fast-acting isolation valves will be located as close as possible to the containment walls and will have double redundancy. All valves in piping directly connected to the primary circuit will also be redundant. When the containment is isolated, this will separate both the containment interior and the process systems located inside it from the surrounding area, thereby preventing a possible release of radioactive substances.

During an SGTR event, the power supply to the pressurizer heaters will be disconnected, supporting rapid primary-circuit depressurization and termination of the primary-medium leak to the secondary side. The steam lines of the affected steam generators will also be isolated during an SGTR event. Because the steam generators will be equipped with safety valves to limit pressure on their secondary side, the strategy for preventing containment bypass will be based on rapid primary-circuit depressurization and reducing pressure in the primary-circuit/damaged-steam-generator system below the safety-valve opening pressure. Prevention of containment bypass during an SGTR and DEC-B will therefore be provided by sufficient and diverse primary-circuit-depressurization provisions that prevent a high-pressure sequence during this event.

If the containment is open during an outage, the reactor will also be shut down and open, so a high-pressure DEC-B event sequence is not anticipated. Containment bypass would be prevented in such a case by closing the personnel access openings in the containment vessel, but the main fuel-handling hatch would remain open to the containment annulus. For this reason, safety provisions will be used to prevent fuel melting in the connected refueling-pool system.

Practical elimination of containment bypass in all three cases will be demonstrated to be extremely unlikely with a high degree of confidence (<1E-7).

Severe damage to nuclear fuel in the irradiated-fuel storage pool

Event phenomenology: To prevent damage to irradiated fuel, fuel subcriticality and residual-heat removal from the storage pool must be maintained. Failure of cooling and makeup to the irradiated-fuel storage pool or leakage from the irradiated-fuel storage pool could potentially result in damage to irradiated fuel followed by a possible radioactive release.

Safety measures: Safety provisions and design features at SMR ETE will prevent a severe accident in the irradiated-fuel storage pool. If the duty fuel pool cooling system (DFPC) fails, two additional safety provisions will ensure safety: faulted fuel pool cooling (FFPC) and fuel pool boil-off prevention (FPBO). If the DFPC is unavailable, the FFPC protective provision will be used, except during a station blackout (SBO). If the FFPC provision is also unavailable, the FPBO provision, which is based on a passive principle and is capable of preventing fuel melting, will be used. Under the FFPC and FPBO safety provisions, the water level will be monitored continuously, potential water leaks will be detected automatically, and protective provisions, meaning isolation features preventing leakage, will be actuated.

Practical elimination of damage to irradiated nuclear fuel will be demonstrated to be extremely unlikely with a high degree of confidence (<1E-7).

D.II.1.4. Radiation risks associated with human activities at the site and in its surroundings

Hazards arising from human activity at the site are represented by accidental events that could potentially present a hazard to SMR ETE nuclear safety. The assessment of these risks takes into account possible events that may arise at stationary, mobile, and pipeline sources. The risk sources identified within 10 km of the SMR ETE site are specified in Chapter B.I.6.3.1. Safety concept and basic safety criteria (page 99 of this Documentation), specifically in its Subsection B.I.6.3.1.14. External hazards.

D.II.1.4.1. Main principles of protection against common-cause failure and of ensuring protection during a radiation extraordinary event at another nuclear facility at the site

Because multiple nuclear facilities may operate concurrently at the same site, SMR ETE design preparation must address the consequences for SMR ETE safety of a radiation incident or radiation accident occurring as a separate event at any nuclear facility at the site and, not least, the consequences of a radiation incident or radiation accident at SMR ETE itself for the other nuclear facilities.

With respect to the possibility of accident conditions occurring simultaneously at multiple nuclear facilities at the site, the technological independence of the individual nuclear facilities means that such a situation could realistically occur only as a result of an extreme external event, such as extreme climatic conditions, an extreme earthquake, or an extreme flood. Given the favorable characteristics of the site, the simultaneous occurrence of accident conditions at several units due to a common-cause failure of external origin can be considered practically eliminated.

In terms of possible effects on SMR ETE safety during accident conditions at an ETE1,2 or New NPP ETE unit, it must be taken into account that the SMR ETE safety systems will be technologically independent of the other nuclear facilities at the site and will also be capable of independently managing accident conditions without support from other units. Both the technical and personnel safety provisions for SMR ETE will be fully self-sufficient. The SMR ETE autonomy concept also includes long-term habitability of the unit control room and other backup locations so that personnel can work under all conditions, including severe accident conditions.

The manner in which nuclear safety of the other nuclear facilities at the site is ensured is described in Chapter B.I.6.4.3. Method for ensuring nuclear safety of other facilities at the site (page 191 of this Documentation).

Protection of personnel at ETE1,2 and New NPP ETE and during construction of SMR ETE or New NPP ETE in the event of a radiation extraordinary event at the site is addressed through the on-site emergency plan and described in Chapter D.II.1.6. Measures for managing a radiation extraordinary event (page 470 of this Documentation), specifically in its Subsection D.II.1.6.2.5. Provision of protection for personnel at the SMR ETE site.

Accordingly, the fundamental requirement for limiting possible interaction between SMR ETE and ETE1,2 or New NPP ETE is to ensure normal shutdown, cooling, and residual-heat removal at the other reactors even during a severe accident at one of the reactors at the site. The principal means are technological independence, separation of safety systems, high robustness and sufficient margins against extreme external events, and self-sufficiency of each unit in managing all conditions, including severe accidents, independently.

D.II.1.4.2. Preliminary assessment of the risk of an accidental aircraft crash

Section 13 of SÚJB Decree No. 378/2016 Coll., on the siting of a nuclear facility, and SÚJB Guide BN-JB-4.2 require assessment of the degree of hazard to a nuclear facility from an accidental aircraft crash by determining the probability of a crash whose consequences exceed the resistance assumed in the nuclear-facility design for systems, structures, and components affecting nuclear safety. The criterion is the aircraft-crash frequency value under Section 11 of SÚJB Decree No. 329/2017 Coll., on requirements for the design of a nuclear facility. It requires ensuring that selected equipment and systems, structures, and components affecting nuclear safety that are necessary for managing accident conditions and a radiation accident at nuclear facilities other than research nuclear facilities are resistant to an accidental aircraft crash whose frequency of impact on the area in which it can cause a basic external initiating event is greater than once per 10^{-7} years.

According to the recommendations of SÚJB Guide BN-JB-4.2, Siting of a Nuclear Facility - Assessment of Phenomena Caused by Human Activity, and IAEA SSG-35, Site Survey and Site Selection for Nuclear Installations, the hazard arising from airport operations can be neglected if there are no airports in the immediate vicinity of the nuclear facility and more distant airports are used to an extent not exceeding specified criteria. The criteria and conclusions from assessing air traffic under these criteria are presented in the following overview.

Airports located within 10 km of SMR ETE: There are no airports within 10 km of SMR ETE.

Airports located 10 to 16 km from SMR ETE with traffic greater than 500 x D^2, where D [km] is the distance between the airport and the nuclear facility: There is no large airport within 16 km of SMR ETE that exceeds the screening-criterion values for the number of movements per year.

Airports located more than 16 km from the SMR with traffic greater than 1000 x D^2: Several airports are located more than 16 km away, but the number of movements at these airports does not exceed the recommended criteria.

Military training areas within 30 km of SMR ETE: Areas LKTRA74, 75, 76, and 77 are located within 30 km of SMR ETE and, like LKTRA78, are used for military-aircraft training flights and overflights. No live-fire exercises are conducted and no bombing ranges are located in the training areas specified above; activities in these areas do not present a hazard to SMR ETE.

Air routes and airport departure and approach corridors within 4 km of SMR ETE: No air routes or airport departure or approach corridors pass within 4 km of SMR ETE.

The assessment of aircraft-crash risk to SMR ETE was performed in 2025 in accordance with the recommendations of SÚJB Guide BN-JB-4.2 and IAEA SSR-1 and SSG-35 and is based on accident statistics for the Czech Republic. Accidents were processed separately for the categories of military aviation (VOJ), general aviation (GA), and commercial or transport aviation (OBCH). The aircraft-crash probability constitutes an approximate estimate for the effective impact area of the structure. The effective impact area is the area corresponding to parts of nuclear-facility structures that are significant in terms of requirements for nuclear safety. The generic RR SMR design layout was used conservatively to calculate the effective area; the resulting effective area A_{eff} is 7,688 m^2. The probability of hazard from an accidental aircraft crash under the stated conditions is therefore 1.36×10^{-7}/year.

It follows that loading from an accidental aircraft crash must be considered in the SMR ETE design as an external design basis event when ensuring resistance to external hazards. The requirements for resistance to the intentional crash of a large commercial aircraft are specified in Chapter D.II.1.5.1. Risk of a terrorist attack (page 468 of this Documentation).

D.II.1.4.3. Preliminary assessment of risks resulting from other human activities at the site

To evaluate hazards arising from human activity, information was collected from state-administration authorities, road and railway administrators, the transit-gas-pipeline operator, and owners of potential hazard sources within 10 km of SMR ETE. This corresponds to the upper screening distance value (SDV) recommended by IAEA SSG-79, Hazards Associated with Human Induced External Events in Site Evaluation for Nuclear Installations. Ten facilities associated with industrial production, energy infrastructure, road, rail, and water transportation, and storage of hazardous substances were identified in the defined assessment area; see Section B.I.6.3.1. Safety concept and basic safety criteria (page 99 of this Documentation), specifically in its Subsection B.I.6.3.1.14. External hazards.

Sources located within the ETE1,2 site must also be considered potential sources of external hazards to SMR ETE. These consist primarily of the storage and on-site transportation of toxic, explosive, combustible, oxidizing, and radioactive substances and asphyxiants, including hydrogen, diesel fuel, hydrazine, oxygen, nitrogen, and other chemicals used at the power plant, as well as transportation of radioactive waste and spent nuclear fuel. A total of 15 potential hazard sources were identified within the ETE1,2 site; see Chapter B.I.6.3.1. Safety concept and basic safety criteria (page 99 of this Documentation), specifically in its Subsection B.I.6.3.1.14. External hazards. Accidents at other nuclear facilities at the site involving release of radioactive substances into the surrounding area constitute a specific hazard source. These hazard sources will be assessed during subsequent phases of the permitting process.

In evaluating hazards arising from human activity at the site, individual hazard sources were screened out on the basis of conservative deterministic and probabilistic assessments. The possible effects of interactions with SMR ETE were established in the conservative deterministic assessment; if these effects on the SMR were not negligible, a probabilistic assessment was performed. If the resulting probability of an event with non-negligible effects on SMR ETE is less than 10^{-7}/year, the hazard source may be considered negligible. Brief conclusions from the assessment performed for the individual groups of external-hazard sources are presented below.

Industrial and military facilities and forest stands: A preliminary assessment of the effects of events that may occur at external stationary hazard sources within 10 km of the SMR ETE site showed that all such events can be considered negligible, except for the possible dispersion of toxic combustion gases during a fire in a forest or other agricultural area around the SMR ETE site.

Rail and road transportation: Assessment of hazard sources arising from rail transportation identified one event that cannot be neglected, EM2.3 (ammonia water on the rail siding), during which a toxic plume could form and disperse as far as the SMR ETE site and could potentially adversely affect power-plant personnel. Of the hazard sources associated with road transportation, event EM3.12 (hydrazine hydrate on Road II/105) was assessed as non-negligible; as in the case of ammonia water on the rail siding, the SMR ETE site could be affected by a toxic plume. The assessment of road transportation around the SMR ETE site also identified as non-negligible three events involving dispersion of a plume of a combustible/explosive substance: EM3.3 (LPG in a road tanker on Road II/105), EM3.4 (LPG in small packages on Road II/105), and EM4.4 (LPG in small packages on Road II/138). During these accidents, the resulting plume of an explosive substance could affect a large portion of the SMR ETE site.

Pipeline routes: Four branches of the transit gas pipeline pass near the SMR ETE site. Events on these pipeline routes have already been assessed in detail for both ETE1,2 and the planned New NPP ETE; SMR ETE will be located in a more favorable position. The event assessment identified one event that cannot be neglected in terms of potential effects on SMR ETE: horizontally diffusing gas leaks.

Electromagnetic interference: The intensity of electromagnetic fields and density of stray (eddy) currents were measured within the SMR ETE site to evaluate electromagnetic interference and eddy currents. No external electromagnetic interference sources that would restrict SMR ETE operation were identified. The decisive sources of interference affecting the equipment installed for the SMR will therefore be interference generated by this newly installed equipment itself; interference from natural sources, including atmospheric, cosmic, and electrostatic sources; and interference generated by ETE1,2, the external 400 kV and 110 kV grids, and similar sources.

Eddy currents: Measurements at the future SMR ETE site showed a higher density of direct-current stray currents near the hot-water pipeline to České Budějovice, and alternating-current stray currents were also measured near the 110 kV high-voltage and 400 kV extra-high-voltage lines.

Waterways: The Vltava River is not used to transport hazardous and toxic materials, so no waterway event sources potentially affecting SMR ETE need to be considered near SMR ETE.

D.II.1.4.4. Conclusion of the preliminary assessment of risks resulting from human activities at the site

The preliminary assessment shows that SMR ETE nuclear safety could be affected by a radiation extraordinary event at another nuclear facility at the site and by events involving dispersion of plumes of toxic and explosive substances during traffic accidents on Roads II/105 and II/138 or on the rail siding. Dispersion of toxic combustion gases during a fire in a forest or other agricultural area around the SMR ETE site, underground diffusion toward the SMR of gas leaking from the transit gas pipeline, and, finally, an accidental aircraft crash at SMR ETE also cannot be neglected. Other hazards arising from human activity at the Temelín site can be considered negligible on the basis of the assessment. The design will

incorporate measures protecting structures, systems, and components important to nuclear safety and protecting operating personnel from all events and their effects on SMR ETE.

The SMR ETE design will protect the SMR against the following design events identified by the preliminary assessment of external, unintentional hazards caused by human activity around the SMR ETE site:

a) The SMR ETE design will protect the SMR against the consequences of a radiation extraordinary event at any other nuclear facility at the Temelín site.
b) To eliminate the adverse effects of events involving dispersion of a toxic or explosive plume, the SMR ETE design basis will include provisions to prevent a toxic plume from being drawn into the ventilation systems of occupied spaces, including control rooms and control centers, and to prevent an explosive plume from being drawn into the ventilation systems of spaces containing systems, structures, and components affecting nuclear safety.
c) The SMR ETE design will include provisions against horizontal diffusion through the soil beneath an impermeable surface of gas leaking from a transit gas pipeline, which could transport natural gas into an enclosed SMR ETE structure and result in explosion of a combustible mixture and a fire.
d) Loading from the accidental crash of an aircraft corresponding to an aircraft with the specified characteristics will be considered in the SMR ETE design as a design event for systems, structures, and components important to nuclear safety.
e) The SMR ETE design will be resistant to the crash of a large commercial aircraft. This event will be assessed as a design extension condition without fuel melting, using the US NRC approach in 10 CFR Section 50.150, Aircraft Impact Assessment, and taking into account WENRA recommendations for new reactors.
f) The SMR ETE design will comply with electromagnetic-compatibility standards and principles (EMC concept). The design will define the electromagnetic environment in which the systems and components operate. Systems and components will be designed to operate in that environment without electromagnetic interference impairing their operability. Systems and components must also comply with limits on the level of interference emitted into the electromagnetic environment. Interfaces, meaning coupling paths, between systems and components and the electromagnetic environment must be appropriately treated where necessary, using protection, interference suppressors, and similar provisions. Interfaces between the units and the network and between the units themselves will be designed in accordance with EMC principles.

D.II.1.5. Other risks

D.II.1.5.1. Risk of a terrorist attack

The risk to SMR ETE from a terrorist attack will be assessed and eliminated during subsequent phases of Project preparation and implementation using the standard physical-protection measures and procedures for nuclear facilities employed in current practice in accordance with the requirements of international and national legislation.

The obligations of the Czech Republic concerning physical protection of nuclear materials arise from accession to the Convention on the Physical Protection of Nuclear Material, which the Czech Republic signed in March 2005 and which entered into force in July 2007. Requirements for physical protection of nuclear materials and nuclear facilities are defined in the Atomic Act and SÚJB Decree No. 361/2016 Coll., on security of a nuclear facility and nuclear material, as amended.

State regulatory activities in this area are performed by SÚJB, which focuses on monitoring the physical protection of nuclear facilities in the Czech Republic and conducts inspections of the physical protection of nuclear facilities, nuclear materials, and radioactive waste, as well as inspections during the transport of nuclear materials. An important part of SÚJB's activities in assessing measures to ensure the physical protection of nuclear-material shipments is the approval of packages for the transport of nuclear materials. SÚJB inspectors inspect all shipments of fresh and spent nuclear fuel and radioactive waste. Information on transportation and physical protection of nuclear materials is governed by Act No. 412/2005 Coll., on protection of classified information and security eligibility, as amended.

Following the attacks in New York on September 11, 2001, protection of all nuclear facilities against attacks involving a large commercial aircraft was increased in all countries with an advanced nuclear-energy sector. This is an entirely different issue from aircraft impacts due to accidental causes, and the method of protection, which is based primarily on preventive measures, also differs fundamentally. Primary protection against intentional attacks is the responsibility of the state, including intelligence services, monitoring of terrorist activities, airspace protection, prevention in air transportation, and similar measures. Impact loading from a large commercial aircraft as a consequence of an intentional attack will be considered in the design of selected safety-significant structures at SMR ETE. The aircraft design parameters and the attack scenarios considered are classified information.

All design suppliers for SMR ETE, including for the reference RR SMR design, have confirmed in technical information that their power plant units are resistant to an aircraft crash, including the crash of a large commercial aircraft. Assessment of the crash of a large commercial aircraft will apply the US NRC approach established in 10 CFR Section 50.150, Aircraft Impact Assessment, requiring license applicants for new nuclear power plants to perform a realistic evaluation of the effects of a large commercial-aircraft crash on the power plant, with this event considered part of design extension conditions. To meet the requirement for resistance to the crash of a large commercial aircraft, it must be demonstrated that the reactor core will remain cooled, or containment integrity will be maintained, and that cooling of irradiated/spent nuclear fuel will be maintained,

or the integrity of the irradiated/spent-fuel pool will be ensured. Requirements for resistance of new reactors to the crash of a large commercial aircraft are similarly established in the WENRA 2020 report.

With regard to the threat from unmanned aircraft, meaning drones, power plant protection will be provided by a multilevel drone-detection system. Protection will address all types of drones. The airspace in the wider area surrounding SMR ETE will be monitored by the Army of the Czech Republic and Air Navigation Services of the Czech Republic. During an intervention, the Police of the Czech Republic cooperate with the Army of the Czech Republic and the nuclear-facility security unit using a combination of different methods.

In view of modern cybersecurity threats, strong emphasis will be placed on digital and cyber protection of SMR ETE through isolation. The power plant control systems controlling the reactor and safety features will be physically isolated from the external Internet, practically eliminating an external cyberattack.

Information supporting the facts specified above is provided in Annex 6.2 to this Documentation (Information of the Ministry of the Interior of the Czech Republic on the System for Protecting Nuclear Facilities against Terrorist Attacks).

D.II.1.5.2. Risks associated with the transport of radioactive substances

Safety requirements for transportation of radioactive or fissile material are governed by Act No. 263/2016 Coll., the Atomic Act, as amended; Act No. 111/1994 Coll., on road transportation, as amended; and Government Decree No. 1/2000 Coll., on the transport rules for public rail freight transportation, as amended. These regulations are supplemented by implementing legislation further specifying the requirements applicable to transportation of radioactive and fissile materials.

Among other matters, SÚJB Decree No. 379/2016 Coll., on type approval of certain products in the field of peaceful use of nuclear energy and ionizing radiation and transportation of radioactive or fissile material, as amended, establishes technical and organizational conditions for transportation of radioactive or fissile material and requirements for packages used to transport, store, or dispose of radioactive or fissile material. Requirements for radiation protection during transportation of radioactive or fissile material are specified in SÚJB Decree No. 422/2016 Coll., on radiation protection and security of a radionuclide source, as amended, while requirements for ensuring physical protection of nuclear material during transportation are included in SÚJB Decree No. 361/2016 Coll., on security of a nuclear facility and nuclear material, as amended.

The principal movements of radioactive substances associated with SMR ETE operation are transportation of fresh nuclear fuel from the manufacturer (supplier) to SMR ETE, transportation of conditioned radioactive waste from SMR ETE to a radioactive-waste repository, transportation of spent nuclear fuel from SMR ETE to a spent-nuclear-fuel storage facility, and transportation of spent nuclear fuel from the spent-nuclear-fuel storage facility to a permanent-disposal facility (deep geological repository). With the exception of the final item, meaning transportation of spent nuclear fuel to a permanent-disposal facility, all types of transportation are currently performed for ETE1,2, and the arrangements will be similar for SMR ETE. The principles established in the legislation above form the basis for managing the risks associated with transporting radioactive substances:

- transport must be authorized or approved by the permitting authorities under the applicable laws of the Czech Republic, the laws of the state of dispatch, and the laws of the transit states;
- transport must be conducted in accordance with approved procedures and the associated requirements of national and international legislation and the Czech Republic's international obligations and treaties;
- transport procedures must take potential risks into account and minimize the probability of an accident;
- the substances transported must be placed in approved transport packages, or storage and transport packages, demonstrably ensuring that radioactive substances are not released into the environment in the event of an accident and, for fissile nuclear material, that subcriticality does not fall below the permitted limit, even if flooded with water;
- the ambient dose equivalent rate at the surface of the package and at the specified distance from it and surface contamination must not exceed the limits specified in the applicable regulation.

Fresh nuclear fuel will be transported from the manufacturing plant in transport packages directly to SMR ETE by rail, road, ship, or aircraft, or using combined transportation. This will be transboundary transportation and will comply with the requirements of Decree No. 379/2016 Coll., as amended. Specific transportation routes are subject to classification and controlled access to classified information under Act No. 412/2005 Coll., on protection of classified information and security eligibility, as amended, and therefore cannot be disclosed publicly. During normal SMR ETE operation, an average of up to five shipments of fresh nuclear fuel to the site per year can be expected. In accordance with the State Energy Policy, nuclear fuel is anticipated to be stockpiled for several years in advance, with a corresponding increase in the number of shipments before SMR ETE operation begins.

After removal from the spent-nuclear-fuel storage pool, spent nuclear fuel will subsequently be stored in a new spent-nuclear-fuel storage facility anticipated to be built at the SMR ETE site or another selected location. The spent nuclear fuel will be transported to and stored in the storage facility in Type B(U) packages. This will constitute transportation within the guarded area of SMR ETE, but it will nevertheless comply with the requirements of Decree No. 379/2016 Coll., as amended. Spent nuclear fuel can be transported by rail or by road. In both cases, there will be no more than several shipments per year.

After conditioning, solidified radioactive waste, including ion-exchange filters, evaporation concentrates, and other waste generated during liquid-waste treatment and conditioned primarily by cementation or other solidification methods, and solid radioactive waste will be transported in

packages, meaning steel drums, by domestic transportation to the Dukovany radioactive-waste repository (Dukovany repository). All requirements of the regulations specified above will be met during transportation.

Compared with the transport of other dangerous goods (from an energy perspective, the transport of other types of fuel), the transport of radioactive substances poses much less risk to the environment and the population, and the quantities transported and frequency of transport are low. The potential for releases of radioactive substances into the environment during transport is minimized. Procedures are developed for each shipment to limit any radiological consequences of an accident so that the health of the population is not endangered. SÚJB Decree No. 379/2016 Coll., as amended, establishes strict limits for the ambient dose equivalent rate both at the surface of the package in which radioactive substances are transported and at a specified distance from the package. The actual radiation exposure of residents due to transportation of nuclear materials is therefore very low. The individual effective dose during a single passage of a vehicle transporting radioactive substances reaches at most several nSv, a dose that is entirely negligible in terms of potential radiological impacts.

SÚJB performs state regulatory activities in this field. Approval of packages for transporting nuclear materials is also an important part of SÚJB activities in assessing the security of transportation of radioactive substances. SÚJB inspectors inspect all shipments of fresh and spent nuclear fuel and radioactive waste. Information on transportation and security of nuclear materials is governed by Act No. 412/2005 Coll., on protection of classified information and security eligibility, as amended.

D.II.1.6. Measures for managing a radiation extraordinary event

D.II.1.6.1. Response to a radiation extraordinary event

Response to a radiation extraordinary event means application of a set of measures to manage the situation associated with occurrence of a radiation extraordinary event, with the objective of regaining control of the situation and preventing or mitigating the consequences of the radiation extraordinary event, including non-radiological consequences.

This is a coordinated, planned activity involving the nuclear-facility operator, regulatory and other state-administration authorities, including other bodies established by them, and local government. The legislative requirements are specified in this Documentation in Chapter B.I.6.2.2. Basic requirements for nuclear power plants (page 86 of this Documentation), specifically in its Subsection B.I.6.2.2.5. Radiation extraordinary event management requirements are based primarily on the Atomic Act, Act No. 263/2016 Coll., as amended, and the related implementing decrees, particularly Decree No. 359/2016 Coll., on details of ensuring radiation extraordinary event management, as amended; Decree No. 329/2017 Coll., on requirements for the design of a nuclear facility; Decree No. 360/2016 Coll., on monitoring the radiation situation, as amended; and Decree No. 422/2016 Coll., on radiation protection and security of a radionuclide source, as amended, as well as Act No. 239/2000 Coll., on the integrated rescue system, as amended, and Act No. 240/2000 Coll., on crisis management, as amended.

Radiation extraordinary event management measures are included as the fifth level of defense-in-depth (DiD 5) and are intended to prevent exposure of the population and SMR ETE personnel, and generally personnel at any nuclear facility, during a radiation accident. Radiation extraordinary event management measures would be used primarily in the event of an early or large release. Czech legislation requires practical elimination of an early or large radioactive release to be demonstrated in the nuclear-facility design through the technical design and provisions incorporated into it. The SMR ETE design includes numerous design safety provisions ensuring an extremely low probability of such a release, typically <1E-07. All potential postulated initiating events that could lead to an early or large release will therefore be addressed by redundant and diverse provisions, and practical elimination of an early or large release will form part of the deterministic and probabilistic demonstrations.

According to the assessment of the radiological consequences of the bounding DBA and DEC-B cases performed in Chapter D.II.1.2.3. Assessment of the radiological consequences of radiation extraordinary events for the population (page 440 of this Documentation), the radiological criteria for these events are met. This means that no accident not involving core melt or damage to irradiated/spent nuclear fuel in storage pools will lead to a radionuclide release requiring the implementation of protective measures consisting of sheltering, iodine prophylaxis, or evacuation of residents anywhere around the New NPP. In view of the conservatism used in establishing the DBA source term, this conclusion also applies to the postulated sequences classified as DEC-A events. Furthermore, for postulated accidents involving nuclear-reactor-core melting or damage to irradiated nuclear fuel in storage pools (DEC-B), design provisions will be adopted so that evacuation of residents is not necessary and long-term restrictions on food consumption need not be introduced in the immediate vicinity.

Nevertheless, in view of the results presented in Chapter D.II.1.2.3.2. Results of the assessment of the radiological consequences of radiation extraordinary events, certain measures cannot be ruled out. For DBA events at SMR ETE, temporary agricultural protective measures are possible in the immediate vicinity of the Temelín site. Although the need for evacuation in the nearest municipalities (within 3 km and 5 km, respectively) is ruled out for an extremely unlikely DEC-B event, the need to declare temporary sheltering and administer iodine prophylaxis to certain population groups in the immediate vicinity cannot be ruled out entirely. At the same time, a DEC-B event could necessitate temporary agricultural protective measures and a temporary prohibition on consumption of food produced in the locally affected territory.

D.II.1.6.2. Radiation extraordinary event management systems

In terms of the substantive approach to radiation extraordinary event management, the measures can be divided into several interrelated systems:

- SMR ETE design equipment for managing a radiation extraordinary event,
- organizational measures for radiation extraordinary event management,
- systems for notifying affected authorities and warning the population,
- radiation situation monitoring,
- provision of protection for personnel at the site,
- provision of protection for the population in the emergency planning zone.

A proven and well-established radiation extraordinary event response-management system will be introduced for SMR ETE in a form similar to that used for nuclear facilities already in operation in the Czech Republic.

D.II.1.6.2.1. SMR ETE design equipment for managing a radiation extraordinary event

The SMR ETE design equipment for managing a radiation extraordinary event is specified by Decree No. 329/2017 Coll., on requirements for the design of a nuclear facility. A more detailed description of the requirements for the individual structures is provided in Chapter B.I.6.3.1.17. Design equipment for managing a radiation extraordinary event. Under the decree specified above, SMR ETE will contain the following structures:

- main control room,
- backup (emergency) control room,
- shelters,
- emergency response center,
- technical support center,
- off-site emergency support center,
- backup technical support center, unless loss or unavailability of the technical support center is practically eliminated,
- backup emergency control center, unless loss or unavailability of the emergency control center is practically eliminated,
- physical-protection control center.

Because SMR ETE will be located in the immediate vicinity of the currently operating ETE1,2 units, where all necessary measures are already implemented, certain technical resources, particularly for organizing management of a radiation extraordinary event at ETE1,2, can be shared with SMR ETE. Possible sharing of individual structures will be based on the future overall approach to organization of emergency management at the site. A more detailed analysis and definition of sharing options will be performed during subsequent Project phases.

D.II.1.6.2.2. Organizational measures for radiation extraordinary event management

Organizational measures for radiation extraordinary event management are developed at several levels. At the highest, national level, this is the National Emergency Plan, approved on December 7, 2020, by Government Resolution of the Czech Republic No. 1276; at the regional level, it will be the Off-site Emergency Plan; and at the site level, it will be the On-site Emergency Plan.

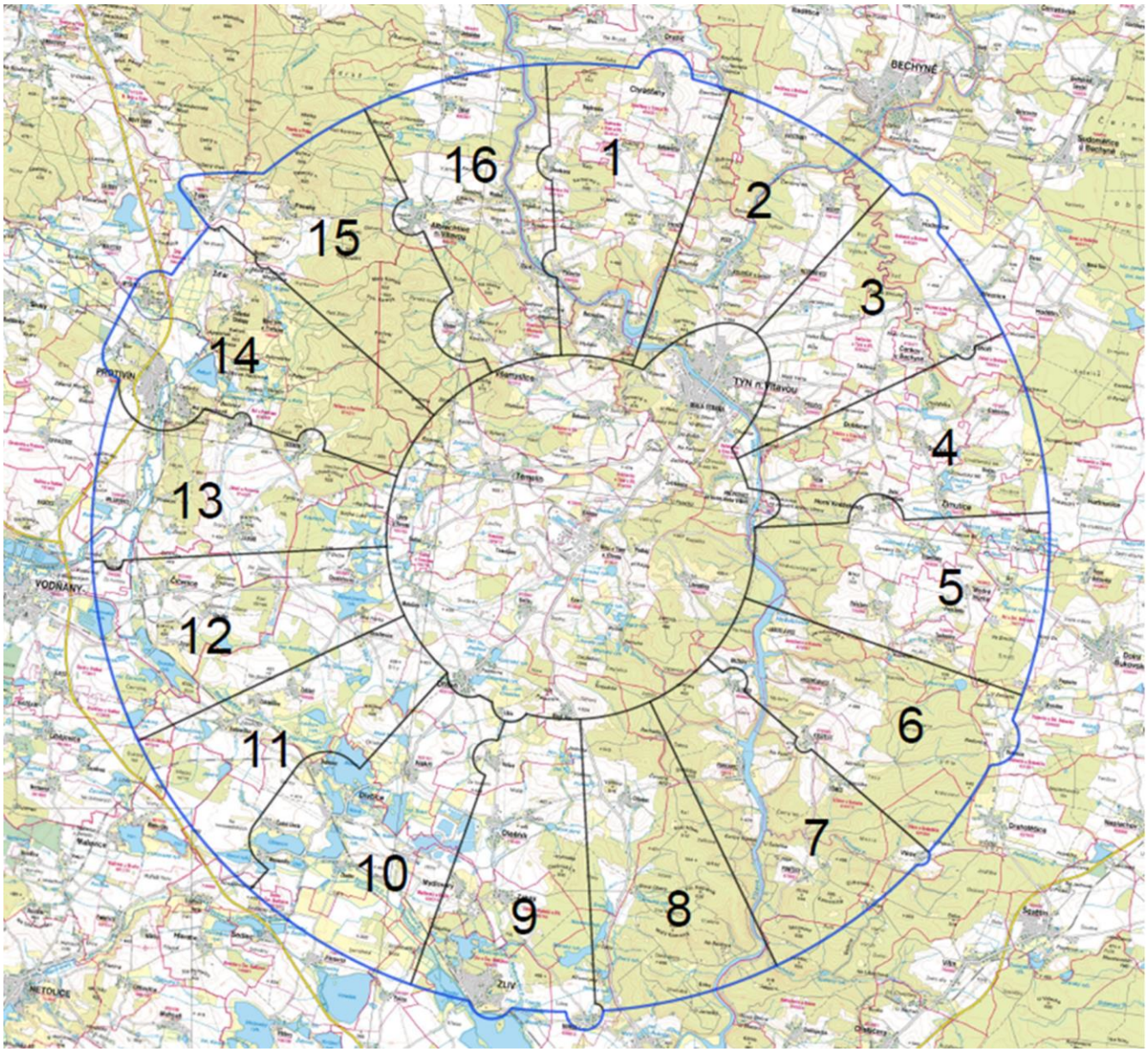
Organizational measures for radiation extraordinary event management at lower levels will be documented in detail, and requirements and procedures will be established in the on-site emergency plan and off-site emergency plan.

National Emergency Plan	is a strategic document prepared by the State Office for Nuclear Safety (SÚJB) in cooperation with the Ministry of the Interior that establishes the organization of the state in responding to radiation accidents with impacts extending beyond ordinary emergency planning zones or originating outside the territory of the Czech Republic. The document constitutes the national framework for crisis management during radiation accidents. It is a strategic plan that defines the responsibilities of public authorities; establishes principles for protection of the population; unifies coordination among ministries, regions, and components of the Integrated Rescue System; governs recovery of the area following an accident; and ensures linkage to international crisis-cooperation systems.
Off-site Emergency Plan	is a document containing a set of measures for addressing emergencies within the emergency planning zone of the applicable nuclear facility. These measures are designed to provide protection of the population, the environment, livestock, property and cultural values. It is a non-public document, available only for the needs of the Integrated Rescue System and authorities dealing with the emergency. The off-site emergency plan is part of the documentation of the Integrated Rescue System.
On-site emergency plan	is a document containing a set of measures for ensuring preparedness for response to and management of radiation extraordinary events within the nuclear-facility site. Under Act No. 263/2016 Coll., the Atomic Act, as amended, the on-site emergency plan will be prepared for the SMR ETE site and will form part of the documentation for the licensed activity of nuclear-facility construction. The content of the emergency plan and the procedures for

testing it are established by SÚJB Decree No. 359/2016 Coll., as amended. A nuclear facility's on-site emergency plan is approved by SÚJB.

In accordance with the requirements of the Atomic Act and Decree No. 359/2016 Coll., on details of ensuring radiation extraordinary event management, an emergency planning zone (ZHP) will be established for SMR ETE. This is an area around the nuclear-facility site in which, based on radiation extraordinary event analysis and assessment, requirements are applied for preparing the introduction of urgent protective measures and other measures to protect the population because reference levels are anticipated to be exceeded. Establishment of the emergency planning zone will form an integral part of the SMR ETE construction-permit process, and SÚJB will determine its extent. For illustration, the following figure shows the existing emergency planning zone for the existing operating Temelín Nuclear Power Plant (ETE1,2). The emergency planning zone for SMR ETE will have a similar shape, with its center in the same location and division into individual segments, but its size, meaning the circle radius, will be established during the SMR ETE construction-permit proceedings under the Atomic Act.

Fig. D.38: Illustrative drawing of the emergency planning zone for ETE1,2



A system of detailed intervention documentation will be prepared for SMR ETE process control and the individual necessary personnel interventions. The intervention documentation will be reviewed regularly so that it always reflects the current state of SMR ETE technology and organization.

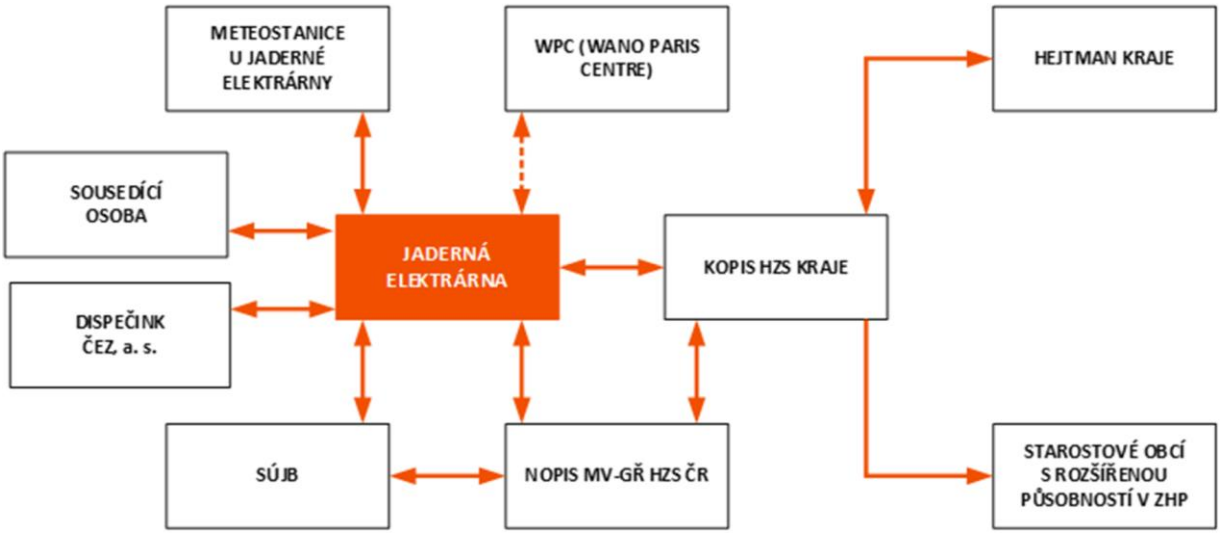
During preparatory work before SMR ETE construction begins, such as surveys and boreholes, SMR ETE workers, including contractor personnel working outside the existing power plant site, will be subject to the ETE1,2 off-site emergency plan. Once SMR ETE construction has begun and throughout the construction phase, emergency-planning requirements for personnel and contractors participating in construction will be taken into

account by ensuring that SMR ETE already has its own on-site emergency plan coordinated with the ETE1,2 emergency plan. After fuel is loaded into SMR ETE, that entity will become an adjacent person to ETE1,2, and the site's on-site emergency plan will thereafter be coordinated and managed for both ETE1,2 and SMR ETE.

D.II.1.6.2.3. Systems for notifying affected authorities and warning the population

Notification of affected authorities and warning of the population concerning a potential radiation extraordinary event at SMR ETE will be provided in a manner similar to that for the ETE1,2 units already in operation. Initial information will be provided by emergency-response-staff personnel; the basic information flows are shown in the following figure.

Fig. D.39: Basic information flows during a radiation extraordinary event



METEOSTANICE U JADERNÉ ELEKTRÁRNY	WEATHER STATION AT THE NUCLEAR POWER PLANT
WPC (WANO PARIS CENTRE)	WPC (WANO PARIS CENTRE)
HEJTMAN KRAJE	GOVERNOR OF THE REGION
SOUSEDÍCÍ OSOBA	ADJACENT PERSON
DISPEČINK ČEZ, a.s.	ČEZ, a.s. CONTROL CENTER
JADERNÁ ELEKTRÁRNA	NUCLEAR POWER PLANT
KOPIS HZS KRAJE	REGIONAL OPERATIONS AND INFORMATION CENTER OF THE FIRE RESCUE SERVICE
SÚJB	SÚJB
NOPIS MV-GŘ HZS ČR	NATIONAL OPERATIONS AND INFORMATION CENTER OF THE MINISTRY OF THE INTERIOR, DIRECTORATE-GENERAL OF THE FIRE RESCUE SERVICE OF THE CZECH REPUBLIC
STAROSTOVÉ OBCÍ S ROZŠÍŘENOU PŮSOBNOSTÍ V ZHP	MAYORS OF MUNICIPALITIES WITH EXTENDED POWERS IN THE ZHP

Note. Under the Atomic Act, adjacent persons are all persons affected by the on-site emergency plan, including a person operating a structure or facility that may be affected or impacted by a radiation extraordinary event arising during an activity for which a license has been issued to the license holder, and persons designated under the on-site emergency plan to respond to a radiation extraordinary event.

The SMR ETE site will be equipped with an on-site warning system, providing warnings for employees and contractors; terminal elements of the unified system in the emergency planning zone, providing warnings for residents of surrounding municipalities; and a system for notifying affected authorities, using notification forms and means such as email, fax, and mobile or satellite telephones. Modern, reliable technical resources will be used for the notification and warning systems and may be partially shared with ETE1,2.

D.II.1.6.2.4. Radiation situation monitoring

Continuous monitoring of the radiation situation both within the SMR ETE site and in the emergency planning zone is necessary for successful management of a possible radiation accident. Permanent monitoring stations will be used for these purposes, and a mobile unit for monitoring the radiation situation in the surrounding area will also be available. Continuous monitoring of the radiation situation will be provided by a teledosimetric

system, whose specific design will be addressed during subsequent Project development. Under Decree No. 329/2017 Coll., the teledosimetric system and emergency-control-center personnel must allow:

- monitoring of the radiation situation in the emergency planning zone,
- continuous evaluation of the results of radiation-situation measurements,
- transmission of the measured results to SÚJB.

Outputs from the teledosimetric system will be available at both the emergency control center and the backup emergency control center, together with all necessary communication lines.

D.II.1.6.2.5. Provision of protection for personnel at the SMR ETE site

Under Decree No. 329/2017 Coll., sufficient space to shelter personnel must be available to protect personnel at the SMR ETE site. The shelters will be located at the SMR ETE site, will be resistant to external hazards, and will be equipped with a filtered ventilation system and potentially other technical equipment, such as oxygen cylinders or breathing apparatus, for the safe presence of response personnel. The shelters must be equipped with other resources for long-term occupancy, such as drinking-water supplies, food supplies, and hygiene supplies, to provide facilities for the required number of response teams during long-term remedial measures following a radiation accident. A reliable communication link between the shelters and both the main and backup emergency control centers is also necessary.

Means for controlled evacuation of SMR ETE personnel and contractor employees present at the site will be available in the event of a radiation extraordinary event. These will primarily be personnel not directly involved in remedial interventions or damage remediation. For the protection of personnel and contractors, a plan and resources will also be prepared for rotating SMR ETE operational control personnel and response teams to ensure long-term performance of activities at the affected site.

D.II.1.6.2.6. Provision of protection for the population in the emergency planning zone

Protective measures will be established to protect the population in the emergency planning zone. The purpose of the protective measures is to eliminate and limit exposure of the population in the SMR ETE emergency planning zone. Protective measures would be provided primarily during a serious radiation extraordinary event in which the possibility that the population could be exposed above one of the reference levels for urgent protective measures, including sheltering, iodine prophylaxis, and evacuation, established by Decree No. 422/2016 Coll., as amended, cannot be ruled out. At the same time, it is required for SMR ETE that the need for evacuation anywhere around SMR ETE and the introduction of long-term restrictions on food consumption be ruled out for any event within the SMR ETE design basis, meaning all events except practically eliminated conditions.

The nuclear-facility operator will ensure procedures for the timely introduction and full implementation of urgent protective measures for the population in the SMR ETE emergency planning zone through its emergency response organization (OHO). If a radiation accident occurred, the emergency response organization would introduce urgent measures to protect the population in accordance with the SMR ETE on-site emergency plan and SÚJB instructions and in cooperation with state-administration authorities under the off-site emergency plan.

D.II.1.6.3. Informing neighboring countries

If control over an ionizing-radiation source, particularly a nuclear reactor, is lost, the operator proceeds in accordance with its on-site emergency plan. The operator classifies the radiation extraordinary event in the applicable category, declares that the radiation extraordinary event has occurred, and subsequently notifies the affected authorities, including SÚJB, regional authorities, regional directorates of the Fire Rescue Service, and municipalities with extended powers. The operator also ensures that the ČEZ, a. s. control center and the ČHMÚ meteorological station at the applicable site are notified of the event without delay.

The operator also activates response personnel during every radiation extraordinary event to the extent and at the time specified in the on-site emergency plan or intervention instructions. The severity of radiation extraordinary events occurring at an operator's facility is assessed by the person designated in its on-site emergency plan. After a radiation extraordinary event occurs, this person is the applicable shift engineer, who then ensures the response to the radiation extraordinary event on the basis of the Intervention Instruction prepared for the applicable workplace. After the operator's Emergency Control Center is activated, this role is assumed by the applicable specialist at that control center.

Neighboring countries and foreign entities are informed in accordance with the National Radiation Emergency Plan of the Czech Republic, approved on December 7, 2020, by Government Resolution of the Czech Republic No. 1276.

Under European Union legislation and the international conventions specified below, European Union countries, neighboring countries, and the IAEA are informed of a radiation extraordinary event that may have a transboundary impact. Information is provided through the USIE and WebECURIE systems and also through direct contact with a contracting party under a bilateral agreement, where bilateral agreements have been concluded. In relation to the IAEA, SÚJB acts as the National Competent Authority for an Emergency Abroad/for a Domestic Emergency, and the Ministry of the Interior, Directorate General of the Fire Rescue Service of the Czech Republic, acts as the National Warning Point. In relation to the European Union, SÚJB acts as the Competent Authority, and the Ministry of the Interior, Directorate General of the Fire Rescue Service of the Czech Republic, acts as the Contact Point.

Bilateral and multilateral agreements with neighboring countries that also address information exchange have been concluded with the following countries:

Slovak Republic: Agreement between the Government of the Czech Republic and the Government of the Slovak Republic on Cooperation in the Field of State Supervision of Nuclear Safety at Nuclear Facilities and State Supervision of Nuclear Materials. Agreement between the Government of the Czech Republic and the Government of the Slovak Republic on Early Notification of a Nuclear Accident and the associated Arrangement between the State Office for Nuclear Safety of the Czech Republic and the Ministry of the Environment of the Slovak Republic on the Exchange of Data from Radiation-Monitoring Networks. Under both documents, information is exchanged at the intergovernmental level between the State Office for Nuclear Safety (CZ) and the Ministry of the Environment (SK).

Republic of Austria: Agreement between the Government of the Czech Republic and the Government of the Republic of Austria on Issues of Common Interest in the Field of Nuclear Safety and Radiation Protection, under which information is exchanged at the intergovernmental level between the State Office for Nuclear Safety (CZ) and the Federal Ministry for Foreign Affairs (AT). Protocol between the Government of the Czech Republic and the Government of the Republic of Austria Amending the Agreement between the Government of the Czechoslovak Socialist Republic and the Government of the Republic of Austria on Issues of Common Interest in the Field of Nuclear Safety and Radiation Protection.

Federal Republic of Germany: Agreement between the Government of the Czechoslovak Socialist Republic and the Government of the Federal Republic of Germany on Issues of Common Interest in the Field of Nuclear Safety and Radiation Protection, followed by the Agreement between the State Office for Nuclear Safety of the Czech Republic and the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety of the Federal Republic of Germany on the Exchange of Information. Under both agreements, information is exchanged at the intergovernmental level between the State Office for Nuclear Safety (CZ) and the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (DE).

Republic of Poland: Agreement between the Government of the Czech Republic and the Government of the Republic of Poland on Early Notification of a Nuclear Accident and the Exchange of Information on the Peaceful Uses of Nuclear Energy, Nuclear Safety, and Radiation Protection, under which information is exchanged at the intergovernmental level between the State Office for Nuclear Safety (CZ) and the Radiation Emergency Center (PL).

Hungary: Agreement between the Government of the Czech and Slovak Federal Republic and the Government of the Republic of Hungary on the Exchange of Information and Cooperation in the Field of Nuclear Safety and Radiation Protection, followed by the Memorandum of Understanding and Cooperation and Exchange of Information on Nuclear Safety between the State Office for Nuclear Safety of the Czech Republic and the Hungarian Atomic Energy Authority. Under these instruments, information is exchanged at the intergovernmental level between the State Office for Nuclear Safety (CZ) and the Atomic Energy Authority (HU).

Cooperation within international organizations:

IAEA USIE: The Czech Republic is a signatory to the Convention on Early Notification of a Nuclear Accident (Vienna, September 26, 1986; Ministry of Foreign Affairs Notification No. 116/1996 Coll.). Under this Convention, the Operations and Information Center of the Ministry of the Interior, Directorate General of the Fire Rescue Service of the Czech Republic (OPIS MV-GŘ HZS ČR) is the contact point for receiving information on a nuclear accident or radiation accident. On the Unified System for Information Exchange in Incidents and Emergencies (USIE) web platform operated by the IAEA and used for international exchange of information on radiation extraordinary events, including outside the EU framework, OPIS MV-GŘ HZS ČR performs the role of National Warning Point. If information is received concerning a radiation accident abroad, it is transmitted to the SÚJB Contact Point service. SÚJB also receives the same information directly from this platform in view of its role as National Competent Authority. Information is exchanged through USIE throughout the radiation extraordinary event, and the situation is addressed by the SÚJB Crisis Staff and, where applicable, the Central Crisis Staff and crisis staffs at the regional and municipal levels.

IAEA RANET: The Czech Republic acceded to the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (Vienna, September 26, 1986; Ministry of Foreign Affairs Notification No. 115/1998 Coll.), on the basis of which the RANET network was established; the Czech Republic has participated in the network since 2009. Within RANET, the contracting parties to the Convention specified above registered their national radiation-situation-monitoring capabilities, for example for searches for ionizing-radiation sources, radiation surveys, radiological assessment of radiation extraordinary events, or post-decontamination activities. Where necessary, the contracting states are prepared to provide their capabilities to assist other contracting states. Requests for assistance are provided through the IAEA USIE platform.

European Commission and Euratom: Under European Union and Euratom legislation, bilateral agreements, and international conventions, European Union and Euratom countries, neighboring countries, and the IAEA are informed of a radiation accident that may have a transboundary impact. The international platform provided by the European Commission for reporting a radiation accident is the WebECURIE system. In relation to the European Union and Euratom, SÚJB acts as the national Competent Authority and OPIS MV-GŘ HZS ČR as the Contact Point. OPIS MV-GŘ HZS ČR is the primary recipient of WebECURIE messages and, after receiving and acknowledging a message, forwards it to SÚJB. The WebECURIE system, like the contact point (OPIS MV-GŘ HZS ČR), operates 24 hours a day, 7 days a week, on a callout-system basis. This system is based on automatic notification of the user by telephone, fax, or email. This service is provided by European Union callout servers. Unless specified otherwise, all information shared through WebECURIE is available to all contact points and national authorities. The WebECURIE system is regularly tested through simple communication tests and a preannounced emergency communication exercise conducted according to a predefined scenario (ECUREX exercise).

D.II.1.7. Liability for nuclear damage

D.II.1.7.1. Liability for nuclear damage under Czech law

The liability of nuclear-facility operators for nuclear damage is established by Act No. 18/1997 Coll., the Atomic Act, as amended, and is also governed by Act No. 89/2012 Coll., the Civil Code, as amended, and the Vienna Convention on Civil Liability for Nuclear Damage, promulgated under No. 133/1994 Coll. (hereinafter the Convention), which is binding on the Czech Republic. Unless the Convention or Act No. 18/1997 Coll. provides otherwise, the general provisions of the Civil Code concerning liability and, where applicable, the amount and extent of compensable damage apply.

Under the definition in the Convention, a nuclear incident means any occurrence or series of occurrences having the same origin that causes nuclear damage. Nuclear damage is then defined in particular as:

- loss of life, any personal injury, or any loss of or damage to property arising out of or resulting from the radioactive properties, or a combination of radioactive properties with toxic, explosive, or other hazardous properties, of nuclear fuel or radioactive products or waste in, or of nuclear material coming from, originating in, or sent to, a nuclear facility,
- any other loss or damage so arising or resulting.

Under Act No. 18/1997 Coll., as amended, nuclear damage also includes damage arising from costs incurred for necessary measures to avert or reduce exposure or restore the environment to its original or a similar condition, if those measures were caused by a nuclear incident and the nature of the damage permits this.

The liability of a license holder for nuclear damage caused by each individual nuclear incident is limited as follows:

- for nuclear facilities used for energy purposes, storage and disposal facilities for spent nuclear fuel intended for such facilities, or nuclear materials resulting from processing of such fuel, to CZK 8 billion,
- for other nuclear facilities and transportation, to CZK 2 billion.

A nuclear-facility operator's liability for nuclear damage is structured as strict liability subject to grounds for exoneration, meaning release from liability, if the nuclear-facility operator demonstrates that the nuclear damage arose wholly or partly as a result of the injured person's own conduct or as a result of external force majeure, specifically an act of armed conflict, hostilities, civil war, uprising, or a serious natural disaster of an exceptional nature.

A nuclear-facility operator is required to obtain liability insurance for nuclear damage with a coverage limit of at least CZK 2 billion. Insurance is obtained separately for each nuclear facility or transportation of nuclear materials. Within the statutory liability limit specified above, the state guarantees satisfaction of awarded nuclear-damage claims not covered by mandatory insurance.

The extent and method of compensation for nuclear damage are determined under the Civil Code. The regulations in effect when the nuclear incident causing the nuclear damage occurred are used to determine the amount of damage.

If a nuclear incident occurs at a license holder's facility, the license holder is required to provide written notice, in the area affected by the incident as determined by the State Office for Nuclear Safety on the basis of the activities of the national radiation-monitoring network, that it is liable for compensation for nuclear damage caused by the incident. This written notice must be publicly available at the license holder's premises, the applicable regional authority, and all municipal authorities in the area.

D.II.1.7.2. Liability for nuclear damage under international conventions

International conventions governing liability for damage caused by nuclear accidents are divided into two international systems.

The first international system consists of the *Paris Convention on Third Party Liability in the Field of Nuclear Energy (Paris Convention) and the Brussels Convention Supplementary to the Paris Convention (Brussels Supplementary Convention)*. The Paris Convention establishes liability for nuclear damage and a compensation regime for victims of nuclear accidents. The competent court is the court of the state in whose territory the nuclear accident occurred. The Paris Convention is open for signature to OECD member states and, with the consent of all existing contracting states to the Convention, to states that are not members of the OECD (Organisation for Economic Co-operation and Development). The Brussels Supplementary Convention establishes a compensation scheme supplementing the compensation required by the Paris Convention. The Brussels Convention is open only to contracting states to the Paris Convention. Germany and Austria, among others, are members of the Paris and Brussels Conventions; however, Austria ultimately did not ratify either Convention, so they are not binding on Austria.

The second international system consists of the *Vienna system, comprising the Vienna Convention on Civil Liability for Nuclear Damage (Vienna Convention) and the Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage*. The Vienna Convention establishes a nuclear-liability and compensation regime similar to the system established by the Paris Convention. Only the courts of the contracting party in whose territory the nuclear incident occurred will have jurisdiction over claims. The Vienna Convention is open for accession by any state. The Protocol to Amend the Vienna Convention improves the original Vienna Convention regime by requiring increased funds to compensate more victims through a higher compensation limit. The contracting parties to the Vienna Convention include Czechia, Slovakia, Hungary, and Poland.

The two systems are linked by the *Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention (Joint Protocol)* and the *Convention on Supplementary Compensation for Nuclear Damage*. The Joint Protocol serves as a bridge between the Paris and Vienna Conventions, extending the benefits provided under one Convention to victims in states that have adopted the other Convention. In the event of a nuclear incident occurring at a nuclear facility, the Convention to which the state in whose territory the facility is located is a party applies. The parties to the Joint Protocol include Czechia, Germany, Hungary, Poland, and Slovakia.

An overview of intergovernmental agreements concerning notification of nuclear accidents between the Czech Republic and neighboring countries is provided above in Chapter D.II.1.6.3. Informing neighboring countries (page 474 of this Documentation).

D.II.2. Non-radiation risks

From a non-radiological perspective, the Project is essentially a conventional industrial operation that does not give rise to a significant risk of accidents with adverse consequences for the environment and/or the population. In connection with operation, the possibility of emergencies involving releases of contaminated wastewater, due to loss of sewer-system leak-tightness or malfunction of the oily-water treatment plant; releases of stored substances, such as chemicals, fuels, lubricants, heat-transfer media, and cleaning agents, from storage tanks or pipelines; or releases during transportation cannot be ruled out. The possibility of ignition of media or other materials also cannot be ruled out.

The risks specified have a low probability of occurrence, and their elimination does not require any special preventive or mitigation measures other than those that are customary or prescribed by the applicable regulations, including construction, safety, fire-protection, transport, and other regulations and the Act on Major-Accident Prevention. The consequences of these types of events can be managed using readily available resources.

D.III.
COMPREHENSIVE CHARACTERISTICS OF PROJECT IMPACTS, POTENTIAL FOR TRANSBOUNDARY IMPACTS

III. Comprehensive characteristics of Project impacts pursuant to Part D, points I and II, in terms of their magnitude and significance, including their interactions, with particular regard to the potential for transboundary impacts

The extent of the Project impacts is mainly local, given by the scope of areas for the Project location and their nearest vicinity. A wider extent of impacts may only occur through environmental outputs from the Project (typically radioactive and non-radioactive discharges to air and watercourses, noise, or other factors) and through visual impacts.

As regards radioactive discharges, given their very low levels, the impacts of radioactive discharges from other existing and planned nuclear facilities at the Temelín site and the generally insignificant contribution of nuclear energy to population exposure (see Chapter C.II.3.2. Ionizing radiation, page 235 of this Documentation), no significant adverse impacts of the Project are expected, even taking into account the combined (cumulative) effect of the other nuclear facilities at the site. The extent of Project impacts will therefore correspond, both quantitatively and qualitatively, to the extent of impacts of the existing nuclear facilities at the site, which are insignificant (well within the permitted limits) and subject to regular monitoring and inspection.

In terms of other factors, the site has sufficient space and capacity for the siting of a new power source. The separation distance between the Project and its individual components and residential areas or other protected areas (e.g. specially protected areas of nature conservation value) is sufficient to prevent adverse impacts or reduce them to an acceptable level. No significant change in the existing quality of the environment can therefore be expected as a result of the Project. Visual impact (i.e. impact on the landscape) must be regarded as a significant factor in terms of the extent of impacts. The Project will comprise spatially dominant structures. On the other hand, this impact is already present at the site as a result of the visual impacts of the existing ETE1,2 and also the planned New NPP ETE, whose structures are considerably larger. The extent of the visually affected area will therefore increase only to a limited extent as a result of the SMR ETE Project, while its qualitative character will correspond to the current situation.

Another significant factor identified is impacts on the qualitative characteristics of surface water. These impacts are already present in the area under current conditions, irrespective of the operation of the existing ETE1,2, which makes only a minor contribution in terms of water quality parameters. The contribution of ETE1,2 is manifested primarily in the concentration of wastewater relative to the abstracted raw water, and consequently in increased concentrations of individual water quality parameters. In terms of the balance, i.e. pollutant load, however, the impact is minor. This ratio will remain unchanged following the implementation of SMR ETE and New NPP ETE.

Noise impacts must also be included among the more significant impacts, both due to noise from the operation of the SMR ETE Project itself and due to the associated traffic on the wider road network, particularly during the Project construction period. This impact has also been present in the area for a long time as a result of overall background traffic, while the contribution of ETE1,2 (and, in the future, New NPP ETE) to total traffic volumes is very low and of low significance in acoustic terms.

As follows from the above data, no circumstances indicating potential significant adverse impacts of the Project on the environment, exceedance of the applicable statutory limits, or (where no limits are established) unacceptable impacts were identified in any of the areas assessed in preparing this Documentation (population and public health, air and climate, noise, radiation and other physical or biological characteristics, groundwater and surface water, soil, the geological environment and natural resources, fauna, flora and ecosystems, tangible assets and cultural heritage, transport infrastructure, or other areas). Appropriate measures are available to prevent, minimize, or compensate for potential adverse impacts.

Similar conclusions also apply to the assessment of Project risks. The analysis of the consequences of radiation extraordinary events shows that the risk acceptance criteria specified by SÚJB and WENRA will not be exceeded for representative cases of design basis accidents and a severe accident. The assessment also takes into account other potential risks associated with the natural characteristics of the site and risks associated with human activities at the site. Measures for radiation extraordinary event management are described.

The Project is (or will be) designed in accordance with the applicable regulations, in particular the requirements of the Atomic Act and related regulations. These also take into account the relevant climatic parameters (temperature, rainfall, snowfall and snow loads, icing, hail, lightning, flooding, and rare meteorological phenomena, including combinations thereof) and other design parameters (e.g. site seismicity). The Project is thus designed to withstand the relevant climatic and other loads. In this regard, the Project takes into account legislative requirements for periodic safety review, i.e. periodic reviews of climatic or other loads, thereby following the principles of adaptive management, i.e. readiness to take newly acquired knowledge into account on an ongoing basis, in accordance with the recommendation specified in the document Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (EU, 2013). This document also requires “no net loss” of biodiversity to be ensured. With the proposed mitigation and compensatory measures in place, the Project will not result in degradation of ecosystem services, loss or degradation of natural habitats, loss of species diversity, or loss of genetic diversity.

All statutory and other requirements for the protection of the environment and public health applicable to the SMR ETE Project relate to the affected territory and population groups in its immediate vicinity. Both the affected territory (i.e. within the meaning of the Environmental Impact Assessment Act, “the territory whose environment and population could be significantly affected by implementation of the Project”) and the representative person (i.e. within the meaning of the Atomic Act, “an individual from the population representing a selected group of natural persons who are most exposed from a given source and through a given exposure pathway”) are located in the immediate vicinity of the Project location.

The nearest residential areas of the surrounding municipalities are only a few kilometers away. All requirements for the protection of the environment and public health are met even within this nearest area. By contrast, the Project is tens to hundreds of kilometers from the national borders of the neighboring countries, as follows:

- Republic of Austria 49 km,
- Federal Republic of Germany 59 km,
- Republic of Poland 191 km,
- Slovak Republic 198 km.

In this context, provided that the requirements of the Atomic Act and the requirements for the protection of the environment and public health are met in the nearest affected territory, significant transboundary impacts resulting from operation of the Project can therefore be excluded. This is demonstrated by the results of the assessment of radiological impacts on the representative person in the countries concerned. Similarly, in the event of radiation extraordinary events (design basis accident, severe accident), the intervention levels for the protection of the population (evacuation, sheltering, iodine prophylaxis) are not exceeded in the territories of the countries concerned; however, short-term measures to restrict agricultural production (placing food on the market) cannot be ruled out.

D.IV.
CHARACTERISTICS OF MEASURES TO PREVENT, AVOID, AND REDUCE ADVERSE IMPACTS, DESCRIPTION OF COMPENSATORY MEASURES

IV. Characteristics and expected effects of the proposed measures to prevent, avoid, and reduce all significant adverse impacts on the environment and public health, and a description of compensatory measures, where feasible in relation to the Project, or measures to monitor potential adverse impacts on the environment (e.g. post-project analysis) relating to the Project construction and operation phases, including measures concerning preparedness for and response to emergencies pursuant to Chapter II

D.IV.1. Basic measures

The basic measure is compliance with generally binding legislation and standards within the scope of the Atomic Act and in the field of environmental and public health protection. These provide a clear and verifiable framework for the preparation, implementation, and operation of the Project, including requirements for monitoring environmental impacts and requirements for emergency preparedness. However, a mere declaration of compliance with statutory requirements cannot be considered a measure to prevent, avoid, reduce, or compensate for adverse environmental impacts. This is an obligation that does not need to be made subject to additional measures.

Basic design provisions to prevent, avoid, reduce, or, where appropriate, compensate for adverse impacts cover the following areas:

- siting the Project outside specially protected areas, at a sufficient distance from residential areas, and in an area with readily accessible infrastructure,
- use of proven and best available Generation III+ reactor technologies,
- ensuring nuclear safety, radiation protection, physical protection, and emergency preparedness in accordance with the requirements of applicable legislation, IAEA and WENRA standards, and other relevant industry standards,
- minimization of radiological impacts on the population and workers in accordance with the ALARA principle and, where relevant and justified, ALARP,
- minimization of non-radiological impacts on the population,
- minimization of demands on environmental resources and outputs to the environment.

A basic description of these measures, applied in the SMR ETE Project, is provided in Chapter B.I.6. Description of the technical design (page 79 of this Documentation).

D.IV.2. Conceptual measures

Conceptual measures do not relate to the design of the Project and therefore do not relate to subsequent proceedings for the Project. Their purpose is to create conditions for integrating the Project into the area and for protecting the area for the Project. The measures are primarily intended as recommendations for the competent spatial planning or other authorities responsible for decisions concerning the spatial arrangement of the area and relationships within it.

The conceptual measures are as follows:

- Within the existing permanently uninhabited zone at the Temelín site, spatial planning documentation will not permit any development projects or changes in land use other than those associated with the use of the area for the operating ETE1,2 and for the SMR ETE, New NPP ETE, and other nuclear facility projects at the site, including associated infrastructure. This does not affect the use of agricultural land for agricultural purposes.
- In any subsequent environmental impact assessment processes for other projects at the site and in its vicinity, their combined impacts with the SMR ETE Project will be required to be taken into account.
- Prohibited airspace LKP2 TEMELÍN will be reviewed and, where necessary, modified so as to provide preventive and effective protection for the SMR ETE site as well.

D.IV.3. Measures for individual components of the environment and public health

D.IV.3.1. Population and public health

- During Project preparation, account will be taken of the condition that the main construction activities for SMR ETE and New NPP ETE will not overlap, so that, even in terms of their combined effect, the deployment of construction machinery (in particular the associated volume of construction truck traffic) will not exceed the level previously assessed in the New NPP ETE EIA Documentation.

- Throughout the preparation, construction, and operation of SMR ETE, communication with the surrounding municipalities and the public will be maintained, including the provision of information on the progress of Project preparation and implementation and its potential impacts on the surrounding area, as well as prompt responses to comments and questions raised.
- An assessment of the health status of the population will be carried out before SMR ETE is commissioned and subsequently at 10-year intervals, and the results will be made available to the public.
- The public will be regularly informed of the environmental impacts of SMR ETE operation through summary annual reports published on the operator's website.

D.IV.3.2. Air and climate

- During construction, measures to prevent or reduce dust generation as specified in the Supporting Measures of the Air Quality Improvement Program under code PZKO_2020_P_21, Reduction of Dust from Construction Activities, and in the Ministry of the Environment Methodology for Setting Conditions to Reduce Emissions from Construction Machinery and Other Construction Activities will be implemented. At the individual stages of construction, emphasis will be placed on selecting the combination of measures most appropriate at the given time, in particular:
  - Construction activities will be designed as early as the construction preparation stage with a view to minimizing dust emissions: The length of transport routes within the construction site will be minimized (by selecting the locations of the construction site exit, storage areas, bulk material stockpiles, and vehicle parking); vehicle movements on unpaved surfaces will be minimized (construction site routes may be temporarily paved with concrete panels or gravel); appropriate construction technologies and techniques will be selected to prevent dust generation and limit its generation and dispersion into the surrounding area to the greatest extent possible, particularly with regard to local conditions; dust levels within the construction site will be continuously monitored so that, if problems are identified, effective techniques can be applied (spraying, wetting at various intervals, mist curtains, etc.).
  - The following measures will be applied during the Project construction phase: Before and during construction activities, the technical condition of machinery and conditions at the construction site (weather conditions, availability of dust-control measures) will be checked; good practices for the handling of machinery will be followed, machinery will be operated by trained personnel, idling of trucks and machinery will be kept to a minimum; open stockpiling of fine-grained materials (cement, lime) will be minimized or completely avoided, and exposed dry and loose surfaces and stockpiles will be sprayed (wetted), particularly in windy weather.

D.IV.3.3. Noise and other physical and biological characteristics

- Noise:
  - A detailed Acoustic Study will be prepared as part of the Project permitting documentation, assessing noise impacts on the nearest, or potentially most affected, protected outdoor areas and protected outdoor areas of buildings in the surrounding municipalities, specifying any measures to reduce noise exposure, and demonstrating compliance with the applicable limits. The study will take into account both Project operation (the target state) and the construction period.
  - After SMR ETE enters trial operation, verification noise measurements will be carried out to demonstrate compliance with the applicable limits.
- Ionizing radiation:
  - In the documentation for the individual stages of the SMR ETE licensing process under the Atomic Act, the ETE1,2 monitoring reports and the New NPP ETE EIA Documentation will be used to assess whether there has been any significant change in radioactive discharges and whether the combined discharges from SMR ETE, ETE1,2, and New NPP ETE exceed the envelope used in the SMR ETE EIA Documentation. If the envelope is exceeded, the causes will be analyzed and the assessment of health impacts will be revised.
  - In the documentation for the individual stages of the SMR ETE licensing process under the Atomic Act, the ETE1,2 monitoring reports will be used to assess whether there are any significant adverse trends in the concentrations of radioactive substances in the environment. If such a trend is identified, the causes will be analyzed and the need for corrective measures will be assessed.
  - Before the commissioning of SMR ETE begins, measurements will commence at the discharge sources (ventilation stack, monitoring tank, and wastewater sump) and in the upgraded/extended parts of the environmental monitoring system. In addition, during the commissioning and trial operation of SMR ETE, the functionality of measurements at the sources and of the environmental monitoring system will be assessed.
  - At the end of trial operation, it will be verified and confirmed that the assumptions and results of the EIA Documentation have not been exceeded with regard to the anticipated impacts of ionizing radiation from SMR ETE in combination with ETE1,2 and other nuclear facilities at the site.
  - Discharges of tritium-containing wastewater from the individual sources at the Temelín site (i.e. ETE1,2, SMR ETE, and New NPP ETE) will be coordinated with one another and with regard to the current flow conditions in the receiving water body so that the indicative value

for tritium activity concentration for drinking-water supply purposes under Government Regulation No. 401/2015 Coll. is not exceeded at drinking-water abstraction profiles.

- Other:
  - Lighting at the SMR ETE site will be designed in accordance with the Ministry of the Environment Methodological Guideline on the Prevention and Reduction of Light Pollution so as to minimize light pollution in the surrounding area.

D.IV.3.4. Surface water and groundwater

- The hydrological inflow to Dvorčice Pond, including Dvorčický Stream, will be maintained.

D.IV.3.5. Soil

- Agricultural land fund and land intended to fulfill forest functions will be taken only to the extent strictly necessary.
- During soil stripping, care will be taken to avoid excessive removal of material from the underlying soil horizon (waste material). Soil stripping in areas containing high-quality soils (protection class II) will be carried out under the supervision of a qualified soil scientist.
- Stripped humus-rich topsoil and the underlying soil layers suitable for soil improvement (subsoil) will be properly stored in separate stockpiles so as to prevent their degradation.
- No temporary construction site facilities or soil stockpiles will be established on land intended to fulfill forest functions outside the construction site and necessary working strips.
- Excavated soil from bulk earthworks and excavation works will be stored so as to minimize erosion impacts.
- Stripping of soil layers suitable for reuse will only be carried out on the basis of detailed measurements of topsoil and subsoil depths.
- Following completion of Project implementation, agricultural land temporarily taken out of use will be returned to its original use, i.e. technical and biological reclamation will be carried out.
- Construction machinery used will be maintained in good technical condition so as to prevent contamination of the soil environment; machinery maintenance (replacement of lubricants, etc.) will only be carried out on areas secured against water pollution and prepared in advance for this purpose.

D.IV.3.6. Natural resources

- The geotechnical properties of the construction site, determined on the basis of a detailed engineering geological investigation, will be taken into account when designing the foundations of individual structures.

D.IV.3.7. Biodiversity

- Summary of the proposed mitigation measures:
  - To protect nesting birds, cutting and felling of woody vegetation will only be carried out outside the bird nesting season, i.e. no felling will take place between 15 March and 15 August. By agreement with the biological supervision, the seasonal restriction on felling may be adjusted at the investor's request to reflect the actual course of the nesting season.
  - Rescue translocations of animals and plants from the construction area and construction site facility areas will be carried out sufficiently in advance, with a final inspection immediately before earthworks begin. Rescue translocation will apply to all species, including both specially and generally protected species under the ZOPK, that are directly threatened by construction activities, are found within the area at risk, and for which rescue translocation is meaningful (e.g. nests of bumblebees of the genus *Bombus*, nests of ants of the genus *Formica*, larval stages and adults of amphibians, reptiles, ground-nesting birds, individual clumps of Siberian iris, etc.).
  - During Project construction, the investor will arrange "biological supervision", to be carried out by a professionally qualified person. The role of the supervision will be to ensure the proper implementation of conditions arising from decisions of nature conservation authorities, particularly by providing supervision during works in valuable natural habitats and their immediate vicinity and at sites where specially protected and threatened species occur. Assistance from the biological supervision is particularly desirable during felling and at the commencement of earthworks. It will assist in setting out access routes and handling areas and will be present during earthworks. During a biologically appropriate period immediately preceding the commencement of construction works, the ecological supervision will survey the demarcated construction site to rule out the presence of nests of bumblebees of the genus *Bombus*, nests of ants of the genus *Formica*, and cavities occupied by bats and, where necessary, ensure their protection from construction works or their rescue translocation.
  - During and after construction, all stormwater from the Project areas will, where possible, be discharged into the existing catchments.

- Intervention in tree stands along the edges of temporary construction site facility areas will be avoided to the greatest extent possible (felling will be minimized); many of these constitute significant landscape features by law (floodplain, forest) or perform the function of ÚSES elements (SMR ETE area – strip of woody vegetation along Road II/138; Area F2 – riparian vegetation along Palečkův Stream; Area B2 – strip of woody vegetation along the southern edge).
- For the construction of the connecting corridor between Areas H and I (bridge), bridge design parameters will be used that allow animal migration along the stream beneath this corridor. The bridge should provide unrestricted passage for animals in categories C1, C2, and D, and at least restricted passage for category B. If earthworks are carried out near the watercourse, the area will be thoroughly inspected and any non-native plant species will be removed before work begins (the invasive knotweed *Reynoutria sp.* has been recorded near the stream); the same will be ensured during construction. At the same time, where soil is moved, the spread of non-native/invasive plant species to new locations will be prevented.

- Summary of the proposed compensatory measures:
  - Key amphibian breeding sites and their immediate surroundings – Dvorčice Pond and Karlovec Pond – will be preserved, and measures to improve their condition will be implemented or funded (e.g. partial desilting, removal of some woody vegetation, and creation of littoral pools). The hydrological regime of these water bodies will be supported so that they do not dry out during the summer; increasing the water supply to both water bodies is appropriate and highly desirable. Their water supply will be ensured (e.g. by partially diverting captured stormwater through suitable retention facilities). To preserve Dvorčice Pond, including Dvorčický Stream, their water supply will be maintained at approximately the current level. To preserve Karlovec Pond, its water supply will be ensured and a set of nature-based measures will be implemented to retain water in the landscape and promote infiltration. Converting part of the surface stormwater runoff into shallow groundwater runoff in this way would help even out the natural inflow to Karlovec Pond, as a larger proportion of the inflow would be provided over time by more stable groundwater runoff.
  - To compensate for adverse impacts from the SMR ETE construction area and Area H, appropriate long-term management (manual mowing once a year after 20 August) must be ensured for the wet meadow between Area H and Dvorčice Pond.
  - At least once every two years, all fish will be regularly removed from water bodies N1, N2, and N3 during September-October; no fish will be stocked in these water bodies.
  - After construction is completed, retention ponds or drainable pools will be created in the construction site facility areas as replacement habitats for amphibians. All construction site facility areas that will not be managed entirely as arable land are potentially suitable, particularly Areas B1, B3, F2, C, D, J, and G.
  - There is a relative shortage in the area of refuges for small vertebrates, particularly reptiles, in the form of piles of stones and wood. It is recommended that several dozen (at least 20) small refuges, also serving as reptile hibernacula, be created at suitable locations throughout the affected territory before construction begins; additional refuges will need to be provided as part of the reclamation of temporarily affected areas.
  - Replacement planting of woody vegetation is recommended over an area equivalent to at least twice the area of vegetation felled. Replacement planting in the vicinity of the Project will be located primarily in areas used as construction site facilities during construction, while respecting utility protection zones and property rights.
  - A replacement biodiversity area will be created in the meadows around Karlovec Pond, with temporary pools providing potential nesting and foraging habitat for the northern lapwing, western yellow wagtail, and other species. These meadows must be mown regularly and the cut material removed. Mowing should preferably be carried out using light machinery; areas showing signs of ruderalization along the edges must be mown at least once a year. The areas should be mown after 15 July. This is primarily compensation for habitats in Area G and the SMR ETE construction area. The replacement habitat should be functional before construction begins and should be maintained throughout Project operation.
  - If the road structure is reconstructed in connection with the SMR ETE Project, a wildlife crossing will be constructed beneath Road II/105 on the axis of the LBK3 Karlovec local biocorridor. The culvert should comply with the applicable methodology Road and Biocorridor Crossings. A functional box culvert measuring 1x1 m to 1x2 m is recommended as the ideal solution, as it will meet the requirements for all small animals up to the size of smaller mammals.
  - As part of replacement planting for authorized tree felling and shrub clearance during Project implementation, and to support the corn bunting, red-backed shrike, and great gray shrike, planting of scattered or linear shrubs is recommended, e.g. along municipal access roads, around the edges of construction site facility areas that have been used, along field boundaries, and along other natural linear features in the landscape. Autochthonous species of regional provenance will be used for planting.
  - To support cavity-nesting birds (tits, common starling, Eurasian wryneck), the hazel dormouse, and bats, nest boxes of various sizes may be installed; the boxes will replace cavity-bearing trees felled as a result of Project implementation. The boxes will be permanently maintained throughout the operation of SMR ETE.
  - SMR ETE water-management facilities used to supply water to ponds and other water bodies in the vicinity of the Project will be maintained in functional condition.
  - An agreement will be concluded with the Nature Conservation Agency of the Czech Republic and the South Bohemian Region to support management of protected areas within 10 km of SMR ETE, habitats of the graylag goose in the PO České Budějovice Ponds, and the

mapping and management of habitat trees within 3 km of SMR ETE. In the same manner, forest management in stands around SMR ETE will support the retention of larger-diameter deadwood for natural decay.

D.IV.3.8. Landscape

- The Project documentation will include an urban and architectural design that takes account of the existing spatial arrangement and adapts the architectural design of the Project (including its color scheme) to facilitate its integration into the landscape, while also taking account of its architectural relationship with the existing ETE1,2 site.
- The Project documentation will include a landscaping plan designed with regard to integrating the Project into the landscape. Autochthonous woody species will be used for landscaping.

D.IV.3.9. Tangible assets and cultural heritage

- The wayside shrine near the Kočín transformer station (located in the power evacuation corridor) and the cast-iron cross near the pumping station (located in construction site facility Area D) will be protected by fencing during construction works.
- Due account will be taken of the fact that the Project is located in an area with archaeological finds. During the construction preparation stage, the Project will therefore be notified to an authorized archaeological organization, and rescue archaeological excavation will be permitted in the affected territory.

D.IV.3.10. Transport and other infrastructure

- The possibility of using rail transport will be considered for selected construction materials (cement, lime).
- The condition of the affected road network will be documented and assessed before construction begins. Where necessary, road surfaces and road-network structures will be modified so that they are not significantly degraded by construction.
- Roads affected by construction will be repaired after construction is completed. The precise scope of repairs will be based on diagnostic assessment and surveys carried out before and after the construction of SMR ETE.

D.IV.3.11. Other

No additional measures beyond the technical design of the Project and the framework of generally binding regulations are proposed.

D.IV.3.12. Environmental risks

No additional measures beyond the technical design of the Project and the framework of generally binding regulations are proposed.

D.IV.4. Measures to monitor potential adverse environmental impacts

- The SMR ETE Project will be included in the Program for Monitoring and Assessment of the Environmental Impacts of Temelín Nuclear Power Plant, or an equivalent program will be established for SMR ETE.
- Continuous biomonitoring of the status of biota and the effectiveness of mitigation and compensatory measures in the vicinity of the Project will be ensured, focusing on key species and habitats; corrective measures will be taken if the results are unsatisfactory. The competent nature conservation authority will be the Regional Authority of the South Bohemian Region. A report will be prepared one year before the start of construction and annually during construction; these reports may be combined with biological supervision activities. Follow-up monitoring after completion of construction may be incorporated into the Program for Monitoring and Assessment of the Environmental Impacts of Temelín Nuclear Power Plant, or an equivalent program, at three-year intervals.

D.V.
CHARACTERISTICS OF THE FORECASTING METHODS USED AND THE UNDERLYING ASSUMPTIONS FOR IMPACT ASSESSMENT

V. Characteristics of the forecasting methods used, underlying assumptions, and evidence for identifying and assessing significant environmental impacts of the Project

D.V.1. Method for forecasting and assessing impacts

The Documentation has been prepared to the extent specified in Annex 4 to Act No. 100/2001 Coll., on Environmental Impact Assessment.

The methodology used to prepare the Documentation and assess impacts consistently follows a conservative approach. All impacts are assessed:

- at their potential maximum (conservatively defined Project envelope parameters are used for the assessment), and
- in terms of their combined (cumulative/synergistic) effects with other facilities or projects at the site and with the environmental background.

Details of these matters are provided in the Introduction chapter (page 16 of this Documentation).

The Documentation assesses all environmental components as required by law. Particular attention is given to those components for which impacts are characteristic of the Project under assessment or the affected territory. These include ionizing radiation and its associated impacts (particularly impacts on population and public health), including consideration of the combined impacts of the Project with other nuclear facilities at the site. Particular attention is also given to impacts on public health, noise impacts, impacts on climate, impacts on surface water and groundwater, impacts on biodiversity (with particular regard to species of Community interest, birds, and habitats of Community interest), and impacts on landscape. Particular attention is also given to the assessment of risks arising from accidents or abnormal conditions with potentially adverse environmental consequences.

In connection with the operation of the existing nuclear facilities at the Temelín site, the affected territory has long been comprehensively monitored from an environmental perspective, both through the monitoring programs of the Temelín NPP operator (radiation monitoring program, non-radiation monitoring program, and impact monitoring and assessment program) and through monitoring programs of state organizations (ČHMÚ, Povodí Vltavy, SÚRO, SÚJB, ŘSD, and others). The results of the monitoring programs are used in the preparation of this Documentation. The same applies to environmental risks. Safety analyses have been prepared for the existing nuclear facilities at the site and form part of the relevant safety documentation (safety analysis reports); data from these analyses are also used in the preparation of this Documentation.

D.V.2. Method for assessing impacts on individual components of the environment and public health

D.V.2.1. Population and public health

The health status of the population is assessed using data from the Czech Statistical Office and the Institute of Health Information and Statistics.

The supporting studies of radiation and non-radiological impacts prepared for the relevant parts of the Documentation provide input for the assessment of health impacts. Impacts on population and public health are assessed using the Health Risk Assessment method, based on procedures developed and further refined by the US Environmental Protection Agency (US EPA) and within the European Union. The guidelines of the Ministry of the Environment of the Czech Republic are also based on these procedures.

The assessment of radiological impacts uses both established limits and risk coefficients for so-called health detriment, based on ICRP recommendations. The assessment of non-radiological impacts uses applicable statutory limits and risk coefficients based on applicable legislation and recommendations of the relevant international organizations.

The assessment of social and economic impacts is based on statistical data and field surveys or questionnaire surveys for the affected territory, conducted both specifically for the purposes of preparing the Documentation and independently of it (literature review sources).

D.V.2.2. Air and climate

The basic data used to assess background air quality are taken from pollution maps constructed on a 1x1 km grid and representing five-year moving averages of pollutant concentrations. Data published by the Czech Hydrometeorological Institute (ČHMÚ) were used for this purpose. For maximum short-term concentrations of certain pollutants for which pollution maps are not prepared, data from the nearest ambient air quality monitoring stations are used.

The contribution of the assessed air pollution sources to ambient air pollution is calculated in accordance with the Methodological Guideline of the Air Protection Department of the MŽP for the preparation of air dispersion studies pursuant to Section 32(1)(e) of Act No. 201/2012 Coll., on Air Protection. The calculation uses the reference method “SYMOS 97”, version 2013, for calculating air pollution from point, line, and area sources, taking into account current legislation (e.g. updated air quality limit values) and new knowledge in the field of air protection.

The results of the modeling calculations are assessed against air quality limit values defining permissible levels of air pollution. The values for individual pollutants are specified in Annex 1 to Act No. 201/2012 Coll., on Air Protection.

Statistically processed ČHMÚ data are used to assess climatic characteristics. The assessment of impacts on selected climatic characteristics uses the results of the CT-Plume mathematical model, with modules for calculating the characteristics of the active plume phase, passive plume dispersion, visible plume dimensions, and plume impacts at ground level.

The assessment of Project impacts on the global climate, i.e. the assessment of Project impacts on climate change, including a description of the Project's vulnerability to climate change, uses the methodological procedures recommended in Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (EU, 2013) and in the Methodological Interpretation of the Application of Selected New Concepts and Requirements of Act No. 100/2001 Coll. (MŽP, Ref. No.: MŽP/2017/710/1985 dated 20 October 2017).

D.V.2.3. Noise and other physical and biological characteristics

Noise measurement and modeling methods are used to assess impacts on the noise environment. Input data for assessing the current situation are taken from the previously prepared Acoustic Study for the New NPP at the Temelín site and from data on traffic volumes on the road network in the affected territory. Input data for the assessment of the Project are based on data provided by the supplier of the reference reactor type (RR SMR). Data from the EIA Documentation and the Acoustic Study for the New NPP ETE Project are also used, together with measurements of actual "in situ" noise levels in front of the nearest surrounding protected/residential areas. The measurement procedure complies with the applicable technical standards (ČSN ISO 1996-1 and 1996-2) and also takes into account Government Regulation No. 272/2011 Coll., on the Protection of Health against the Adverse Effects of Noise and Vibration, as amended, and the Methodological Guideline for the Measurement and Assessment of Noise in the Non-occupational Environment (Ministry of Health of the Czech Republic, Bulletin, Issue 14, 2023). Modeling calculations for both the current and future situations are performed using SoundPLAN 7.4. The measurements performed are used to verify the calculation model. Based on the identified differences between the values of acoustic parameters predicted by the calculation model and the actual values of acoustic parameters obtained by "in situ" measurement, the model is calibrated and the input acoustic parameters (terrain reflection/absorption, etc.) are adjusted. The measured and calculated values of the determining quantities are assessed against the noise hygiene limits for protected outdoor areas of buildings and protected outdoor areas established by Government Regulation No. 272/2011 Coll., on the Protection of Health against the Adverse Effects of Noise and Vibration, as amended.

Annual individual doses and committed effective doses for SMR ETE are calculated using the ESTE Annual Impacts calculation program developed by ABmerit, s. r. o. The ESTE AI calculation code is used to assess the radiological impacts of normal operation of nuclear facilities on the surrounding environment. The calculations are performed by ABmerit specialists with detailed knowledge of both the calculation program and the subject of the assessment. The ESTE Annual Impacts program is used, or approved for use, by the nuclear regulatory authorities in the Czech Republic and Slovakia and has been independently verified within several international projects. The program allows the impacts of airborne discharges from individual discharge sources at the site and discharges to watercourses to be assessed separately. The ESTE AI program makes it possible to determine and present the impacts of discharges from SMR ETE on the nearer and more distant surroundings, as well as impacts on neighboring countries located within the calculation domain. A 200 km x 200 km calculation domain with a 1 km grid spacing (calculation-cell resolution) is used for modeling, with the center of the grid at the planned location of the base of the SMR ETE ventilation stack. Hourly data from the ČHMÚ Temelín meteorological station are used to model the atmospheric dispersion of radioactive substances for the representative years 2018 (dry year), 2024 (wet year), and 2023 (average year). Each year is modeled using actual hourly data for that year provided by ČHMÚ, covering the following parameters: wind direction and speed at 10 m above ground level, precipitation intensity, and atmospheric stability category. To model hydrological conditions for the calculation of annual doses, measured minimum, average, and maximum annual flow values in the Vltava at the Kořensko profile, where SMR ETE wastewater is planned to be discharged, are considered for the same period, i.e. 2018 to 2024. Other boundary and initial conditions are set conservatively on the basis of justified engineering judgment or sensitivity analyses so as to conservatively result in higher consequences. Individual doses are determined and assessed for individual age groups of the population, taking account of different lifestyle and dietary assumptions and habits according to age and country. The most conservative assumption used may be considered to be the use of water from the Vltava as drinking water to meet the entire drinking-water consumption of all residents living in municipalities whose cadastral territories are crossed by the Vltava downstream of the Kořensko profile. The assessment of the impact of ionizing radiation on the biotic component is performed in accordance with IAEA and ICRP procedures. The assessment uses the concept of a reference animal or reference plant and evaluates whether the reference dose-rate values for reference animals or plants are reached or not reached. In assessing the cumulative effects of other existing and planned nuclear facilities at the Temelín site, the highest dose values determined in the New NPP ETE EIA Documentation, representing the combined effects of the operating ETE1,2 and the planned New NPP ETE at the maximum output option, are added to the highest annual doses identified from SMR ETE operation; the radiological impact of SVJP ETE after expansion, as determined in the relevant EIA Documentation for the expansion of SVJP ETE, is also added. In doing so, the maxima at individual distances are conservatively summed irrespective of the specific sectors in which the maxima from the individual sources are identified. The effect of the change in dose coefficients under the amendment to Decree No. 422/2016 Coll., which entered into force at the beginning of 2026, is conservatively taken into account (added) when assessing the combined effect of doses from discharges from ETE1,2 and New NPP ETE. The effect of the new dose coefficients for ETE1,2 and New NPP ETE is applied to doses from liquid effluents discharged to the watercourse (the Vltava), where the new dose coefficients result in higher doses; conversely, it is not applied to doses from airborne discharges, where the new dose coefficients result in slightly lower doses. For dose calculations for discharges from SMR ETE, only the new dose coefficients under the amendment to Decree No. 422/2016 Coll. are applied, both for determining doses from liquid effluents discharged to the watercourse and from airborne discharges.

The assessment of vibration impacts is based on measurements of actual conditions in the immediate vicinity of the Dukovany Nuclear Power Plant (EDU1-4) and along the associated transport routes (roads, railway), carried out as part of the preparation of the EIA Documentation for the New NPP EDU in 2017. The measurement results demonstrated that the vibration impacts of both the technology and the transport routes are entirely insignificant even in their immediate vicinity. The results obtained in this way are also generalized to the future situation at the Temelín site, both during SMR ETE construction and operation, and are assessed in accordance with the applicable regulations for the protection of people (Government Regulation No. 272/2011 Coll., on the Protection of Health against the Adverse Effects of Noise and Vibration, as amended) and regulations for the protection of structures (ČSN 73 0040 Loads on Structures Due to Technical Seismicity and Their Response).

The impacts of non-ionizing radiation (electromagnetic fields) in the vicinity of power lines are assessed by an accredited calculation of modified current density, which is the limiting parameter under Government Regulation No. 291/2015 Coll., on the Protection of Health against Non-ionizing Radiation, and ČSN 33 2040 Protection against the Effects of 50 Hz Electromagnetic Fields within the Zone of Influence of Electric Power System Equipment. The calculation is performed for the potentially least favorable configuration of the Project power lines (SMR ETE power evacuation and backup supply for SMR ETE auxiliary power) where they run in parallel with or cross other power lines in the area. This demonstrates compliance with the limit under the above Government Regulation at all publicly accessible locations.

The impact of light pollution is assessed on the basis of the requirements of MŽP Methodological Guideline Ref. No. MZP/2023/710/2146 and ČSN 36 0459 Limitation of the Undesirable Effects of Outdoor Lighting, which will be complied with during further Project preparation.

The assessment of shading in the area takes into account both shading by structures and shading by the steam plume from the cooling towers. A detailed assessment of shading is performed for selected points in the potentially most affected inhabited areas; the locations of Natura 2000 sites are also examined. The assessment is based on an analysis of the configuration of SMR ETE structures (location and dimensions) in combination with other structures at the site, i.e. the existing ETE1,2 and the planned New NPP ETE, as well as the terrain configuration and the actual movement of the sun across the area. The calculations were performed using GRASS GIS, a geographic information system designed for the processing, analysis, and modeling of spatial data. The shading effect of steam plumes from the cooling towers, resulting from the analysis of impacts on local climatic characteristics using CT-Plume (see above), is also taken into account (added) when assessing shading by structures.

D.V.2.4. Surface water and groundwater

Data on the qualitative and quantitative status of surface water and groundwater and on abstracted raw water and discharged wastewater are obtained from materials provided by ČEZ, a. s., Povodí Vltavy, s. p., the Czech Hydrometeorological Institute (ČHMÚ), and the T. G. Masaryk Water Research Institute. The list of surface-water bodies and their status is taken from the Upper Vltava Sub-basin Plan and the Lower Vltava Sub-basin Plan for the period 2021-2027. The latest assessment of the chemical and quantitative status of groundwater bodies, prepared for the update of the plans using data for the period 2019-2024 (4th cycle), is used for the list and assessment of groundwater bodies.

These data provide the basis for assessing the impact of SMR ETE operation on surface water and groundwater.

First, the hydrological balance was modeled using the BILAN model; in the simulation of the storage function, hydrological conditions were represented by time series of modeled natural mean monthly flows covering a total of 43 and 44 years, respectively. The assessment was performed for alternative hydrological datasets representing the emission scenario (SSP245) and models (ec-earth3, mpi-esm1-2-hr, taiesm1, ALADIN-CLIMATE/CZ), with regard to climate change impacts for the reference years 2060 and 2080. The assessment was also supplemented by an assessment of the reliability of water abstraction from the Vltava under current hydrological conditions and for an option with warming of 2°C relative to current conditions.

The area of interest is considered to be the Vltava catchment down to the profile of the Prague – Velká Chuchle gauging station. The water-management system considered includes the Lipno I, Lipno II, Římov, Hněvkovice, Kořensko, Orlík, Slapy, Švihov, and Vrané water reservoirs. The modeling outputs are the extent of the impact on the hydrological regime in the Vltava River catchment and the reliability of water abstraction from the Vltava for the needs of ETE.

For the qualitative assessment of surface water, critical profiles on the Vltava River are selected with regard to the general assessment of permissible surface-water pollution, assessment of the status of surface-water bodies (ecological status/potential and chemical status), use for the production of drinking water, bathing, or protection of waters suitable for the life and reproduction of fish. These are the VN Kořensko pod, VNO Zvíkovský most, Solenice, and Kamýk n. Vltavou and Štěchovice profiles.

For these critical profiles, parameters for assessing the impact of SMR ETE on surface-water quality are specified so as to correspond to surface-water quality requirements relevant to the particular critical profile.

Concentrations at the critical profiles are modeled for two Project output options: SMR ETE+ETE1,2 and SMR ETE+ETE1,2+New NPP ETE (2x1,700 MW_e). For both of these options, surface-water quality at the critical profiles is modeled for two hydrological situations:

- "normal flow" (the long-term mean flow Q_a is used for modeling),
- "drought - climate change impact" (flow Q_{355} is used for modeling); in addition, the situation at the VN Kořensko pod profile is also modeled for the minimum guaranteed flow (Q_{zab}) in order to estimate extreme (maximum) parameter values for comparison with values established by legislation as annual maxima (or minima in the case of dissolved oxygen).

Modeling is also performed for two discharge scenarios:

- "average discharge" - based on actually measured concentrations in ETE1,2 wastewater (average for 2015-2024) and analogous concentrations in wastewater (based on the assumption that the water-management systems of all three facilities will be essentially similar) for SMR ETE and New NPP ETE; for radioactivity parameters, the actually measured values of activity discharged from ETE1,2 (average for 2015-2024) are used, while for the other sources in the assessed Project output option (SMR ETE or, where applicable, New NPP ETE), the specified source term for SMR ETE or the design radionuclide discharges according to the EIA process for the New NPP ETE Project are conservatively used,
- "maximum discharge" - based on the "max" and "m" emission limit values specified in the permit for wastewater discharges from ETE1,2; for the other sources in the assessed output options (SMR ETE or, where applicable, New NPP ETE), the same approach is used as for the average discharge scenario; this scenario represents an extreme (bounding) condition that has not been reached in practice at ETE1,2.

To assess the current groundwater status and the longer-term development of groundwater levels and quality, time series of groundwater levels and quality in boreholes at the Temelín site, mostly covering the period 2009-2024, are used, supplemented in some locations by shorter time series from newly constructed boreholes.

The impact on the status of surface-water and groundwater bodies is assessed using the same procedures and methodologies as those used to assess the current status of water bodies under the Upper Vltava Sub-basin Plan and the Lower Vltava Sub-basin Plan for the period 2021-2027.

D.V.2.5. Soil

To assess impacts on the agricultural land fund (ZPF), soil conditions in the area are mapped, including classification of soils according to evaluated soil-ecological units (BPEJ) and the resulting protection classes. In addition to analysis of available sources (geoportal.vumop.cz, geoportal.spucr.cz, etc.), the description of soil conditions is based on a dedicated soil survey carried out in the area of interest in spring 2025 and 2026. The soil survey verified the thickness of the upper cultivated layer (topsoil) and underlying soil layers suitable for soil improvement (subsoil) using soil probes. The survey also included verification of changes in soil cover in relation to the applicable BPEJ classification and soil erosion risk. Land intended to fulfill forest functions (PUPFL) is also mapped.

Permanent and temporary ZPF land takes, including their breakdown by individual protection classes, are quantified conservatively. Areas of PUPFL to be taken or permanently restricted are quantified in the same manner.

D.V.2.6. Natural resources

Data from the Temelín NPP Safety Analysis Report and its supporting studies, together with data from public databases of the Czech Geological Survey, are used in preparing this part of the Documentation.

D.V.2.7. Biodiversity

To assess the impacts of the Project on biodiversity, an authorized person prepared an assessment of the impact of the proposed significant intervention on nature and landscape conservation interests pursuant to Section 67 of Act No. 114/1992 Coll., on Nature and Landscape Protection, as amended. The assessment focuses in particular on impacts on specially protected plant and animal species, specially protected areas, significant landscape features, the territorial system of ecological stability, nature parks, memorial trees, and other nature and landscape conservation interests.

A Natura 2000 screening was also carried out to examine potential impacts of the Project on the qualifying features and integrity of Sites of Community Importance and Special Protection Areas. As the possibility of a significant impact was excluded by the opinion issued pursuant to Section 45i(1) of the Nature and Landscape Conservation Act, an assessment pursuant to Section 45i(2) of that Act was not prepared.

The primary source of information is detailed field surveys of the affected territory carried out in 2025 and 2026, covering floristics, malacology, entomology, hydrobiology, ichthyology, herpetology, batrachology, ornithology, and mammalogy. The surveys are supplemented by data from the Nature Conservation Species Occurrence Database of the Nature Conservation Agency of the Czech Republic and by the results of earlier surveys conducted in 2023 and 2024. The supporting materials also include map outputs and proposed preventive, mitigation, and compensatory measures.

The assessment of Project impacts on biodiversity also uses methodological procedures recommended in Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (EU, 2013) and the MŽP Methodological Guideline on the application of selected new concepts and requirements of the Environmental Impact Assessment Act (MŽP, dated 20 October 2017).

D.V.2.8. Landscape

To assess impacts on the landscape, an assessment of impacts on landscape character is carried out in accordance with generally recommended methodological procedures for such assessments.

For the purposes of the assessment, an analysis of Project visibility and landscape relationships is carried out, followed by a field survey. The affected landscape area is delineated on the basis of an analysis of the potential visibility of the Project, calculated using the ČÚZK DMP 1G digital model; within this area, the landscape characteristics are described and the Project's impacts on the visual/aesthetic values, natural values, and cultural and historical values of the area are assessed. For the assessment of impacts on the landscape, an expert assessment of impacts on landscape character is carried out in accordance with the methodology for preventive landscape character assessment (Bukáček, Matějka, 1997) and the methodology for case-specific landscape character assessment (Vorel, Bukáček, Matějka, Culek, Sklenička, 2004). The affected landscape area is delineated on the basis of an analysis of the digital terrain model.

Illustrative 3D massing models and visualizations are prepared to provide a clearer representation of the visual effect of the Project in combination with other projects at the Temelín site.

D.V.2.9. Tangible assets and cultural heritage

Information from the databases of the National Heritage Institute and a dedicated survey of the affected territory are used to assess Project impacts on tangible assets and cultural heritage.

D.V.2.10. Transport and other infrastructure

Data on current (background) traffic volumes on the road network in the area of interest are based on the results of the 2020 National Traffic Census published by the Road and Motorway Directorate of the Czech Republic (ŘSD ČR), which were valid when this Documentation was prepared. For road sections not covered by the National Traffic Census, traffic volumes were determined by a traffic survey carried out during 2025. The relevant traffic coefficients specified in TP 225 Road Traffic Volume Forecasting, 3rd revised edition, are used to convert the data to the current forecast period. The traffic volumes generated by the construction or operation of SMR ETE, obtained from the traffic model on the basis of an analysis of trip origins and destinations, are added to the background traffic volumes determined in this way for the forecast period. Impacts are assessed by comparing traffic volumes generated by the SMR ETE Project (in combination with other planned projects at the site) with background traffic volumes and by assessing the impact on road capacity. The main purpose of the data obtained in this way is to provide input for subsequent parts of the Documentation (preparation of the Air Dispersion Study and Acoustic Study).

Data on railway infrastructure are based on information from Správa železnic (SŽ; national railway network) and ČEZ, a. s. (ETE siding).

Air transport data are obtained from the Aeronautical Information Publication of Air Navigation Services of the Czech Republic (ŘLP ČR).

Inland waterway transport data are based on information from the Waterways Directorate of the Czech Republic (ŘVC ČR).

Data on infrastructure networks are obtained from their owners (ČEZ, a. s., ČEPS, a.s., EG.D, a.s.) and from map sources.

D.V.2.11. Other

Data on other environmental characteristics of the affected territory are obtained from databases maintained by the relevant responsible authorities. Since no specific features that could be affected by the Project were identified, the impacts are not specifically assessed (nor did such a requirement arise from the screening and scoping procedure).

D.V.2.12. Environmental risks

The environmental risk assessment primarily evaluates the radiation consequences of radiation extraordinary events (design basis accidents (DBAs) and severe accidents (DEC-B)), as well as risks arising from other industrial activities at the site and in its vicinity.

A key input parameter for assessing the radiation consequences of extraordinary events is determination of the source term (the quantity of radioactive substances, their radionuclide composition, and their temporal distribution) released into the environment during a radiation extraordinary event. The source terms for both DBAs and DEC-B are derived on the basis of EUR requirements for limiting the economic consequences of accidents, which are applied as requirements that must be met, and US NRC guidance and recommendations (NUREG 1645 and 1940 and RG 1.183) for modeling radionuclide behavior in the containment. The containment leak rate is assumed to be 0.2% of the containment volume per 24 hours, i.e. twice the design containment leak rate for the reference RR SMR design. In determining the source terms, account is taken of the ratio of the reactor core sizes of the reference RR SMR and large units and of the results for releases of radioactive substances into the containment atmosphere for large units according to their safety documentation. The duration and location of the release are conservatively determined by expert judgment so as to result in higher radiation consequences. The basic modeling and assessment are performed out to approximately 100 km from SMR ETE; within this area, a graded computational grid is used, with finer subdivision into smaller cells in areas closer to SMR ETE (from squares with 100 m sides at distances of up to 3.7 km from SMR ETE to squares with 2.7 km sides at distances greater than 33.3 km from SMR ETE). For the assessment of radiological impacts on the population and agricultural production in Poland and Slovakia, the calculation domain is extended to 400 km from SMR ETE. Doses to the population via all exposure pathways, impacts on agricultural production, and impacts on the biotic component (reference animals and plants) are assessed.

Calculations of radionuclide dispersion in the environment and dose determination are performed by ABmerit s.r.o. using the ESTE program. The calculations are performed by ABmerit specialists with detailed knowledge of both the calculation program and the subject of the assessment. The ESTE program has been verified for modeling the radiation consequences of extraordinary events within several international programs and is used by several national emergency response centers, including SÚJB, to forecast the radiation consequences of simulated and actual radiation extraordinary events at nuclear facilities. For both groups of radiation extraordinary events assessed (design basis accidents and severe accidents), the assessment includes probabilistic and deterministic analyses. The probabilistic analyses take into account the actual nature of meteorological conditions and their development over time during the event and after it has ended. For the probabilistic assessment, the years 2022-2024 are used as reference years for several hundred actual meteorological sequences at a time step of 1 hour. The results are the averages of the maxima and the 95th percentiles of the maxima at individual distances from SMR ETE for all cases analyzed. The deterministic analyses assume predefined, constant conservative meteorological conditions, with possible rainfall over the area specifically assessed. The assessment determines individual doses to members of the public at various distances from SMR ETE over different time periods (2 days, 7 days, 30 days, 1 year, and 50 or 70 years), time-integrated activity concentrations of selected radionuclides in the ground-level air layer (TIC), ground deposition of selected radionuclides, and the quantity of contaminated agricultural produce that could not subsequently be placed on the market in accordance with European Commission regulations. Individual doses are compared with the acceptance criteria for the relevant type of radiation extraordinary event. The acceptance criteria used are taken from SÚJB requirements, and the WENRA criteria are also assessed. Specific national criteria are used to assess doses and the radiation situation in Austria and Germany. The impacts of radiation extraordinary events on biota are assessed using IAEA criteria and IAEA and ICRP approaches and methods.

Other industrial risks are assessed on the basis of an analysis of information on industrial activities at the site (quantities of hazardous substances, transport of hazardous substances), the probability of occurrence of an event according to industrial risk databases and the approaches applied, together with an assessment of the potential consequences of the risks. The methodological approach is applied in accordance with the relevant SÚJB and IAEA guidance, with detailed consequence assessment using the SAVE II program for the dispersion of explosive and toxic clouds and the multi-energy concept for assessing blast-wave effects, by analogy with the results of assessments of these events for the existing operating ETE1,2 and taking into account specific differences, particularly the location of SMR ETE in relation to the sources of potential hazardous events, etc.

D.V.3. Documents and sources used

D.V.3.1. Procedural supporting documents

[P.1] New SMR Power Plant at the Temelín Site. Project Notification. Jacobs Clean Energy s.r.o., 22 October 2024

[P.2] New SMR Power Plant at the Temelín Site. Commencement of the screening and scoping procedure. Ministry of the Environment, Ref. No.: MZP/2024/710/4728 dated 15 November 2024

[P.3] New SMR Power Plant at the Temelín Site. Conclusion of the screening and scoping procedure. Ministry of the Environment, Ref. No.: MZP/2025/710/1972 dated 7 July 2025

D.V.3.2. Internal supporting documents

A number of detailed reports and studies addressing individual areas of the environment and public health were prepared as internal supporting documents for the preparation of the Documentation.

Studies covering the key areas of the environment and public health are provided in the Annexes (page 529 of this Documentation); in some cases, the data have been appropriately adapted or condensed to maintain clarity and a reasonable scope of the Documentation.

The list of internally prepared supporting documents is as follows:

[I.1] DP1 Biogeographical Characteristics of the Area. Partial supporting study for the preparation of the SMR ETE EIA Documentation. Amentum Clean Energy s.r.o., April 2025, revised May 2026.

[I.2] DP2A Construction and Operation of SMR ETE – Stationary Noise Sources. Acoustic study for EIA. Greif-akustika, s.r.o., July 2025.
DP2B Construction and Operation of SMR ETE – Traffic Volumes. Acoustic study for EIA. Greif-akustika, s.r.o., July 2025.
DP2C Construction and Operation of SMR ETE – Construction Noise. Acoustic study for EIA. Greif-akustika, s.r.o., July 2025, revised May 2026.

[I.3] DP3 Assessment of Project Impacts on Landscape Character. Study of Impacts on the Landscape Character of the Area, supporting document for the SMR ETE EIA Documentation. Ing. Roman Bukáček, Studio B&M, June 2025.

[I.4] DP4 Public Health Study at the Temelín Site as a supporting document for the SMR ETE EIA Documentation. Institute of Public Health, Faculty of Medicine, Masaryk University, June 2025.

[I.5] DP5 Air Quality Study at the Temelín Site (supporting study for the SMR ETE EIA Documentation). Czech Hydrometeorological Institute, April 2025.

[I.6] DP6 New SMR Power Plant at the Temelín Site. Air Dispersion Study. Amentum Clean Energy s.r.o., August 2025.

[I.7] DP7 Climatic Characteristics of the Temelín Site. Technical report. Czech Hydrometeorological Institute, June 2025.

[I.8] DP8 Pedological Characteristics of the SMR ETE Site. Research Institute for Soil and Water Conservation, August 2025, revised June 2026.

[I.9] DP9A New SMR Power Plant at the Temelín Site. Biological surveys and assessment of Project impacts on nature conservation interests pursuant to Section 67 of Act No. 114/1992 Coll. for the EIA Documentation. Mgr. Vladimír Melichar, December 2025, revised July 2026.

DP9B New SMR Power Plant at the Temelín Site. Natura 2000 Screening Report. Mgr. Vladimír Melichar, December 2025, revised July 2026.

[I.10] DP10 Study of the Impact of the SMR at the Temelín Site on CO_2 Emissions and Comparison with Alternative Electricity Generation Options. CI3, s.r.o., June 2025.

[I.11] DP11 Tangible Assets and Cultural Heritage. Partial supporting study for the preparation of the SMR ETE EIA Documentation. Amentum Clean Energy s.r.o., April 2025, revised May 2026.

[I.12] DP12 Impact of External and Internal Hazards on the SMR ETE Site. Supporting study for the SMR ETE EIA Documentation. Jacobs Clean Energy s.r.o., August 2025.

[I.13] DP13 Geographical Characteristics of the Site. Partial supporting study for the preparation of the SMR ETE EIA Documentation. Amentum Clean Energy s.r.o., October 2025, revised June 2026.

[I.14] DP14 Study of the Mental Health of Residents at the Temelín Site – 2025. Final report. PhDr. Petr Sadílek, Agentura INRES, June 2025.

[I.15] DP15 SMR ETE Shading Study. Ing. Radim Seibert, July 2025.

[I.16] DP16 Radiation Situation. Partial supporting study for the preparation of the SMR ETE EIA Documentation. Amentum Clean Energy s.r.o., June 2025.

[I.17] DP17A Study of the Radiological Impacts of Normal Operation of the SMR ETE. ABmerit, s.r.o., June 2025, revised April 2026.

DP17B Cumulative Impact of Normal Operation of the SMR ETE, ETE1,2, and New NPP ETE on Public Exposure. Partial supporting study for the preparation of the SMR ETE EIA Documentation. Amentum Clean Energy s.r.o., June 2025, revised May 2026.

[I.18] DP18 Old Environmental Burdens at the SMR ETE. Final report. ENVI-AQUA, s.r.o., July 2025.

[I.19] DP19 Traffic Census for SMR ETE – update. PRAGOPROJEKT, a.s., July 2025.

DP19 SMR ETE Traffic Study. DOPRAVOPROJEKT Ostrava a.s., June 2025, revised August 2025.

[I.20] DP20A Water Management Study – Quantity – Basic Assessment of SMR ETE. T. G. Masaryk Water Research Institute, June 2026.

DP20A Water Management Study – Quantity – Supporting Report for the SMR EIA Documentation. T. G. Masaryk Water Research Institute, November 2026.

DP20B Water Management Study – Quality – Basic Assessment of SMR ETE. T. G. Masaryk Water Research Institute, October 2025.

DP20C Water Management Study – Groundwater, SMR ETE EIA. T. G. Masaryk Water Research Institute, August 2025, revised December 2025.

[I.21] DP21 Assessment of Impacts on Public Health. ATEM - Ateliér ekologických modelů, s. r. o, July 2026.

DP21 Assessment of Radiological Impacts of SMR ETE Operation. Department of Health Care Disciplines and Population Protection, Czech Technical University in Prague, July 2026.

DP21 Assessment of the Impacts of Air Pollution and Noise Exposure on Public Health for SMR ETE. ATEM - Ateliér ekologických modelů, s. r. o, July 2026.

[I.22] DP22 SMR ETE EIA: Radiological Impacts of Accident Conditions, Including a Severe Accident and Transboundary Impacts. ABmerit, s.r.o., December 2025, revised May 2026.

[I.23] DP23 EIA SMR ETE: Determination of the Design Envelope Source Term for DBC and DEC-B Conditions for the Project of New SMR Power Plant at the Temelín Site. ÚJV Řež, a. s. – ENERGOPROJEKT PRAHA Division, May 2025

[I.24] DP24 Determination of Outlet Air Parameters for a Mechanical-draft Cooling Tower at the Temelín Site, REKO Praha, a.s., April 2025.

DP24 Assessment of the Impact of SMR ETE Cooling Towers on the Microclimate, Separately and in Combination with ETE1,2 and New NPP ETE. Institute of Atmospheric Physics of the Czech Academy of Sciences, June 2025.

[I.25] DP25 Geological Environment and Natural Resources. Supporting study. RNDr. Ivan Prachař, CSc., IPConsult, June 2025.

[I.26] DP26 Visualizations of SMR ETE. Amentum Clean Energy s.r.o., September 2025.

[I.27] DP27 SMR ETE EIA: Preparation of a preliminary rough grading design for SMR ETE. Technical report. ÚJV Řež, a. s. – ENERGOPROJEKT PRAHA Division, July 2025, Revision 1 October 2025, Revision 2 March 2026.

[I.28] DP28 Social and Economic Impacts of the Construction and Operation of SMR ETE in Combination with New NPP ETE. GaREP spol. s r.o., May 2025.

[I.29] DP29 Radiological Impacts of SMR ETE Accident Conditions on Biota. ABmerit, s.r.o., April 2026.

DP29 Addressing the Requirements of the Conclusion of the Screening and Scoping Procedure – Expert Support - Opinion on the Feasibility of Stormwater Infiltration at the SMR ETE Site. T. G. Masaryk Water Research Institute, January 2026.

DP29 Water Management Study – Groundwater Bodies and Impacts of SMR ETE on their Status. T. G. Masaryk Water Research Institute, April 2026.

DP29 Assessment of the Impact of the SMR ETE Project on the Status of Surface-water Bodies. T. G. Masaryk Water Research Institute, April 2026.

DP29 Assessment of the Impact of Stormwater and Pumped Groundwater Drainage from the SMR ETE Project on Receiving Water Bodies. T. G. Masaryk Water Research Institute, May 2026.

DP29 Water Management Study – Quantity – Requirement of the Conclusion of the Screening and Scoping Procedure Concerning the Impact of the Project on the Vltava Cascade. T. G. Masaryk Water Research Institute, May 2026.

DP29 Expert Opinion on Issues Concerning Karlovec Pond in Connection with Construction of the SMR ETE. T. G. Masaryk Water Research Institute, May 2026.

DP29 Test Report by an Accredited Laboratory, Area Beneath the 400 kV Overhead Line and Above the 110 kV Cable Line. EGU - HV Laboratory a.s., July 2026.

D.V.3.3. Legislative source documents

The complete set of legislation of the Czech Republic is binding on the Project. An illustrative list of relevant legislation is provided below. All legislative source documents are taken into account in this Documentation in the wording valid and effective as of the date of preparation of the Documentation.

[L.1] Nuclear energy and ionizing radiation:

Act No. 263/2016 Coll., Atomic Act

SÚJB Decree No. 329/2017 Coll., on the requirements for nuclear installation design

SÚJB Decree No. 379/2016 Coll., on the type approval of certain products in the field of the peaceful use of nuclear energy and ionizing radiation and the transport of radioactive or fissile material

SÚJB Decree No. 378/2016 Coll., on the siting of a nuclear installation

SÚJB Decree No. 377/2016 Coll., on the requirements for the safe management of radioactive waste and on the decommissioning of nuclear installations or Category III or IV workplaces

SÚJB Decree No. 376/2016 Coll., on dual-use items in the nuclear area

SÚJB Decree No. 375/2016 Coll., on selected items in the nuclear area

SÚJB Decree No. 374/2016 Coll., on the accountancy and control of nuclear materials and reporting of information on them

SÚJB Decree No. 362/2016 Coll., on the conditions for the award of a grant from the state budget in certain existing exposure situations

SÚJB Decree No. 361/2016 Coll., on the security of nuclear installations and nuclear material

SÚJB Decree No. 360/2016 Coll., on radiation situation monitoring

SÚJB Decree No. 359/2016 Coll., on details of ensuring radiation extraordinary event management

SÚJB Decree No. 358/2016 Coll., on requirements for assurance of quality and technical safety and assessment and verification of conformity of selected equipment

SÚJB Decree No. 408/2016 Coll., on management system requirements

SÚJB Decree No. 409/2016 Coll., on activities especially important from the nuclear safety and radiation protection viewpoint, special professional qualification, and training of persons ensuring radiation protection of the registrant

SÚJB Decree No. 422/2016 Coll., on radiation protection and security of a radionuclide source

SÚJB Decree No. 21/2017 Coll., on assuring nuclear safety of a nuclear installation

SÚJB Decree No. 464/2016 Coll., on the procedure for providing grants from the state budget for the implementation of measures to reduce exposure due to the presence of radon and its decay products in the indoor air of buildings intended for housing and public occupancy and for the implementation of measures to reduce the content of natural radionuclides in drinking water intended for public supply

Government Regulation No. 347/2016 Coll., on rates of fees for professional activities of the State Office for Nuclear Safety

Government Regulation No. 35/2017 Coll., laying down the rate of the one-off fee for radioactive waste disposal, the amounts of contributions from the nuclear account to municipalities, and the rules for their provision

[L.2] Construction permitting:

Act No. 283/2021 Coll., Building Act

MMR Decree No. 131/2024 Coll., on construction documentation

MMR Decree No. 146/2024 Coll., on construction requirements

MMR Decree No. 149/2024 Coll., implementing certain provisions of the Building Act

MMR Decree No. 157/2024 Coll., on spatial planning analytical materials, spatial planning documentation, and the uniform standard

[L.3] Environmental impact assessment:

Act No. 100/2001 Coll., on Environmental Impact Assessment

MŽP Decree No. 453/2017 Coll., on professional competence and regulation of certain other matters related to environmental impact assessment

[L.4] Integrated pollution prevention and control:

Act No. 76/2002 Coll., consolidated version of the Act on Integrated Pollution Prevention and Control and on Amendments to Certain Acts

MŽP Decree No. 288/2013 Coll., implementing certain provisions of the Act on Integrated Prevention

Act No. 25/2008 Coll., consolidated version of the Act on the Integrated Environmental Pollution Register and the Integrated System for Fulfilling Environmental Reporting Obligations and on Amendments to Certain Acts

Government Regulation No. 145/2008 Coll., laying down the list of pollutants and threshold values and the data required for reporting to the Integrated Environmental Pollution Register

[L.5] Landscape and nature conservation:

Act No. 114/1992 Coll., on Nature and Landscape Conservation

MŽP Decree No. 395/1992 Coll., implementing certain provisions of the Nature and Landscape Conservation Act

Act No. 167/2008 Coll., on the Prevention and Remedying of Environmental Damage and on Amendments to Certain Acts

[L.6] Protection of the agricultural land fund:

Czech National Council Act No. 334/1992 Coll., on the Protection of the Agricultural Land Fund

MŽP Decree No. 271/2019 Coll., laying down procedures to ensure the protection of the agricultural land fund

MŽP Decree No. 48/2011 Coll., laying down protection classes

MŽP Decree No. 153/2016 Coll., laying down details of the protection of agricultural soil quality and amending Decree No. 13/1994 Coll., regulating certain details concerning the protection of the agricultural land fund

[L.7] Air protection:

Act No. 201/2012 Coll., on Air Protection

MŽP Decree No. 415/2012 Coll., on the permissible level of pollution and its determination and implementing certain other provisions of the Air Protection Act

[L.8] Water protection:

Act No. 254/2001 Coll., on Waters and on Amendments to Certain Acts

Government Regulation No. 401/2015 Coll., on indicators and values of permissible pollution of surface water and wastewater, particulars of permits for wastewater discharge into surface waters and sewerage systems, and sensitive areas

Government Regulation No. 57/2016 Coll., on indicators and values of permissible wastewater pollution and particulars of permits for wastewater discharge into groundwater

[L.9] Waste management:

Act No. 541/2020 Coll., on Waste

MŽP and MZd Decree No. 8/2021 Coll., on the Waste Catalog and assessment of waste properties (Waste Catalog)

MŽP Decree No. 273/2021 Coll., on details of waste management

Act No. 542/2020 Coll., on End-of-Life Products

Act No. 477/2001 Coll., on Packaging and on Amendments to Certain Acts

[L.10] Chemical substances and mixtures:

Act No. 350/2011 Coll., on Chemical Substances and Chemical Mixtures and on Amendments to Certain Acts (Chemical Act)

MZd Decree No. 61/2013 Coll., on the scope of information provided on chemical mixtures having certain hazardous properties and on detergents

[L.11] Prevention of major accidents:

Act No. 224/2015 Coll., on the Prevention of Major Accidents Caused by Selected Hazardous Chemical Substances or Chemical Mixtures (Major Accident Prevention Act)

MPO Decree No. 225/2015 Coll., laying down the scope of physical protection safety measures for an establishment classified in Group A or Group B

MV Decree No. 226/2015 Coll., on the principles for defining an emergency planning zone and the procedure for its definition and on the particulars of the content and structure of an external emergency plan

MŽP Decree No. 227/2015 Coll., on the particulars of safety documentation and the scope of information provided to the preparer of an assessment

MŽP Decree No. 228/2015 Coll., on the scope of public information, reporting of a major accident, and the final report on the occurrence and impacts of a major accident

[L.12] Geology and mining:

Act No. 62/1988 Coll., on Geological Work

Act No. 61/1988 Coll., on Mining Activities, Explosives, and the State Mining Administration

[L.13] Health protection:

Act No. 258/2000 Coll., on the Protection of Public Health and on Amendments to Certain Related Acts

Government Regulation No. 272/2011 Coll., on the Protection of Health against the Adverse Effects of Noise and Vibration

Government Regulation No. 291/2015 Coll., on the Protection of Health against Non-ionizing Radiation

MZd Decree No. 43/2025 Coll., laying down hygiene limits for chemical, physical, and biological indicators for the indoor environment of occupied rooms in certain buildings

[L.14] Fire protection:

Act No. 133/1985 Coll., on Fire Protection

Act No. 240/2000 Coll., on Crisis Management and on Amendments to Certain Acts

[L.15] Energy:

Act No. 458/2000 Coll., on Business Conditions and Public Administration in the Energy Sectors and on Amendments to Certain Acts (Energy Act)

[L.16] Transport routes:

Act No. 13/1997 Coll., on Roads

Act No. 266/1994 Coll., on Railways

[L.17] Aviation:

Act No. 49/1997 Coll., on Civil Aviation

MD Decree No. 108/1997 Coll., implementing Act No. 49/1997 Coll., on Civil Aviation

[L.18] Water discharge:

Act No. 274/2001 Coll., on Public Water Supply and Sewerage Systems and on Amendments to Certain Acts

MZe Decree No. 428/2001 Coll., implementing Act No. 274/2001 Coll., on Public Water Supply and Sewerage Systems and on Amendments to Certain Acts (Water Supply and Sewerage Systems Act)

[L.19] Forest protection:

Act No. 289/1995 Coll., on Forests and on Amendments and Supplements to Certain Acts

[L.20] Heritage conservation:

Act No. 20/1987 Coll., on State Heritage Conservation

D.V.3.4. International conventions and agreements

[U.1] International conventions:

Convention on the Physical Protection of Nuclear Material. Vienna, 26 October 1979, succession 24 March 1993, entry into force 1 January 1993, MZV Communication No. 114/1996 Coll.

Convention on Early Notification of a Nuclear Accident. Vienna, 26 September 1986, succession 24 March 1993, entry into force 1 January 1993, MZV Communication No. 116/1996 Coll.

Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency. Vienna, 26 September 1986, succession 24 March 1993, entry into force 1 January 1993, MZV Communication No. 115/1996 Coll.

Convention on Nuclear Safety. Vienna, 20 September 1994, entry into force 24 October 1996, MZV Communication No. 67/1998 Coll.

Vienna Convention on Civil Liability for Nuclear Damage. Vienna, 21 May 1963, entry into force 12 November 1997, Ministry of Foreign Affairs Communication No. 133/1994 Coll., corrected by MZV Communication No. 125/2000 Coll.

Protocol to Amend the 1963 Vienna Convention on Civil Liability for Nuclear Damage. Vienna, 18 June 1998.

Convention on Supplementary Compensation for Nuclear Damage. Vienna, 12 September 1997.

Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. Vienna, 30 September 1997, entry into force 18 June 2001.

Comprehensive Nuclear-Test-Ban Treaty. 12 November 1996, ratification 11 September 1997, not yet in force (Annex 2).

Treaty on the Non-Proliferation of Nuclear Weapons. Moscow, Washington, London, 1 July 1968, entry into force 5 March 1970, MZV Decree No. 61/1974 Coll.

Convention on Environmental Impact Assessment in a Transboundary Context, 25 February 1991, Espoo, 30 September 1993.

Agreement on the Privileges and Immunities of the Agency. Vienna, succession 27 September 1993.

Amendment to the Convention on the Physical Protection of Nuclear Material and Nuclear Facilities. Vienna, 8 July 2005, promulgated in the Czech Republic under No. 64/2016 Coll. of International Treaties.

[U.2] International agreements:

Treaty establishing the European Atomic Energy Community (Euratom). Rome, 25 March 1957, entry into force 1 January 1958.

Agreement between the Government of the Czechoslovak Socialist Republic and the Government of the Republic of Austria on the Regulation of Issues of Common Interest relating to Nuclear Safety and Radiation Protection. Vienna, 25 October 1989, entry into force 23 July 1990, FMZV Communication No. 431/1990 Coll.

Protocol between the Government of the Czech Republic and the Government of the Republic of Austria amending the Agreement between the Government of the Czechoslovak Socialist Republic and the Government of the Republic of Austria on the Regulation of Issues of Common Interest relating to Nuclear Safety and Radiation Protection. Prague, 20 December 2007, entry into force 1 July 2008, MZV Communication No. 44/2008 Coll. of International Treaties.

Agreement between the Government of the Czech and Slovak Federal Republic and the Government of the Federal Republic of Germany on the Regulation of Issues of Common Interest relating to Nuclear Safety and Radiation Protection. Prague, 30 May 1990, entry into force 2 August 1990, FMZV Communication No. 432/1990 Coll.

Agreement between the Government of the Czech and Slovak Federal Republic and the Government of the Republic of Hungary on the Exchange of Information and Cooperation in the Field of Nuclear Safety and Radiation Protection. Vienna, 20 September 1990, entry into force 15 May 1991, Federal Ministry of Foreign Affairs Communication No. 447/1991 Coll.

Agreement between the Government of the Czech Republic and the Government of the Slovak Republic on Cooperation in the Field of State Supervision of the Nuclear Safety of Nuclear Facilities and State Supervision of Nuclear Materials. Bratislava, 8 March 1996, Ministry of Foreign Affairs Communication No. 117/1996 Coll.

Agreement on the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons. Entered into force for the Czech Republic on 1 October 2009.

Agreement between the Government of the Czech Republic and the Government of the Republic of Korea on Cooperation in the Peaceful Uses of Nuclear Energy. Seoul, 16 March 2001, MZV Communication No. 83/2001 Coll.

Agreement between the Government of the Czech Republic and the Government of the Slovak Republic on Early Notification of a Nuclear Accident. Prague, 28 June 2002, entry into force 14 November 2002, MZV Communication No. 132/2002 Coll.

Revised Supplementary Agreement Concerning the Provision of Technical Assistance by the International Atomic Energy Agency to the Government of the ČSFR. Vienna, 20 September 1990, entry into force 1 January 1993, FMZV Communication No. 509/1990 Coll.

Agreement between the Government of the Czech Republic and the Government of the Republic of Poland on Early Notification of a Nuclear Accident and Exchange of Information on the Peaceful Uses of Nuclear Energy, Nuclear Safety, and Radiation Protection. Vienna, 27 September 2005, MZV Communication No. 20/2006 Coll.

Commission Regulation (Euratom) 2025/974 of 26 May 2025 on the application of Euratom safeguards.

D.V.3.5. Other source documents

[O.1] Documents and recommendations applicable in the nuclear field

WENRA Reactor Safety Reference Levels

WENRA Safety Reference Levels for Existing Reactors, Revision 2020

WENRA Reactor Harmonisation Working Group (RHWG) – Report on Safety of new NPP designs, 3/2013

IAEA Fundamental Safety Principles

IAEA Safety Requirements

IAEA General Safety Guides (GSG) and Specific Safety Guides (SSG) relating to nuclear facility siting, site evaluation, radiological impacts, and assessment of hazards to nuclear facilities, and, exceptionally, documents in the TECDOC series

Selected US NRC guidance relating to releases of radioactive substances within containment under accident conditions and to the assessment of hazards to nuclear facilities

Recommendations of the International Commission on Radiological Protection (ICRP)

SÚJB Safety Guides

[O.2] Related reports and documents

EIA Documentation for ETE1,2 (2000), SVJP ETE (2004), New NPP ETE (2010), New NPP EDU (2017), and expansion of SVJP ETE (2024)

ETE1,2 environmental protection reports, annual reports for 2015 to 2025

ETE1,2 reports Results of Monitoring of Discharges and the Radiation Situation in the Vicinity of the Temelín Nuclear Power Plant, annual reports for 2002-2025

Program for Monitoring and Assessment of the Environmental Impacts of Temelín Nuclear Power Plant, results for 2000 to 2025

Results of public opinion surveys concerning nuclear energy and ETE1,2 for 2020, 2023, and 2024

SÚJB annual reports on activities and monitoring of the radiation situation in the Czech Republic for 2000-2025

Current and historical permits for water abstraction and discharge at ETE1,2 and permits for the release of radionuclides into the environment through airborne discharges and discharges to a watercourse (authorized limits)

[O.3] Policy and strategic documents

Strategic and policy documents of the Czech Republic relating to the use of nuclear energy:

- State Energy Policy of the Czech Republic (2015), update of the State Energy Policy (2024, in preparation)
- Small and Medium-Sized Reactor Roadmap for the Czech Republic (2023)
- Policy for Radioactive Waste and Spent Nuclear Fuel Management (2019), update of the Policy for Radioactive Waste and Spent Nuclear Fuel Management (2025, in preparation)
- National Energy and Climate Plan of the Czech Republic (2024)
- Climate Protection Policy of the Czech Republic (2025 update)

Strategic and policy documents of the European Commission relating to the use of nuclear energy, energy efficiency, energy sources, energy performance, and energy savings.

[O.4] Other source documents

Rolls-Royce Documentation – Environment, Safety, Security and Safeguards Case (“E3S Case”), Version 3, (https://gda.rolls-royce-smr.com/documents)

Maps: ČÚZK, HEIS VÚV TGM, v.v.i., mapy.com

Publicly available sources were also generally used in all areas of the environment and public health.

D.VI.
CHARACTERISTICS OF DIFFICULTIES ENCOUNTERED IN PREPARING THE DOCUMENTATION

VI. Characteristics of any difficulties (technical deficiencies or lack of knowledge) encountered in preparing the Documentation, and the main uncertainties arising from them

No difficulties (technical deficiencies, lack of knowledge, or uncertainties) were encountered during preparation of the Documentation that would prevent the anticipated impacts of the Project on the environment and public health from being clearly specified. The environmental characteristics of nuclear power sources are well known. Data on environmentally relevant parameters of the reference designs are available. Data on existing and planned nuclear facilities at the site and their environmental impacts are also available.

In preparing the Documentation, all relevant data on the Project and the site were obtained, and all relevant surveys and analyses necessary to determine the state of the environment and public health and subsequently specify the impacts were carried out:

- Data on the RR SMR reference design are based on data provided directly by its supplier and provide all information necessary for the assessment of environmental and public health impacts.
- Data on other nuclear and non-nuclear facilities at the site, including data on their environmental impacts, are known. All data required to assess the combined (cumulative) impacts of the Project with other projects at the site are therefore available. Of particular importance in this respect is the availability of discharge monitoring results and environmental monitoring results for radiological and non-radiological characteristics (for the existing ETE1,2), as well as data on the environmental effects of other facilities at the site that have been subject to environmental impact assessment (for the planned New NPP ETE and the expansion of SVJP ETE).
- The state of the environment in the affected territory is known and has been determined both from literature sources and from dedicated surveys carried out for individual environmental components in the area of interest/affected territory.
- Environmental standards, i.e. statutory or other requirements and limits, are known.
- All impacts on the environment and public health are assessed in the Documentation using a conservative bounding approach, i.e. at their potential maximum. Sensitivity data are also verified, i.e. the dependence of changes in anticipated impacts on changes in Project parameters. Accordingly, there are no uncertainties in this respect that could be interpreted to the detriment of the legitimate interests of environmental or public health protection.

Under applicable legislation, the environmental and public health impact assessment process precedes subsequent and other proceedings. In preparing this Documentation, it is therefore reasonably assumed that all statutory requirements will be respected and complied with during further Project preparation. This gives rise to essentially the only uncertainty that can be identified. This concerns the outcomes of subsequent proceedings conducted by the competent authorities. This Documentation reasonably assumes that the Project will comply with all applicable legal requirements and that all necessary permits will therefore be issued. The fact that this will occur only subsequently is not material. What is essential is that all statutory requirements must be fully met during further Project preparation; otherwise, the Project will not be implemented. From this perspective, therefore, this is not an uncertainty that would affect the results and conclusions of the assessment.

PART E
(COMPARISON OF PROJECT OPTIONS)

PART E COMPARISON OF PROJECT OPTIONS (where submitted)

The Project is not submitted in multiple options. The reasons for this are provided in Chapter B.I.5.2. Description of the options considered (page 78 of this Documentation).

An option that must be considered is the so-called zero option, which in substantive terms means that the Project will not be implemented. It is considered as the reference option, with its impacts represented by the current state of the environment in the affected territory and its development trends, as described in Chapter C.II. CHARACTERISTICS OF THE CURRENT STATE OF THE ENVIRONMENT IN THE AFFECTED TERRITORY (page 208 of this Documentation). The zero option does not in any way concern the operation of other nuclear facilities at or outside the Temelín site, or other energy policy instruments (other methods of electricity generation and/or electricity savings).

An indicative comparison of the impacts of the zero option (without implementation of the SMR ETE Project, while retaining the other existing and planned facilities at the site) and the active option (with implementation of the SMR ETE Project, in combination with other existing and planned facilities at the site) is provided in the following overview.

Character of the area:	The Temelín site has the character of a heavy industrial area (electricity generation). The site is provided with infrastructure connections (in particular water supply, wastewater discharge, power evacuation to the transmission system, and transport connections). The site has been assessed as suitable for the siting of a nuclear facility and has long been monitored in terms of both radiological and non-radiological parameters. The SMR ETE Project is fully consistent with the character of the site. The Project uses the site's infrastructure connections in accordance with their available capacity, which may be regarded as efficient use of available resources; non-implementation of the Project would require its capacity to be replaced by other means. In terms of the character of the area, the SMR ETE Project therefore does not result in a significant change in the affected territory.
Population and public health:	Development in the affected territory has long been consolidated, and the distance of residential areas of the municipalities from the power plant site is sufficient to eliminate direct adverse impacts (particularly noise). The health status of the population in the affected territory has been monitored over the long term; it is stable and consistent with national trends, and no adverse effect of Temelín Nuclear Power Plant operation has been identified. Trends in the psychological characteristics of the population in the affected territory indicate a relatively stable and favorable development. Public opinion is relatively favorable. Temelín Nuclear Power Plant is a significant positive socioeconomic factor in the affected territory. The SMR ETE Project maintains a sufficient distance from residential areas of the municipalities. The health impacts of the Project (in combination with other facilities at the site) are at acceptable levels in all areas assessed, i.e. ionizing and non-ionizing radiation, air pollution, noise, psychological impacts, and social and economic impacts. In terms of impacts on population and public health, the SMR ETE Project therefore does not result in a significant change in the affected territory.
Air quality and climate:	Air quality in the affected territory has long been favorable; it is not an area where air quality limit values are exceeded. Climatic factors have long been stable, in line with global climate trends, and Temelín Nuclear Power Plant does not significantly affect climatic factors in the affected territory. The SMR ETE Project is not a combustion source and will therefore not make a significant contribution to air pollution. Nor will it have a significant impact on the local microclimate. In terms of impacts on air quality and climate, the SMR ETE Project therefore does not result in a significant change in the affected territory.
Noise:	The noise situation in the affected territory has long been monitored and complies with the hygiene limits for both stationary-source noise and traffic noise. Based on the assessment carried out, the SMR ETE Project will continue to comply with the hygiene limits. In terms of noise impacts, the SMR ETE Project therefore does not result in a significant change in the affected territory.
Ionizing radiation:	The radiation situation in the affected territory has long been monitored. With regard to discharges, the authorized limit for the release of radionuclides into the environment has consistently been complied with. The results of monitoring of individual environmental components only indicate global contamination, with no influence from

Temelín Nuclear Power Plant, except for tritium in the Vltava River at levels not exceeding the relevant indicative values.

The SMR ETE Project will continue to comply with the authorized discharge limit, and the dose constraint applicable to all facilities at the site will also continue to be met. No significant contamination of environmental components is expected as a result of the Project, except for tritium in the Vltava River which, with appropriate measures in place, will remain below the relevant indicative values and reliably comply with statutory drinking-water requirements.

In terms of the impacts of ionizing radiation, the SMR ETE Project therefore does not result in a significant change in the affected territory.

Other physical and biological factors: The impacts of non-ionizing radiation (electric/magnetic fields), vibration, light pollution, shading, and other factors have long been stable in the affected territory, with no significant adverse impacts or exceedances of applicable limits attributable to Temelín Nuclear Power Plant and its associated infrastructure.

The SMR ETE Project does not impose any additional burden in terms of other physical and biological factors; all monitored factors will remain within acceptable levels.

In terms of the impacts of other physical and biological factors (non-ionizing radiation, vibration, light pollution, shading, and others), the SMR ETE Project therefore does not result in a significant change in the affected territory.

Surface water and groundwater: The hydrological situation in the affected territory has long been monitored in terms of both water quantity and quality. Water abstraction and discharge from Temelín Nuclear Power Plant are carried out in accordance with the relevant water-management permits. The overall status of the affected surface-water bodies is predominantly unsatisfactory, primarily due to pollutant loads carried by the rivers; the contribution from Temelín Nuclear Power Plant is minor. The quantitative status of groundwater follows the global trend and is assessed as good for groundwater bodies; groundwater quality has long been stable, while the chemical status of groundwater bodies is assessed partly as good and partly as unsatisfactory, predominantly due to agricultural impacts (nitrates, pesticides), with no contribution from Temelín Nuclear Power Plant. There are no groundwater sources used for public water supply in the affected territory.

Water abstraction for the SMR ETE Project will be carried out in accordance with the operating rules of the affected water-management system; adequate reliability of water supply for the Temelín site (i.e. for the combined effect of SMR ETE+ETE1,2+New NPP ETE) has been demonstrated, including when the effects of climate change are taken into account (with the exception of one extremely conservative climate-change impact model). The potential quantitative impact of the Project on small watercourses due to reduced stormwater infiltration will be compensated for by inflow from pumped groundwater. In terms of quality, the potential contribution from SMR ETE only represents a minor contribution to pollutant loads in the receiving water body, with no significant impact on surface-water bodies or on the future achievement of good status in the affected surface-water bodies. The impact on groundwater will not be significant; the quantitative impact resulting from groundwater pumping will only affect the immediate vicinity. Groundwater bodies will not be affected by the Project in terms of either quantity or quality.

In terms of impacts on surface water and groundwater, the SMR ETE Project therefore does not result in a significant change in the affected territory.

Soil: Soil conditions in the affected territory are characterized by the occurrence of soils with lower levels of protection. Soils in the highest protection class I do not occur in the affected territory at all; 12% of the classified areas fall within protection class II, while 88% fall within protection classes III to V.

The SMR ETE Project (main construction site) is located on land in protection class III, while the construction site facility areas are located on land in protection classes II (to a minor extent) to V. The soils affected therefore have low productive capacity and may be used for development in spatial planning.

In terms of impacts on soil, the SMR ETE Project therefore does not result in a significant change in the affected territory with regard to soil protection.

Natural resources: No mineral deposits (including prognostic resources), old mine workings, or undermined areas are registered in the affected territory.

The SMR ETE Project does not affect mineral deposits or geological or paleontological monuments.

In terms of impacts on natural resources, the SMR ETE Project therefore does not result in a significant change in the affected territory.

Biodiversity: The implementation option is not in direct spatial conflict with specially protected areas, Natura 2000 sites, nature parks, or memorial trees. A significant adverse effect on the qualifying features and integrity of Natura 2000 sites has been excluded; potential indirect impacts on selected qualifying features were assessed as slightly adverse. The Project may affect significant landscape features defined by law, particularly watercourses and their floodplains, ponds and forests, as well as local ÚSES elements and interaction elements.

Most of the affected territory consists of agricultural and other anthropogenically affected areas. Habitats of greater nature conservation value are concentrated particularly around Dvorčice and Karlovec Ponds, in the wetland meadow near Dvorčice Pond, in parts of Areas B3 and J, in Area F1, in the wet meadow near Area G, and in the south-western part of the power evacuation corridor. Some stands of woody vegetation are also significant, including stands in Area C and the forest stand in reserve Area F2. Biological surveys confirmed the occurrence of specially protected plant and animal species.

The construction site facility areas do not constitute separate Project options; however, their actual use may significantly affect the extent of intervention. From the perspective of biodiversity, use of reserve Area F2 is not recommended. The waterlogged eastern part of Area B3, the more species-rich western part of Area J, and the wetland meadow near Dvorčice Pond in Area H should be preserved. Use of Area C is acceptable provided that grassland and woody vegetation are subsequently restored.

The overall impact of the implementation option on biodiversity is predominantly slightly adverse. However, significant impacts have also been identified locally. During operation, these relate in particular to the permanent removal of approximately 1 ha of younger woody vegetation in the SMR ETE area and the long-term change in the character of forest stands within the power evacuation corridor. During construction, significant impacts may arise from the use of reserve Areas F2, B2, and B3, particularly as a result of the removal of forest and non-forest woody vegetation and potential impacts on specially protected plants. These impacts are spatially limited and do not constitute an assessment of the Project as a whole.

The overall level of adverse impact is assessed as acceptable provided that intervention in the most valuable parts of the area is restricted, felling is minimized, towers are appropriately located, and the proposed preventive, mitigation, and compensatory measures are implemented.

In terms of impacts on biodiversity, the SMR ETE Project therefore does not result in a significant change in the affected territory.

Landscape: The affected territory is characterized, from a landscape perspective, by the presence of the prominent industrial site of Temelín Nuclear Power Plant, situated in a dominant position and including the prominent vertical structures of the cooling towers.

The SMR ETE Project will extend this site and thereby reinforce the presence of the industrial site. In terms of visibility, however, it does not include prominent vertical structures, and the extent to which the industrial site is visible from the wider surrounding area will therefore change to a relatively limited degree.

In terms of impacts on the landscape, the SMR ETE Project therefore does not result in a significant change in the affected territory.

Tangible assets and cultural heritage: There are no tangible assets belonging to third parties in the affected territory (with the exception of land). There are no designated heritage conservation areas in the affected territory; architectural and historical monuments are located predominantly in municipalities or at the sites of former municipalities. The presence of archaeological sites in areas already used for the construction of Temelín Nuclear Power Plant has been investigated and excluded.

The SMR ETE Project does not affect any tangible assets belonging to third parties (buildings, etc.). Immovable architectural or historical monuments will not be affected by the SMR ETE Project; the occurrence of archaeological finds cannot be excluded and will be investigated in advance.

In terms of impacts on tangible assets and cultural heritage, the SMR ETE Project therefore does not result in a significant change in the affected territory.

Transport and other infrastructure: The affected territory is served predominantly by Class II roads, which are in satisfactory structural and technical condition and are properly maintained. Traffic volumes on the roads are relatively low, with no capacity problems. The Temelín Nuclear Power Plant is equipped with a railway siding. All necessary infrastructure is present in the affected territory, in particular power evacuation to the transmission system, backup supply for auxiliary power from the distribution system, the water supply system, and the wastewater discharge system.

The SMR ETE Project will not introduce unexpected traffic volumes into the affected territory; the potential change in traffic volumes is within the normal trend of traffic growth. The Project will not result in the capacities of roads being exceeded. The railway siding can be used for the SMR ETE Project without difficulty. The use of other infrastructure is likewise unproblematic and desirable.

In terms of impacts on transport and other infrastructure, the SMR ETE Project therefore does not result in a significant change in the affected territory.

Other factors: The affected territory has been examined against the requirements for the suitability of the site for siting a nuclear facility in terms of conditional and exclusion criteria.

The SMR ETE Project will be sited at the same site, and a comparable result of the site suitability assessment can therefore be expected.

In terms of impacts on other factors, the SMR ETE Project therefore does not result in a significant change in the affected territory.

As follows from the above information, the SMR ETE Project respects and preserves the overall character of the area, determined by its existing spatial arrangement and functional use for electricity generation by a nuclear power source.

By its very nature, the construction and operation of the SMR ETE Project will naturally result in some additional burden on the area (as it constitutes an additional facility at the site with corresponding environmental demands). Based on the assessment performed, this additional burden on the area will remain within the environmental limits of the area and within acceptable levels of impact. At the same time, the SMR ETE Project will make use of infrastructure for electricity generation already existing at the site (in particular power evacuation to the transmission system, backup supply for auxiliary power from the distribution system, the water supply system, and the wastewater discharge system), which was constructed previously. Use of this infrastructure within environmental limits represents a significant positive effect, constitutes environmentally optimal use of available resources, and is therefore desirable.

This is also the conclusion of the indicative comparison of the impacts of the active option and the zero option. The additional burden on the area resulting from the active option, whose impacts are assessed as acceptable, is at the same time offset by the efficient use of existing resources and infrastructure, which, under the zero option, would have to be provided elsewhere or in another manner, likewise entailing adverse environmental consequences (not specified here, but highly likely). The zero option in itself, without taking its other externalities (i.e. environmental demands) into account, therefore does not represent an environmentally optimal solution.

PART F
(CONCLUSION)

PART F CONCLUSION

The subject of the Documentation is the assessment of the environmental impacts of the Project

NEW SMR POWER PLANT AT THE TEMELÍN SITE.

The Documentation assesses impacts on population and public health and impacts on the environment, including impacts on air quality and climate, noise and other physical and biological characteristics (including impacts of ionizing radiation), surface water and groundwater, soil, natural resources, biodiversity (including impacts on fauna, flora, and ecosystems), landscape, tangible assets and cultural heritage, transport and other infrastructure, and other environmental impacts. Impacts on biodiversity are assessed with particular regard to species of Community interest, birds, and habitats of Community interest. The assessment includes the identification, description, assessment, and evaluation of the anticipated direct and indirect environmental impacts of both implementation and non-implementation of the Project. The impacts of Project operation, as well as its preparation and implementation and its subsequent decommissioning, are assessed. Both normal operation of the Project and the possibility of accident conditions are taken into account, including the vulnerability of the Project to major accidents or disasters. The assessment includes an assessment of potential transboundary impacts. The Documentation also includes proposed measures to prevent adverse environmental impacts and to avoid, reduce, mitigate, or minimize such impacts (including measures to monitor potential significant impacts).

No circumstances were identified during preparation of the Documentation that would, from an environmental perspective, prevent the preparation, implementation, operation, or subsequent decommissioning of the Project. The anticipated impacts on public health and all components of the environment, including the combined (cumulative) effects of other facilities at the site and the environmental background, do not exceed acceptable levels. Measures to avoid and minimize impacts are taken into account, with compliance with the requirements of generally binding legislation being the primary measure.

The impacts of the Project will therefore not result in damage to the environment or public health.

Significant transboundary impacts are excluded.

PART G
(NON-TECHNICAL SUMMARY)

PART G GENERALLY UNDERSTANDABLE NON-TECHNICAL SUMMARY

The non-technical summary presents, in a concise and readily understandable form, information on the Project and the conclusions of the individual areas of assessment of potential environmental impacts of the Project. Readers interested in more detailed information are therefore advised to consult the relevant chapters of the Documentation.

G.I. Basic Project data

G.I.1. Character and location of the Project

ČEZ, a. s., is preparing the construction of a new nuclear power plant at the Temelín site (ETE site), comprising the construction and operation of a small modular reactor (SMR ETE) with a net electrical output of up to 500 MW_e, consisting of one generating unit with one nuclear reactor, including all associated structures and systems (technological equipment) serving for electricity generation and power evacuation and for ensuring the safe operation of the nuclear facility.

The reason for implementing the SMR ETE Project is the need to ensure reliable electricity generation and supply in the Czech Republic, taking into account the phase-out of fossil sources of electricity (in particular the complete phase-out of coal use for electricity generation by 2033) and the transition to renewable energy sources and nuclear power sources. The Project is consistent with the objectives of the update of the State Energy Policy currently under preparation, the National Action Plan for the Development of Nuclear Energy in the Czech Republic, and the current update of the National Energy and Climate Plan of the Czech Republic. The Temelín site offers suitable spatial conditions for the siting of the SMR and, at the same time, connections of sufficient capacity to the necessary infrastructure, in particular process water supply, wastewater discharge, and power evacuation to the Czech electricity system. New SMR power plants are also being prepared and considered at other sites in the Czech Republic; in this respect, the Temelín site constitutes a pilot project.

The SMR ETE Project will be located in an area adjoining the site of the existing Temelín Nuclear Power Plant (ETE1,2). The areas for siting the Project, i.e. the area for siting the generating unit, the temporary construction site facility areas, and the electrical connection corridor, are shown in the following figures.

Fig. G.1: Wider context of the Project location

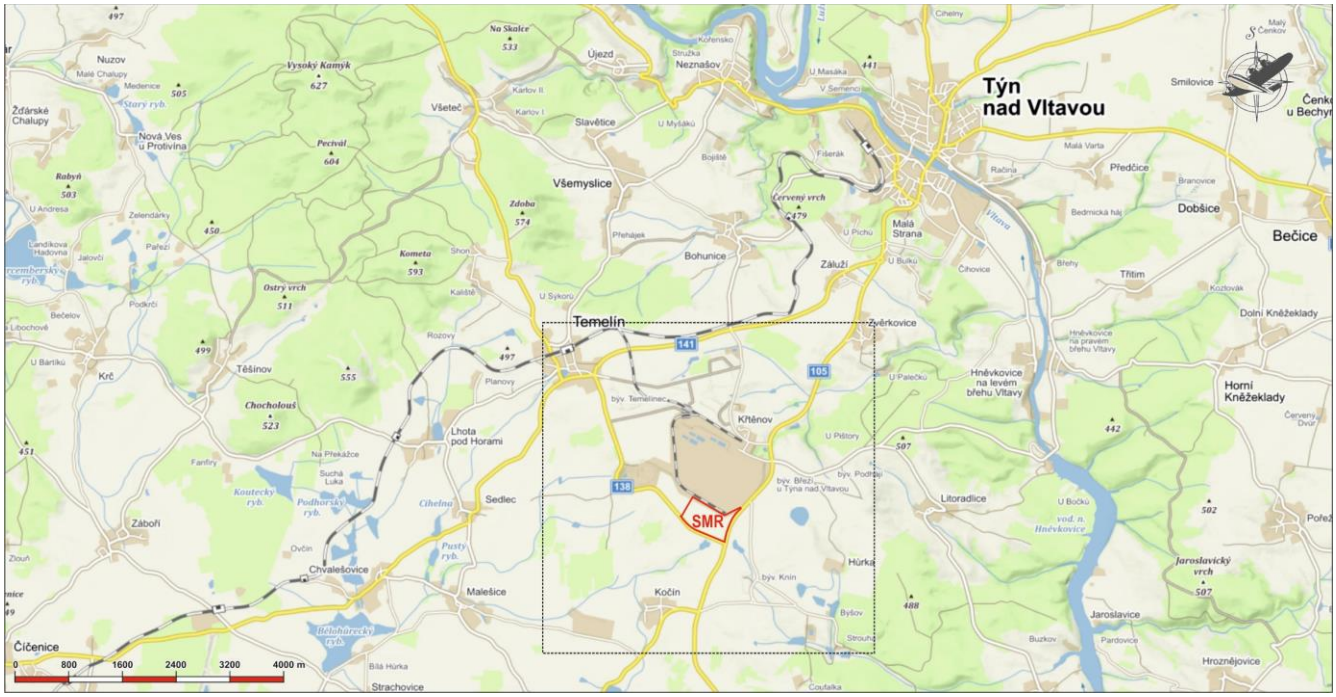
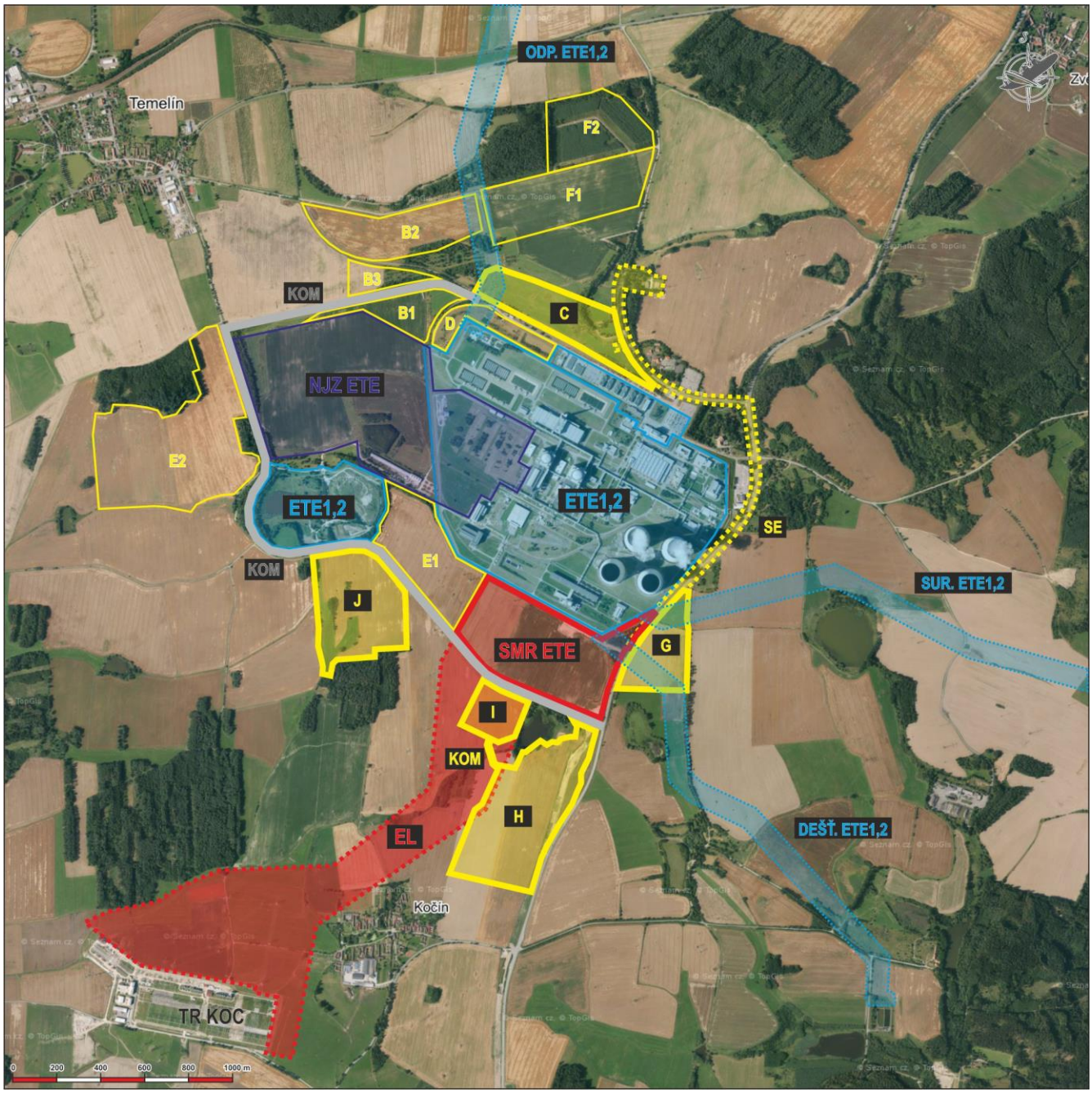


Fig. G.2: Layout of the Temelín site, overview of the Project location



Legend:

Main areas and corridors:

SMR ETE	SMR ETE siting area - main construction site
C, G, H, I, J	temporary construction site facility areas for SMR ETE construction
KOM	Road II/138 widening corridor, service road widening/modification corridor, temporary connection corridor between Areas H and I
EL	corridor for SMR ETE power evacuation and backup supply to the Kočín transformer station
SE	construction site power supply corridor

Other areas and corridors:

ETE1,2	areas of the existing ETE1,2
SUR. ETE1,2	corridor of the existing ETE1,2 raw water supply
ODP. ETE1,2	corridor of the existing ETE1,2 wastewater pipeline
DEŠŤ. ETE1,2	corridor of the existing ETE1,2 stormwater sewer
New NPP ETE	area for siting New NPP ETE
B1, B2, B3, D, E1, E2, F1, F2	other/reserve temporary construction site facility areas
TR KOC	existing Kočín transformer station (ČEPS, a.s.)

Note: The figure does not delineate the power evacuation corridors for ETE1,2 and New NPP ETE to the Kočín transformer station, which have no operational connection to the SMR ETE Project.

The Project will be located in the SMR ETE area - main construction site (approximately 29.7 ha). The Project's electrical output will be evacuated through the EL corridor to the Kočín transformer station, which will also provide backup supply for the Project auxiliary power.

Five temporary construction site facility areas will be established for Project construction:

- area C (approximately 13.9 ha) - temporary construction site facilities, temporary material transshipment area,
- area G (approximately 9.5 ha) - temporary construction site facilities, temporary high-capacity parking lot,
- area H (approximately 25.8 ha) - temporary construction site facilities, temporary technological structures, temporary topsoil stockpiles, temporary construction material storage areas, temporary recycling facility,
- area I (approximately 5.6 ha) - temporary administrative buildings, temporary parking lot/reserve area),
- area J (approximately 19.2 ha) - temporary construction site facilities, temporary concrete mixing plant, temporary technological structures, temporary construction material storage areas.

The construction site facilities also include a corridor for supplying electricity to the construction site from the Křtěnov substation (SE) and a temporary connection between areas H and I by means of a bridge over Dvorčický Stream (KOM), which will be dismantled after construction is completed. Other modifications in the KOM corridor (widening Road II/138 and widening/modifying the service road) implemented for construction traffic will be retained after construction is completed.

The other designated temporary construction site facility areas (B1, B2, B3, D, E1, E2, F1, F2) are considered reserve areas.

The Project will share the existing water-management infrastructure of ETE1,2, i.e., the existing raw water supply line (SUR. ETE1,2), the existing wastewater discharge pipeline (ODP. ETE1,2) and the existing stormwater sewer (DEŠŤ. ETE1,2). Some of the pumped groundwater and stormwater from the SMR ETE area will be discharged into the Dvorčický Stream basin (not delineated graphically; direct contact).

To illustrate the visual effect of the Project in combination with other existing and planned facilities at the Temelín site, illustrative massing models and visualizations have been prepared and are shown in the following figures.

Fig. G.3: Visualization of the Project – view from the south, view from the east



The SMR ETE Project is shown in red in the figures. The existing Temelín Nuclear Power Plant (ETE1,2) is shown without color highlighting, the planned New Nuclear Power Plant at the Temelín site (New NPP ETE) is shown in yellow, and the planned expansion of the spent nuclear fuel storage facility (SVJP) is shown in blue.

Construction of SMR ETE is expected to commence after 2029, with commissioning after 2034. Construction of SMR ETE will commence before construction of New NPP ETE, and the works will be coordinated so that the main construction activities for SMR ETE and New NPP ETE do not overlap and the construction demands (including construction traffic) previously assessed in the EIA process for the New NPP ETE Project are not exceeded. This will ensure that there is no additional burden on the area due to construction works.

G.I.2. Brief description of the technical design

Small modular reactors (SMRs) are new Generation III+ or potentially Generation IV nuclear reactor designs whose electrical output ranges from single-digit values to hundreds of MW_e. They use a broad range of reactor technologies and a modular approach to designing key components and systems. The modular approach to design, manufacturing, and construction means that individual structural modules are manufactured and assembled separately at manufacturing plants, transported to the construction site in that form, and then installed and assembled into larger units. SMRs generally have an electrical output of up to 300 MW_e, or up to 500 MW_e for modern designs that are classified as SMRs because they follow the principle of modular manufacturing and have a substantially lower electrical output than large nuclear units, which commonly have an output of 1,000-1,700 MW_e. The designation SMR therefore describes not only the size and output, but above all the modular method of manufacturing

and construction. Compared with conventional nuclear power plants, SMRs are smaller and more flexible, and they may be constructed more quickly.

Compared with existing large reactors, small modular reactors are generally simpler, and their safety concept relies more heavily on passive systems and inherent reactor safety characteristics. Small modular reactors therefore offer greater flexibility, enhanced safety features, and the possibility of phased construction. They therefore represent a promising direction for the development of nuclear energy.

The basic parameters of the SMR ETE Project are summarized as follows:

Nuclear unit:	number of units:	one unit (comprising one nuclear reactor)
	type:	light-water-moderated pressurized water reactor (PWR)
	generation:	III+ with a high degree of passive safety features
	net electrical output:	up to 500 MW_e
	design lifetime:	60-80 years
	The power-generating unit includes all necessary structures and technological equipment of the primary, secondary, and tertiary (cooling) circuits and auxiliary structures and operations, including all related and induced investments required for Project construction and operation.	
Electric connection:	power evacuation:	overhead 400 kV line
	backup supply for auxiliary power:	overhead/underground 110 kV line
	Electrical connection includes all the elements required for the Project construction, operation and connection to the electricity network of the Czech Republic. The Project's electrical output is to be evacuated to the Kočín transformer station, and backup power for own consumption will be supplied from the Kočín transformer station.	
Water system connection:	water supply:	underground pipe mains
	wastewater discharge:	underground pipe mains
	stormwater discharge:	underground pipe main, extension of existing infrastructure
	The water-management connection includes all water-management facilities necessary to supply the Project with raw water and potable water and to discharge sanitary and process wastewater and stormwater.	
	Raw water will be supplied through the existing ETE1,2 raw-water supply system from the Hněvkovice Reservoir on the Vltava River.	
	Potable water supply shall be realized by connection to the existing potable water supply system.	
	Treated sanitary and process wastewater will be discharged by connecting to the existing infrastructure of ETE1,2, including final discharge via the Kořensko water-management facility into the Vltava River.	
	Stormwater will be discharged by connecting to the existing storm sewer network that conveys stormwater from the ETE1,2 site to the receiving water body, Strouha Stream, and onward to the Vltava River. Some stormwater will be discharged through a separate dedicated stormwater drainage network to Dvorčice Pond and onward to Dvorčický Stream. Some collected stormwater may also be conveyed via appropriate retention facilities to Karlovec Pond.	

The Project also includes areas and facilities for construction, i.e., the main construction site and construction site facilities, including areas considered for expanding the construction site support facilities and temporary construction site facility areas, comprising all elements required by the Project contractors during building or construction work, excluding public infrastructure.

The SMR ETE Project is subject to all binding legal regulations applicable in the Czech Republic, particularly those governing the use of nuclear energy and environmental protection. It will comply with all applicable safety standards, both those currently in force and those entering into force at any time during its life cycle. These include, in particular, the requirements of the Atomic Act and related legislation, which are harmonized with the safety recommendations of the Western European Nuclear Regulators Association (WENRA), of which the Czech Republic is a member, as well as the requirements of European Atomic Energy Community (Euratom) legislation and regulations and the nuclear safety recommendations issued by the International Atomic Energy Agency (IAEA) in its Safety Standards Series. Compliance with these requirements and recommendations will be supervised by the State Office for Nuclear Safety (SÚJB), which is the supervisory body for the use of nuclear energy in the Czech Republic.

The supplier of SMR ETE will be selected during further Project preparation (supplier selection is not subject to environmental impact assessment). The environmental and safety requirements are the same for all reactor types, and the impacts in the assessment carried out are considered at their potential maximum. This means that the parameters used for the impact assessment safely bound the facility parameters of all potential suppliers. The SMR supplier may therefore be any manufacturer whose design meets all statutory requirements (particularly those required for nuclear power facilities) and at the same time complies with the parameters used for the environmental impact assessment.

The Rolls-Royce product (RR SMR) has been selected as the reference design for the environmental impact assessment. It is a single-reactor, light-water-moderated pressurized water reactor unit. Its thermal output is up to 1,400 MW_t and its electrical output up to 500 MW_e. The reactor uses standard fuel assemblies containing UO_2 fuel pellets enriched to a maximum of 4.95% U-235 as nuclear fuel. Core reactivity is controlled by control rods. The nuclear unit design emphasizes the use of passive safety systems, supplemented by active safety systems. The passive safety provisions are designed to perform their safety functions without the need for external intervention for 72 hours. To prevent the release of radioactive substances under fault and accident conditions, the entire primary circuit and other important systems are located inside a steel pressure vessel (inner containment). The structures are designed to provide protection against external hazards. A reinforced-concrete protective

structure surrounds the inner leaktight steel containment and provides protection against design-basis aircraft impact and other external hazards of natural origin as well as human-induced hazards.

The basic parameters of the Rolls-Royce SMR design are summarized in the following table.

Table G.1: Basic RR SMR design parameters

Parameter	Value
Reactor thermal output	up to 1,400 MW_t
Design life	60 years
Net electrical output (depending on power plant configuration)	up to 500 MW_e
Expected capacity factor	>90 %
Coolant/moderator	light water
Primary circulation	forced circulation during normal operation, natural circulation for residual heat removal
Primary circuit operating pressure	15.5 MPa
Maximum primary circuit design pressure	17.6 MPa
Fuel Cycle	18 months
Nuclear fuel	Industry-standard UO_2 in a 17 × 17 lattice
Active nuclear fuel length	2.8 m
Number of fuel assemblies	121
Nuclear fuel enrichment	<4.95% U-235
Reactivity control	89 control rods for primary reactivity control, alternative boron concentrate injection system
Outage length	18 days (target value)
Containment	full-pressure steel vessel
Number of loops	3

G.II. Data on inputs and outputs

The SMR ETE Project is characterized by basic parameters which, for the purposes of environmental impact assessment, are summarized in a list of inputs and outputs representing the so-called parameter envelope used for the environmental impact assessment.

G.II.1. Data on inputs

Land take:

permanent land take: up to 29.7 ha

The permanent land take comprises the land required for siting the generating unit in the SMR area. The existing ETE1,2 site covers approximately 123.3 ha, defined by the boundary of permanent land take formed by the perimeter fence of the existing power plant and excluding the waste-management area at Temelínec; according to the New NPP ETE EIA documentation, the total land take for ETE1,2 and New NPP ETE will not exceed approximately 187.2 ha. The total permanent land take for the combined effect of ETE1,2, New NPP ETE, and SMR ETE will therefore not exceed 216.9 ha.

temporary land take: up to 74.0 ha

The temporary land take comprises the construction site facility areas used during construction; the value stated constitutes the total area of the main construction site facilities (C, G, H, I, J), excluding reserve areas.

Water abstraction:

raw water: up to 12,000,000 m^3/year

The Vltava River will be the raw-water source. Raw water will be abstracted at the existing abstraction point, namely the pumping station on the left bank of the Hněvkovice hydraulic-structure reservoir, and conveyed through the existing discharge mains to the existing ETE water reservoir and from there to the SMR water treatment systems. The existing permitted surface-water abstraction for ETE1,2 is 47,000,000 m^3/year, while actual abstraction has long ranged from approximately 35,000,000 to 40,000,000 m^3/year. According to the New NPP ETE EIA documentation, surface-water abstraction for the concurrent operation of ETE1,2 and New NPP ETE is expected to be up to 109,000,000 m^3/year or, taking into account the currently permitted surface-water abstraction for ETE1,2, which is 5,000,000 m^3/year higher than in the EIA documentation, 114,000,000 m^3/year. The total raw-water abstraction for the combined effect of operating ETE1,2+New NPP ETE+SMR ETE will therefore not exceed 126,000,000 m^3/year.

potable water: up to 31,000 m^3/year

Potable water will be supplied from the existing Temelín site supply source/system from the Zdoba water reservoir. Potable water will be used for drinking and hygiene purposes and, to some extent, for operational purposes. The existing permitted contractual potable-water abstraction for ETE1,2 is 280,000 m^3/year, of which up to approximately 140,000 m^3/year is used. According to the New NPP ETE EIA documentation, potable-water abstraction for New NPP ETE is expected to be up to 33,000 m^3/year. Taking into account actual abstraction by ETE1,2, total potable-water abstraction for the combined effect of operating ETE1,2+New NPP ETE+SMR ETE will therefore not exceed 204,000 m^3/year, or up to 344,000 m^3/year when the existing permitted contractual abstraction for ETE1,2 is taken into account.

Nuclear fuel: up to 13.05 t/year

Nuclear fuel will be purchased on the market from reputable suppliers. The fuel will be based on uranium dioxide (UO_2), with enrichment of up to 5% U-235. Fuel cycles of 18 to 24 months are assumed, followed by an outage for replacement of part of the fuel. Current nuclear fuel consumption for ETE1,2 is up to 46 t/year; according to the New NPP ETE EIA Documentation, consumption of up to 78.5 t/year is assumed

for New NPP ETE; total nuclear fuel consumption under the combined effect of the operation of ETE1,2+New NPP ETE+SMR ETE will therefore not exceed 137.6 t/year.

Electricity (auxiliary power): up to 50 MW_e

Auxiliary power is supplied by the unit itself and by the backup power supply. The auxiliary power demand of ETE1,2 is approximately 140 MW_e; according to the New NPP ETE EIA Documentation, approximately 220 MW_e is assumed for New NPP ETE; the total auxiliary power demand under the combined effect of the operation of ETE1,2+New NPP ETE+SMR ETE will therefore not exceed 410 MW_e.

Consumables: consumption not specified (normal)

Operating materials means chemicals, lubricants, motor fuels, fuels, and industrial gases. Total consumption of consumables under the combined effect of the operation of ETE1,2+New NPP ETE+SMR ETE will amount to thousands of metric tons per year for chemicals and several hundred metric tons per year for petroleum products.

Transport: road transport, operation: approx. 185 vehicles/24 h, of which approx. 35 heavy vehicles

The stated value represents the average daily inbound traffic volume (number of arrivals) associated with SMR ETE operational requirements. The outbound traffic volume (number of departures) will be identical. This volume includes transportation of permanent operations and maintenance personnel (passenger vehicles and buses) and transportation associated with operational requirements (mainly trucks). Transportation will take place mainly on Road II/105, which runs alongside the Temelín site, using a section of Road II/138 from which the entrance to the SMR ETE site will be provided. In the directional distribution of traffic on Road II/105, the direction from the south (Hluboká nad Vltavou and České Budějovice) will slightly predominate over the direction from the north (Týn nad Vltavou). The operational inbound traffic volume generated by ETE1,2 is approximately 630 vehicles/24 h, of which approximately 130 are heavy vehicles (this is already included in existing traffic volumes on the road network and therefore does not constitute a new/additional traffic demand); according to the New NPP ETE EIA Documentation, the operational inbound traffic volume generated by New NPP ETE will likewise be approximately 630 vehicles/24 h, of which approximately 130 are heavy vehicles. The total inbound traffic volume under the combined effect of the operation of ETE1,2+New NPP ETE+SMR ETE will therefore be approximately 1,445 vehicles/day, of which approximately 295 will be heavy vehicles.

road transport, construction: up to 450 vehicles/24 h, of which approximately 150 are heavy vehicles

The stated value represents the average daily inbound traffic volume (number of arrivals) associated with SMR ETE construction requirements. The outbound traffic volume (number of departures) will be identical. This volume includes transportation of construction workers (passenger vehicles and buses) and construction and structural materials (mainly trucks). Transportation will take place mainly on Road II/105, which runs alongside the Temelín site, using a section of Road II/138 from which access will be provided to the SMR ETE construction area (main construction site) and the respective construction-facility areas. In the directional distribution of traffic on Road II/105, the direction from the north (especially the transportation of workers from accommodations in Týn nad Vltavou and materials from the D3 motorway) will predominate over the direction from the south (České Budějovice).

During construction of SMR ETE, Road II/138 will be closed to public traffic in the section between Roads II/105 and II/141 (i.e., in the area of the SMR ETE construction site and related construction facilities). Existing traffic will be diverted via Roads II/141 and II/105; the closed section of Road II/138 will only remain accessible to traffic associated with SMR ETE construction. For construction purposes, Road II/138 will be widened between Road II/105 and the ETE service road. The ETE service road will also be modified and widened by constructing truck passing bays on both sides of the road. In addition, access roads will be constructed from Road II/138 or II/105 to the SMR ETE main construction site and the individual construction-facility areas (G, H, I, and J), and a temporary road connection between construction-facility Areas H and I will be built by means of a bridge over Dvorčický Stream.

Construction of SMR ETE will be coordinated with construction of New NPP ETE so that the main SMR ETE and New NPP ETE construction activities do not coincide. Construction of SMR ETE, which will precede construction of New NPP ETE, will therefore take place concurrently with the initial/preparatory phase of New NPP ETE construction, for which heavy-vehicle traffic demand will be approximately half that of the main New NPP ETE construction phase (for which the New NPP ETE EIA Documentation assumes inbound traffic of approximately 890 vehicles/24 h, including approximately 490 heavy vehicles, with the same number of departures). Under the combined effect of SMR ETE construction traffic and New NPP ETE construction traffic (initial/preparatory phase), the total volume of heavy construction traffic previously assessed in the EIA process for the New NPP ETE Project will therefore not be exceeded.

railway transport: insignificant

The operating period does not place significant demands on railway transport. The existing volume of railway transport generated by activities at the Temelín site is insignificant and does not exceed a few trains per month; this situation will therefore continue during concurrent operation.

Inbound railway traffic volume during the period of construction can be expected at the level of a few trains per day. The construction organization principles will seek to maximize the use of rail routes for transporting components and materials, while the final alternative will be subject to a technical and economic analysis that will take into account, among other things, the locations of construction-material and process-module suppliers. From this perspective, the above road traffic volumes are considered conservatively, i.e., without taking rail transport into account, although rail transport may assume part of the transportation work.

special transport: insignificant

Transportation of oversize and heavy components during construction will not be significant in terms of traffic volume (a few shipments over the construction period). Water, road, or rail transport, or a combined route, is assumed. Existing infrastructure will be used; in terms of spatial and weight requirements, this transportation may require local modifications to existing infrastructure (already being prepared for the transportation of oversize and heavy components for the New NPP ETE Project) or temporary restrictions on its use.

Other infrastructure: electricity system: necessary modification/strengthening

The Project will use the connection to the electricity system of the Czech Republic, both for power evacuation to the transmission system and for backup supply of auxiliary power from the distribution system. A connection to the electricity system is available in the affected territory at the Kočín transformer station site. The transmission capacity of the Czech Republic's transmission system is guaranteed by the transmission system operator (ČEPS, a.s.); it is not part of the SMR ETE Project.

other infrastructure: insignificant

The Project places no demands on other public infrastructure. Connections to the necessary infrastructure networks are available in the Project area.

G.II.2. Data on outputs

Emissions into atmosphere: insignificant

The SMR ETE Project is not a combustion source and will therefore not be a significant source of air emissions. Pollutant sources associated with operation of the process equipment will be backup (emergency) process equipment (diesel generator stations), which will not, however, be in continuous operation; the related road traffic is also taken into account.

Similar assumptions also apply to concurrently operating process sources and road traffic associated with operation of the existing ETE1,2 and planned New NPP ETE. Even under the combined effect during concurrent operation of ETE1,2+New NPP ETE+SMR ETE, air pollutant emissions will not reach significant levels.

During the SMR ETE construction period, emissions may be expected both from construction activities at the construction site itself and from the resulting road traffic. The most significant effect may be expected from particulate matter emissions, both during work on exposed ground (earthwork or excavation work) and especially during concrete placement, when a significant portion of the transportation of materials for producing concrete and prefabricated modules will take place (including on-site transportation between individual areas). Emissions and the nature of other pollutants are associated with the use of machinery and the related consumption of fuel. Emissions will be limited by available minimization measures and will be limited in time to the construction period. During construction, emissions will vary depending on the schedule of the individual construction activities. An electric auxiliary boiler plant, which will not be a source of air emissions, is expected to operate during SMR ETE construction.

The preparation and construction phase of SMR ETE will be particularly significant in terms of emissions. In these phases, emissions of particulate matter are expected in particular; emissions of other pollutants will be less significant and will be associated with the use of machinery and fuel consumption.

Waste heat:

waste heat: 900 MW_t

evaporation: up to 1,200 m^3/h (0.333 m^3/s)

Low-grade waste heat will be released to the atmosphere through forced-draft wet cooling towers (the use of natural-draft towers is not anticipated but is not excluded).

Waste heat from the operating ETE1,2 units amounts to up to 4,014 MW_t, with total evaporation of 3,788 m^3/h (1.052 m^3/s); the waste heat is released to the atmosphere through four natural-draft cooling towers. For the New NPP ETE Project, evaporation together with ETE1,2 is expected to reach up to 11,000 m^3/h (3.06 m^3/s). The total values for the combined effect of operating ETE1,2+New NPP ETE+SMR ETE will therefore not exceed 11,117 MW_t of heat dissipated to the atmosphere and evaporation of 12,200 m^3/h (3.39 m^3/s).

Waste water:

process wastewater: up to 3,564,000 m^3/year

Process wastewater will be discharged through the existing ETE1,2 wastewater pipelines to the receiving water body (the Vltava River at the Kořensko profile). The stated value represents the estimated quantity of process wastewater from SMR ETE. Process wastewater will consist mainly of blowdown from the circulating cooling (tertiary) circuit or service-water blowdown, as well as wastewater from water treatment and inspection tanks. In qualitative terms, the composition of process wastewater will approximately correspond to that of process wastewater from the existing ETE1,2 and will be determined primarily by the quantity of pollutants abstracted with the raw water and their concentration as a result of evaporation. Pollutant input into the wastewater as a result of SMR ETE operation (water treatment, adjustment of chemical regimes, etc.) will be minimal.

Process wastewater discharge from ETE1,2 is currently limited to 10,800,000 m^3/year; actual discharge has long ranged from approximately 8,000,000 to 9,000,000 m^3/year. For the New NPP ETE Project, the expected quantity of process wastewater is 15,123,000 m^3/year; total process wastewater discharge under the combined effect of the operation of ETE1,2+New NPP ETE+SMR ETE will therefore not exceed 29,487,000 m^3/year.

Quantity of process wastewater from construction is not specified. Water abstracted for construction purposes becomes part of the structures, evaporates, or is reused for construction purposes. Potentially contaminated waters (tests of technological facilities, flushings, etc.) will be collected in drainless pits and depending on the physical-chemical analyses, they will be either discharged to the receiving water body or transported for disposal. Process wastewater discharge will gradually decrease during termination of operation.

sanitary wastewater: up to 20,000 m^3/year

The stated value represents the quantity of sanitary wastewater from SMR ETE (up to 400 workers). In qualitative terms, the composition of sanitary wastewater will correspond to that of sanitary wastewater from the existing ETE1,2.

The existing discharge of treated sanitary wastewater from ETE is approximately 100,000 m^3/year. Sanitary wastewater discharge from the New NPP ETE Project is expected to be approximately 33,000 m^3/year; total sanitary wastewater discharge under the combined effect of operating ETE1,2+New NPP ETE+SMR ETE will therefore not exceed 153,000 m^3/year.

Treated sanitary wastewater will be discharged together with process wastewater through the existing ETE1,2 wastewater pipelines to the receiving water body (the Vltava River at the Kořensko profile).

The quantity of sanitary wastewater during construction is expected to be approximately 39,200 m^3/year; the receiving water body for treated sanitary wastewater from construction will be the Vltava River. Sanitary wastewater discharge will gradually decrease during termination of operation.

stormwater: up to 175,000 m^3/year

The stated value represents a conservative upper estimate of stormwater runoff from the SMR ETE site based on its area.

Existing stormwater discharge from the ETE1,2 site is approximately 266,000 m^3/year. The quantity of stormwater discharged from the New NPP ETE Project is expected to be approximately 155,000 m^3/year; the total quantity of stormwater discharged under the combined effect of operating ETE1,2+New NPP ETE+SMR ETE will therefore not exceed 596,000 m^3/year.

Because the geological conditions are unsuitable for infiltration, stormwater discharge flows will be limited by retention basins and safety basins. It is assumed that the SMR ETE area (29.7 ha) will be drained by the storm sewer in two ways. The inner fenced part (approximately 18.3 ha) will be drained in a controlled manner through a retention basin (approximate volume 3,200 m^3) at the northeastern tip of the SMR ETE area into the existing stormwater pipeline from ETE1,2 to the Strouha Stream. The outer part of the SMR ETE area, covering approximately 11.2 ha, will be drained by the storm sewer to Dvorčice Pond and Dvorčický Stream, to which stormwater from the SMR ETE area currently drains naturally. Some collected stormwater may also be conveyed via appropriate retention facilities to Karlovec Pond.

Stormwater discharge from the SMR ETE construction area will be approximately the same as during the operating phase. The quantity and receiving water body for stormwater from the construction site facility areas during SMR ETE construction will differ among the individual construction-facility areas. For all construction-facility areas, it is assumed that stormwater falling on the paved portions of these areas will always be pretreated using an oil separator immediately at the pollution source.

Nonradioactive waste:

municipal and other waste:	up to 660 t/year
hazardous waste:	up to 75 t/year
sludge from raw-water treatment:	up to 750 t/year

The stated values represent the anticipated quantities of non-radioactive waste associated with SMR ETE operation. In both qualitative and quantitative terms (taking into account the ratio of output to facility size), the quantity and composition of the non-radioactive waste generated will correspond to the waste composition of the existing operating ETE1,2. They include the usual types of waste produced by cleaning, maintenance, repairs, operation and replacement of non-radioactive equipment, construction waste produced by repairs, and others. Waste will be managed similarly to waste generated in connection with operation of ETE1,2, in accordance with the Waste Act, and the management documents of ČEZ, a. s. (collection, secure storage, and transfer to professionally authorized companies for further management). Sludge from raw-water treatment will be disposed of at the existing Temelínec sludge lagoon.

At present, ETE1,2 produce an average of approximately 1,200 metric tons of non-radioactive waste per year (including approximately 130 metric tons of hazardous waste) and 3,000 metric tons of sludge from raw-water treatment; production is, however, highly variable depending on current activities and the quality of the raw water abstracted. According to the New NPP ETE EIA Documentation, average production of 752 metric tons of non-radioactive waste per year (including 112 metric tons of hazardous waste) is assumed for the New NPP ETE Project; the quantity of sludge from raw-water treatment will be proportional to the quantity of raw water. Total non-radioactive waste production under the combined effect of operating ETE1,2+New NPP ETE+SMR ETE will therefore not exceed 2,370 t/year of municipal and other waste, 317 t/year of hazardous waste, and 8,850 t/year of sludge from raw-water treatment.

During construction, the waste will consist mainly of construction waste and municipal waste. A final part of construction will in particular be of great importance because of the disposal of construction site installations. The quantity of waste generated during the construction period will be up to approximately 100,000 metric tons over the construction period (including up to 1,000 metric tons of hazardous waste); the waste will consist mainly of construction waste and municipal waste. Priority will be given to reusing and recycling waste using the recycling line, or the waste will be transferred to professionally authorized companies for further management. Commissioning of SMR ETE will be followed by the construction site facility removal phase. The total quantity of waste from this phase is estimated at 56,000 metric tons, including up to 200 metric tons of hazardous waste. The majority of the total waste from demolition of the construction facilities will consist mainly of concrete waste, mixtures or separate fractions of concrete, or bricks containing reinforcing steel, originating primarily from demolition of foundation structures and paved concrete areas. Steel and iron from dismantling the steel structures of buildings and other auxiliary steel structures will constitute a significant share of the waste. Another significant waste component by volume will be waste from removal of asphalt road surfaces and aggregate base layers.

Noise:

stationary sources:

forced-draft fan cooling tower:	L_{pA} = 75 dB
turbine building:	L_{pA} = 60 dB
transformer:	L_{pA} = 87 dB
other individual buildings:	L_{wA} = up to 80 dB

The stated values represent the anticipated sound pressure at a distance of 1 m from the outer surface of the source (L_{pA}) or the sound power (L_{wA}) of the dominant SMR ETE sources. These sources will operate continuously and therefore identically during the daytime and nighttime. All sources will be provided with noise-control measures so that the public-health limits under Government Decree No. 272/2011 Coll., on Protection of Health against the Adverse Effects of Noise and Vibration, as amended, are met in the nearest, or potentially most affected, protected outdoor space (Kočín). Another source of noise during SMR ETE operation will be on-site traffic. Passenger-vehicle movements will be naturally distributed among the existing or future parking areas. Bus transportation will use the existing public-transport stand and stop area. Freight traffic entering the SMR ETE site will use dedicated on-site roads. Similar assumptions apply to existing sources at the site. The stated acoustic parameters may also be redistributed among the individual groups of noise sources, or individual noise sources, so that compliance with the limit under the above Government Decree is always demonstrably ensured.

Noise measurements at ETE1,2 and the Kočín transformer station show that the public-health limits are reliably met in the nearest, or potentially most affected, protected outdoor space (Kočín). As with SMR ETE, all sources for the New NPP ETE Project will be provided with noise-control measures so that the public-health limits are met under the combined effect of all sources (i.e., ETE1,2+New NPP ETE+SMR ETE).

The SMR ETE preparation and construction period will be significant in terms of the acoustic effects of emissions. During these phases, the main activity assumed is operation of construction machinery in the SMR ETE construction-site area and construction-facility areas, and movement of machinery and materials between the areas. The most significant effect may be expected during construction of the construction site facilities, when extensive deployment of machinery is anticipated, involving dozens of machines operating concurrently (dozers, excavators, loaders, compaction equipment, etc.) in areas oriented toward the nearest residential development. On-site transportation of soil during bulk earthworks will also be a significant noise source, with many dozens of trucks expected to be deployed concurrently. The SMR ETE construction period will be characterized by activities associated with construction of the main generating unit, the fan cooling-tower block, and other structures (concrete work, including operation of concrete pumps, powered hammers, operation of cranes or mobile cranes, and on-site transportation of materials by truck, etc.).

Acoustic parameters of construction machinery are as follows:

dozer:	$L_{wA} \leq 111$ dB
excavator:	$L_{wA} \leq 107$ dB
roller:	$L_{wA} \leq 110$ dB
loader:	$L_{wA} \leq 109$ dB
powered hammers:	$L_{wA} \leq 109$ dB
mobile crane:	$L_{wA} \leq 95$ dB

truck mixer:	L_{wA} ≤ 115 dB
concrete pump:	L_{wA} ≤ 107 dB
tower crane:	L_{wA} ≤ 95 dB
heavy-duty crane:	L_{wA} ≤ 102 dB
crushing line:	L_{wA} ≤ 109 dB
concrete batching plant:	L_{wA} ≤ 111 dB

transport on public roads: up to $L_{Aeq,7.5m}$ = 53/51 dB (day/night)

The stated value represents the noise-emission characteristic of SMR ETE inbound+outbound road traffic in the profile with the highest traffic load (at the main entrance to the SMR ETE site, Road II/138). In view of its low frequency, noise from rail traffic may be disregarded.

Existing ETE1,2 inbound+outbound traffic together with future New NPP ETE traffic in the profile with the highest load will have a traffic-noise emission value of up to $L_{Aeq,7.5m}$ = 59/58 dB (day/night). During concurrent operation of ETE1,2+New NPP ETE+SMR ETE, traffic-noise emissions will therefore not exceed $L_{Aeq,7.5m}$ = 60/59 dB (day/night).

During construction work for the Project, increased noise levels can be expected in the vicinity of transport routes, always within the limit.

Vibrations: insignificant

The SMR ETE Project will not be a source of significant vibrations propagating to the surrounding area. The turbine-generator building (turbine) is the principal vibration source; suitable mounting minimizes the transfer of vibrations from the turbine to the turbine-pedestal subsoil and limits them to the immediate vicinity. Effects of vehicle movements driving on the public roads can be additional potential sources of vibrations. However, these are usual transport sources that are suppressed in the subbase already in the immediate vicinity of roads. Similar conclusions also apply to the existing facilities at the Temelín site and the New NPP ETE Project.

With regard to vibrations during SMR ETE preparation and construction, only conventional construction machinery and vehicles are considered, and their effects will be limited to their immediate vicinity. No blasting operations using explosives are assumed during construction.

Ionizing radiation: radioactive airborne discharges:

noble gases (excluding Ar-41):	up to 4.26E+13 Bq/year
tritium:	up to 1.00E+12 Bq/year
C-14:	up to 4.38E+10 Bq/year
iodine:	up to 2.74E+08 Bq/year
aerosols:	up to 2.64E+08 Bq/year
Ar-41:	up to 2.40E+12 Bq/year

The stated values represent the bounding annual activities of airborne discharges from SMR ETE during operational states (normal and abnormal operation) for the individual radionuclide groups. The values are based on the authorized estimates provided by the RR SMR technology supplier. Based on operating experience with PWR-type reactors, actual discharges may realistically be expected to be lower than the values assumed by the Project.

Nuclear fuel itself, in which the fission chain reaction takes place and also produces active isotopes of gases, is the primary source of radioactive gases. Limited quantities of these pass through microleaks in the fuel cladding into the primary-circuit coolant, which is in continuous contact with the cladding. By means of the primary circuit coolant, radioactive gases reach other power plant systems related to the primary circuit. This is also in accordance with isotope composition of discharges, in which noble gases and radiologically significant iodines prevail. As far as activation products are concerned, it is radioisotopes of carbon and argon that above all are of radiological significance. The discharges will be released to the atmosphere in a controlled manner after high-efficiency filtration and radiological monitoring.

Actual airborne discharges from the existing ETE1,2 have been within the following ranges in recent years:

noble gases:	up to 1.21E+13 Bq/year
tritium:	up to 3.70E+12 Bq/year
C-14:	up to 1.25E+12 Bq/year
iodine:	up to 2.47E+08 Bq/year
aerosols:	up to 3.62E+08 Bq/year
Ar-41:	up to 1.81E+12 Bq/year

The stated values are a bounding selection (maxima) of measured radionuclide discharge-activity values from ETE1,2 for 2004 through 2025. Other nuclear facilities at the site do not produce gaseous discharges. The discharges are released to the atmosphere in a controlled manner through ventilation stacks after high-efficiency filtration and radiological monitoring.

According to the New NPP ETE EIA Documentation, the anticipated bounding airborne discharges from the New NPP ETE Project are as follows:

noble gases:	3.55E+15 Bq/year
tritium:	2.59E+13 Bq/year
C-14:	5.40E+11 Bq/year
iodine:	3.85E+10 Bq/year
aerosols:	3.48E+09 Bq/year
Ar-41:	2.52E+12 Bq/year

No radioactive airborne discharges from SMR ETE will be produced during construction. During termination of operation and decommissioning, discharges will decrease progressively and significantly (by up to several orders of magnitude) compared with the operating period. The isotopic composition of gaseous discharges during termination of operation and decommissioning will differ from that during the operating phase (with a substantially lower proportion of noble gases and iodine).

radioactive discharges to the watercourse: tritium: up to 5.00E+12 Bq/year
corrosion, activation, and fission products: up to 2.89E+09 Bq/year

The stated values represent the bounding annual activities of SMR ETE liquid discharges (discharges to the watercourse) during operational states (normal and abnormal operation) for the individual radionuclide groups. The values are based on the authorized estimates provided by

the RR SMR technology supplier. Based on operating experience with PWR-type reactors, actual discharges may be expected to be lower than the values assumed by the Project.

Tritium, which is generated in the primary circuit and cannot be captured effectively by treatment systems, dominates the isotopic composition of liquid discharges. The lower relative tritium discharge values compared with ETE1,2 are due primarily to the boron-free operating regime of the RR SMR. The discharges will be discharged in a controlled manner to the receiving water body (the Vltava River), following radiological monitoring, via the existing final wastewater collector, together with process wastewater and sewage wastewater.

Actual liquid discharges to the watercourse from the existing ETE1,2 have been within the following ranges in recent years:

tritium:	up to 6.38E+13 Bq/year
corrosion, activation, and fission products:	up to 6.42E+08 Bq/year

The stated values are a bounding selection (maxima) of measured liquid-discharge activity values from ETE1,2 for 2006 through 2025. Other nuclear facilities at the site do not discharge liquid effluents.

According to the New NPP ETE EIA Documentation, the estimated liquid discharges to the watercourse from the New NPP ETE Project are as follows:

tritium:	1.2E+14 Bq/year
corrosion, activation, and fission products:	1.9E+10 Bq/year

No liquid radioactive discharges from SMR ETE will be produced during construction. During termination of operation and decommissioning of SMR ETE, discharges will decrease progressively and significantly (by up to several orders of magnitude) compared with the operating period.

ionizing radiation field: insignificant

An ionizing-radiation field means electromagnetic (gamma) radiation or neutron flux directly from process equipment (without the contribution from discharges). It is not significant even in the immediate vicinity of the buildings of the existing nuclear facilities at ETE1,2 or in the case of the SMR ETE and New NPP ETE Projects.

It cannot be excluded that radiation sources (sealed sources), which are part of radiographic testing equipment (e.g. for weld inspection), will be used in the course of construction, without a significant impact on the vicinity. No additional ionizing-radiation sources will arise during termination of operation or decommissioning.

radioactive waste: up to 27.5 m^3/year

The stated value represents the bounding quantity of RAO produced during SMR ETE operation after conditioning (i.e., RAO intended for disposal). The value is based on unit production of 55 m^3/GW_e/year, conservatively assumed for RAO from SMRs in the updated Policy for Radioactive Waste and Spent Nuclear Fuel Management in the Czech Republic (update for 2025 through 2035, with an outlook beyond 2050). Radioactive-waste sources include, in particular, liquid-radioactive-waste treatment systems (concentrates, spent ion exchangers, and sludge), filters from active ventilation systems, used measuring probes and surveillance-specimen capsules, as well as contaminated unusable components, protective equipment or clothing, segregated materials from the controlled area, etc. The RAO treatment and conditioning technology (in particular the solidification matrix) and the packaging systems for RAO storage and disposal will be selected depending on the RAO acceptance criteria for operating repositories in the Czech Republic (currently the Dukovany repository), the requirements of the Policy for Radioactive Waste and Spent Nuclear Fuel Management in the Czech Republic, and the best available technologies. RAO storage at the SMR site is a standard part of the SMR ETE reference design.

According to the New NPP ETE EIA Documentation, conditioned radioactive-waste production from the existing ETE1,2 and the planned New NPP ETE units will range from 50 to 70 m^3/GW_e/year (long-term RAO production from ETE1,2 is approximately 50 m^3/GW_e/year). This RAO is and will be disposed of in accordance with the Policy for Radioactive Waste and Spent Nuclear Fuel Management (currently at the Dukovany ÚRAO). SÚRAO information on radioactive-waste management is provided in Annex 6.3 to this Documentation.

No radioactive waste will be produced during SMR ETE construction. During termination of operation and decommissioning, radioactive waste will include, in particular, segregated contaminated materials (contaminated process systems or building structures) from dismantling and demolition, and materials used for decontamination.

spent nuclear fuel: up to 13.05 t UO_2/year

The quantity of spent nuclear fuel generated corresponds to the quantity of fresh fuel in the fuel load. According to the supplier of the RR SMR reference design, the stated value represents the bounding value of spent nuclear fuel production for SMR ETE.

Spent nuclear fuel production for the existing ETE1,2 units is up to 46 t UO_2/year. According to the New NPP ETE EIA Documentation, spent nuclear fuel production of up to 78.5 t UO_2/year is assumed for the New NPP ETE Project; total spent nuclear fuel production under the combined effect of operating ETE1,2+New NPP ETE+SMR ETE will therefore not exceed 137.6 t UO_2/year.

Spent nuclear fuel will not be produced in the period of construction. After operation has ended and the fuel has been removed from the reactor and pools, no further spent nuclear fuel will be produced.

Non-ionizing radiation: insignificant

The Project will not be a significant source of non-ionizing radiation. The electric and magnetic fields around the individual facilities (electrical lines, transformers, electrical generators, and other equipment) will meet the requirements of Government Decree No. 291/2015 Coll., on Protection of Health against Non-Ionizing Radiation, as amended. Employee limits will be met within the power plant site, and limits for members of the general public in a non-occupational environment will be met in publicly accessible outdoor areas (applicable only to electrical lines).

Similar information also applies to the existing facilities at the Temelín site and to the New NPP ETE Project.

Odor: without outputs

The Project is not a source of odor.

Light pollution: no significant outputs

The Project is not a source of light pollution. Project lighting will be designed in accordance with MŽP Methodological Guideline Ref. No. MZP/2023/710/2146 and standard ČSN 36 0459, Limiting the Adverse Effects of Outdoor Lighting, so as to eliminate light pollution in the surrounding area.

Other physical or biological factors:		without outputs	
	The Project is not a source of other significant outputs.		
Earthwork:	bulk earthworks:	topsoil and subsoil stripping:	up to 300,000 m³
		excavation:	up to 1,390,000 m³
		embankment:	up to 1,381,000 m³

The Project respects the terrain character of the affected territory and does not require extensive permanent interventions in the landscape. Within its own areas, the Project has a predominantly balanced earthwork cut-and-fill balance, except for Area J, which will receive some of the excavated soil from other areas.

Before construction begins, topsoil and subsoil will be stripped from the construction areas, including the construction site facility areas, to the layer thickness determined by the soil survey. The topsoil and subsoil will be stockpiled in Area H during construction.

Excavation work in all affected territories, excluding topsoil and subsoil stripping, will amount to up to 1,390,000 m³, including up to 615,000 m³ in the SMR ETE area (main construction site). Of this quantity, up to 542,000 m³ will be used for embankments and backfilling in the SMR ETE area (main construction site); the surplus of approximately 73,000 m³, together with surplus excavated soil from the other areas, will be used to level construction site facility Area J (634,000 m³), and the remainder, approximately 128,000 m³, will be placed in the soil stockpile in Area H, which will also serve as a soil stockpile for final grading and subsequent reclamation of the construction site facility areas after SMR ETE construction is completed.

G.III. State of the environment in the affected territory and overall assessment of its quality

The affected territory immediately adjoins the existing ETE industrial site and its external infrastructure (in particular power evacuation, raw water supply, and wastewater and stormwater discharge). The affected territory is intensively used for agriculture, but is also of nature conservation value and contains transport and technical infrastructure as well as urban and municipal development. The state of the environment in the affected territory is therefore determined by four factors: agricultural, industrial, natural, and residential functions. These four functions have long been consolidated in the area, with clearly defined relationships. Therefore, they are not a source of significant conflicts. The area around the power plant is diverse and valuable in terms of nature and landscape, with a relatively high proportion of natural and near-natural ecosystems. Health, social, and economic conditions for the population are favorable, comply with hygiene requirements, and in many respects are better than those in other regions of the Czech Republic. Results of monitoring of individual environmental components show an overall good quality of the environment. It is desirable to preserve and further develop this condition in the future in accordance with sustainable-development principles. This is also a principle of the applicable spatial plan.

A balance between nature-conservation interests and economic and social interests is therefore effectively maintained in the area. This is also confirmed by the analysis of the balance of territorial conditions and the potential of the individual pillars of sustainable development (Planning Analytical Materials for the Týn nad Vltavou ORP Administrative District, sixth complete update, 2024).

Operation of the existing power plant (ETE1,2) and its associated infrastructure (including the existing spent nuclear fuel storage facility) does not damage the environment or public health. All outputs are checked and fluctuate within required limits, stipulated by competent authorities, in the long term. The authorized effective-dose limits are reliably complied with in the radiological area. The power plant and its facilities therefore do not significantly affect environmental quality in the area.

As shown by the data presented, the overall environmental quality in the affected territory, in relation to its existing state and development (i.e., without the Project), is favorable in all respects and has remained stable over the long term. The area is not subject to an unsustainable load that could affect Project feasibility. Based on the available information on the state of the environment and its development trends, it can therefore be concluded that favorable environmental conditions will be maintained in the affected territory.

G.IV. Characteristics of the Project impacts on the environment and public health

The assessment is based on bounding values of the characteristics of the SMR ETE Project (e.g. maximum radioactive discharges, maximum water abstraction and discharge, etc.), so that all impacts are assessed at their potential maximum.

The assessment takes into account the combined effects of other existing and planned facilities at the site, i.e. the existing power plant (ETE1,2), the planned New Nuclear Power Plant at the Temelín site (New NPP ETE), and the spent nuclear fuel storage facility at the Temelín site, including its planned expansion (SVJP ETE), throughout the planned operating life of SMR ETE. The assessment also takes into account the existing state of the environment and its expected development trends (due, inter alia, to ongoing climate change).

The impacts of SMR ETE will correspond, both qualitatively and quantitatively (taking into account its proportionally lower output), to those of the existing ETE1,2 power plant. The latter has been in long-term operation at the Temelín site; its impacts are continuously monitored, assessed, and publicly reported, and no circumstances have been identified that would indicate significant adverse impacts on individual environmental components or public health. It can therefore reasonably be expected that this situation will be maintained and that acceptable levels of impact will not be exceeded following implementation of SMR ETE.

A more detailed summary of the impacts of the SMR ETE Project on the environment is provided briefly below for the individual areas assessed in greater detail in the Documentation.

G.IV.1. Impacts on population and public health

G.IV.1.1. Radiological impacts

The impacts of ionizing radiation ("radiological impacts") on the health of the population in the affected territory are assessed using the health risk assessment method applied worldwide. This method is based on the assumption that some risk of health detriment always exists and therefore cannot be completely avoided, but the risk must be minimized to an acceptable level.

The assessment is based on the recommendations of the International Commission on Radiological Protection (ICRP), which establishes a risk coefficient for health detriment due to exposure to ionizing radiation. The assessment is performed for the so-called representative person, i.e. an individual from the population who is most highly exposed from the source concerned. For radioactive airborne discharges from nuclear facilities at the Temelín site, this is a resident of one of the nearby municipalities (varying depending on the meteorological conditions in the given year); for radioactive discharges to a watercourse, it is a resident living along the Vltava River downstream of the discharge point.

The maximum annual effective dose (see Chapter G.IV.3.2. Impacts of ionizing radiation below) from all existing and planned nuclear power sources at the Temelín site (i.e. in addition to SMR ETE, also the existing ETE1,2 and the planned New NPP ETE, with the expanded spent nuclear fuel storage facility at the ETE site also taken into account) is up to 1.47 μSv/year for airborne discharges (or up to 2.05 μSv/year including the contribution from the spent nuclear fuel storage facility, which, however, does not contribute through airborne discharges), up to 3.89 μSv/year for discharges to a watercourse, and up to 4.33 μSv/year at the location of the potentially greatest combined effect of airborne discharges and discharges to a watercourse. These values can be compared with the annual effective dose from natural sources, which is approximately 5,930 μSv/year (5.93 mSv/year) at the Temelín site. It is evident that exposure from natural sources is more than a thousand times higher than the combined exposure from all nuclear power sources at the Temelín site.

Taking into account lifetime exposure (70 years) and applying the above ICRP risk coefficient, the potential risk of health detriment is in the order of 10^{-5} to 10^{-6}, which corresponds to the most stringent internationally accepted recommendations. The combined impact of all nuclear power sources at the Temelín site can therefore be considered insignificant in terms of risks to the health of the affected population. For comparison, the risk from natural sources can be assessed as being in the order of 10^{-2} and is therefore more than a thousand times higher than the potential risk from all existing and planned nuclear power sources at the Temelín site. It follows that the risk associated with the SMR ETE Project, in combination with other existing and planned sources at the Temelín site, is far below the generally accepted level of risk from natural sources.

Moreover, this radiological burden does not affect an area in which the previous operation of Temelín Nuclear Power Plant has had any adverse health effects. The results of monitoring and assessment of the health status of the population in the affected territory, carried out since the pre-operational period of the power plant, show that the health status of the population is the same as or better than in geographically, socially, and economically comparable areas without nuclear facilities, as well as compared with the national average. The same applies to the mental health of the population and to social and economic conditions.

G.IV.1.2. Non-radiological impacts

As regards the impacts of indicators other than ionizing radiation ("non-radiological impacts"), the assessment covers the impacts of electromagnetic fields around conductors of the electricity transmission and distribution systems, the impacts of air pollution and noise, and other impacts (psychological, social, and economic impacts). The results for the individual areas mentioned are summarized below.

The assessment of the impacts of electromagnetic fields (non-ionizing radiation) relates to their occurrence in the vicinity of electrical equipment located in publicly accessible areas. These are typically overhead or underground power lines, with the combined effect at locations where they cross or run in parallel also taken into account. Based on the assessment performed, the statutory limit for the maximum permissible value of the modified electric field strength in human body tissue, based on the recommendations of the International Commission on Non-Ionizing Radiation Protection (ICNIRP), is complied with in all cases assessed, by a very substantial margin. Compliance with the maximum permissible value ensures adequate protection of individuals against all currently known direct and indirect effects of exposure to electromagnetic fields.

The effect of air pollution will not be significant, particularly given that the SMR ETE Project, like the other existing and planned nuclear facilities at the site, is not a combustion source. Air quality at the site is very good, and the area is not subject to exceedances of air quality limit values. The assessment covers both the impacts of the operation of the individual facilities in their combined effect and, in particular, their construction periods. The results show that the effect of the relevant pollutants (PM_{10} and $PM_{2.5}$ particulate matter, nitrogen dioxide, benzene, and benzo[a]pyrene) is not significant from a health perspective. The same applies to short-term exposures during construction works. Under existing conditions, the situation in the affected territory is satisfactory from a health perspective; when the contribution of the SMR ETE Project is assessed (in combination with other existing and planned projects at the site), the concentrations of the pollutants assessed, including background concentrations, remain below the applicable limits and are therefore acceptable from a health perspective.

Noise impacts are assessed both for stationary sources (i.e. operational noise from technological equipment) and for traffic noise on roads in the affected territory passing through urban and municipal development. In both cases, the hygiene noise limits are complied with under existing conditions, and the situation is satisfactory from a health perspective. This situation will be maintained following implementation of the SMR ETE Project (in combination with other existing and planned projects at the site), with the potential change compared with existing conditions not exceeding a few tenths of a decibel (exceptionally, up to a few decibels). As a result of this change, only a very small potential increase in the

number of people affected by noise can be expected from a health perspective, while the direct effect of noise on cardiovascular risks (ischemic heart disease) in the population is negligible.

No relevant impacts of Project-related vibration on population health have been identified.

From a psychological perspective, residents in the immediate vicinity could potentially be adversely affected by concerns about the proximity of a nuclear power plant and the associated potential risks of radiation exposure and possible radiation accidents. Previous surveys, however, show that the presence and proximity of the nuclear power plant do not adversely affect significant personality traits or the psychological balance and well-being of residents. This favorable situation can also be expected to continue during the operation of SMR ETE and other facilities at the site. Provided that SMR ETE, ETE1,2, and New NPP ETE continue to operate as they have to date, without extraordinary events, they will not have an adverse effect on the psychological characteristics of the population in the affected territory in the future either.

The Project does not require any changes to the settlement structure of the area (demolition of residential buildings, abolition of municipalities, etc.). It will therefore not give rise to any social impacts resulting from the forced resettlement of residents. The Project does not constitute a new activity not previously present in the area; it is essentially a continuation of existing activities on an expanded scale. No significant change in the existing ownership structure of real property or in property prices can therefore be expected. If any change does occur, an increase in demand is more likely. The Project will create a significant number of employment opportunities, both for highly qualified specialists and for less-skilled occupations. In terms of employment, not only the direct number of jobs (number of employees) is significant, but also the indirect number of workers employed by cooperating companies and self-employed persons, as well as the number of jobs in the tertiary sector (i.e. trade and services) supported by the purchasing power of power plant employees and workers. The direct positive effect on the infrastructure of municipalities in the affected territory and its surroundings resulting from the power plant operator's (ČEZ, a. s.) long-term sponsorship program should also not be overlooked. Following implementation of the Project, the quality of life in the affected territory will therefore be maintained at least at its current level from a social and economic perspective. The affected territory will retain its "rural" character, while maintaining a high quality of life supported by the presence of a major employer.

G.IV.2. Impact on air and climate

G.IV.2.1. Impact on air quality

The SMR ETE Project is not a combustion source and will therefore not be a significant source of air pollutant emissions.

Under existing conditions, the affected territory is not an area where air quality limit values are exceeded. ČHMÚ data show that air quality limit values are complied with for all relevant pollutants; in the case of annual averages, concentrations are even well below the applicable limit values.

An air dispersion study has been prepared to assess the impact of the SMR ETE Project, in combination with other existing and planned projects at the site, covering all relevant pollutants from technological equipment and activities, including associated traffic. The assessment covers both the Project operation period and the construction period, in each case assuming the potentially least favorable combination with other facilities in terms of emissions.

Only an insignificant change in air quality conditions in the area can be expected during SMR ETE operation. Maximum values occur near the access route to the SMR ETE site (Road II/138), primarily as a result of traffic generated by both the assessed SMR ETE Project and the planned New NPP ETE Project. In terms of annual average concentrations of the individual pollutants, these maximum values amount to tenths of a percent of the relevant air quality limit values; at the potentially most affected residential areas (particularly the municipality of Kočín), the contributions can be expected to be entirely insignificant. Taking into account the existing background pollution, natural traffic growth in the area, and operation of the assessed sources, it can be clearly confirmed that concentrations of all assessed pollutants (PM_{10} and $PM_{2.5}$ particulate matter, nitrogen dioxide, benzene, and benzo[a]pyrene) in the affected territory can be expected to remain well below the applicable limit values.

During construction, the dominant factor will be emissions of particulate matter (PM_{10} and $PM_{2.5}$) from the activities carried out and vehicle movements within the construction areas. In terms of annual average concentrations, increases amounting to tens of percent of the air quality limit values can be expected at the boundary of the SMR ETE construction site, and up to several percent of the limit values at the nearest residential areas. Taking into account the combined effect of changes in background concentrations due to construction activities, including associated traffic related to construction of New NPP ETE, and the construction of SMR ETE itself, only a minor change in air quality conditions can be expected at the most affected residential areas, and annual average concentrations will remain below the applicable limit values.

The situation is different for maximum daily concentrations, where contributions from the most demanding stage of construction (topsoil stripping) may reach values well above the air quality limit value even at considerable distances from the SMR ETE construction site (including the nearest residential areas). These maximum possible daily concentrations may occur provided that the combination of the most adverse meteorological conditions persists continuously throughout the entire day during the period in which these activities are carried out. According to wind-rose data, such adverse conditions can only be expected during a limited period of the year; the probability of the modeled concentrations actually occurring is therefore low, and actual values can be expected to be half as high or even lower. There is a sufficient margin in the area to remain within the permissible number of exceedances of the basic limit value; under the existing conditions, up to one exceedance day per year can be expected in the nearest municipalities, while in the event of concurrent construction of New NPP ETE and SMR ETE, the number of days exceeding the daily

maximum may increase by approximately five days per year. The resulting air quality conditions will therefore remain compliant with the applicable limit value (the Air Protection Act allows 35 exceedances per year).

In view of the above impacts on particulate-matter concentrations, preventive measures are therefore proposed to control dust during construction of the assessed Project. An appropriate combination of measures enabling dust generation during construction to be significantly reduced can thus substantially reduce the impact on air quality in the affected territory and prevent potential adverse conditions.

Implementation of the Project is therefore not expected to result in a significant change in air quality at the site during SMR ETE operation (in combination with other existing and planned projects at the site). Measures to eliminate adverse impacts are proposed for the construction period, and exceedances of the specified air quality limit values are not expected in the affected territory even during these phases, which are less favorable in terms of air quality.

G.IV.2.2. Impacts on climate

The assessment of climate impacts focuses on two factors – the assessment of the impacts of emissions and heat from the Project cooling towers (impacts on the local climate) and the assessment of impacts on greenhouse gas emissions (impacts on the global climate).

The impacts on the local climate are assessed both for the SMR ETE Project alone and for its combined effect with other existing and planned projects at the site. SMR ETE alone has a very small impact on the local microclimate. The average increase in temperature in the area is negligible, and the increases in both average and maximum humidity are similarly small. Deposition of water emitted from the cooling towers is negligible in terms of its impact on the microclimate. The only perceptible impact of SMR ETE on the microclimate is shading, as even this relatively small source produces a visible plume that causes partial shading of the surrounding area. Similar conclusions apply to the cumulative effect of all facilities at the site. The cumulative effect of deposition of emitted water due to drift of a small proportion of water droplets from the cooling towers is small, negligible in practical terms, and moreover concentrated in the immediate vicinity of the sources. This also applies to deposition on roads in the vicinity of the Project, which cannot affect road traffic.

As regards the impact on the global climate, nuclear energy ranks among energy sources with near-zero greenhouse gas emissions, comparable to or better than renewable energy sources. The SMR ETE Project therefore forms part of measures to reduce greenhouse gas emissions, thereby contributing to the mitigation/slowing of climate change. The principal benefit in this respect is the combined effect of the Project (including other nuclear power sources at the site) in the gradual transition of the Czech energy system from combustion sources to renewable and low-carbon energy sources. In this respect, the Project is also designed to withstand all relevant climate extremes that may occur at the Temelín site, with climatic loads being periodically reassessed now and in the future.

G.IV.3. Impacts on the noise situation and other physical and biological characteristics

G.IV.3.1. Noise impacts

Under existing conditions, the noise situation in the affected territory is satisfactory, i.e. compliant with the required limits, both for noise from stationary sources (i.e. operational noise from technological equipment) and for traffic noise on roads in the affected territory passing through built-up areas of towns and municipalities.

This situation will be maintained even after implementation of the SMR ETE Project, including when the combined effect of other existing and planned projects at the site is taken into account. Naturally, a corresponding increase in noise levels can be expected as a result of the introduction of new facilities into the area (including the SMR ETE Project) and the associated traffic demand. As follows from the conclusions of the Acoustic Study, this increase will be very small; in protected outdoor areas of buildings, the potential change compared with existing conditions will not exceed a few tenths of a decibel (exceptionally, up to a few decibels), and the maximum permissible noise levels (limits) will continue to be complied with. This is due in particular to the favorable spatial arrangement of the site, which ensures a sufficient distance between technological noise sources and protected outdoor areas of buildings (municipal residential areas). No additional noise-control measures therefore need to be proposed.

Similar results have also been identified for the SMR ETE Project construction period and for the combined effect of SMR ETE and New NPP ETE construction. Hygiene limits for construction noise will be complied with in the protected areas of the affected territory, by a substantial margin. The same applies to noise from construction traffic on the road network in the affected territory. This is also due, inter alia, to the requirement to avoid an overlap of the main construction phases of SMR ETE and New NPP ETE. SMR ETE construction will therefore take place concurrently with the initial/preparatory phase of New NPP ETE construction, for which heavy-vehicle traffic demand will be approximately half that of the main construction phase; the total volume of heavy construction traffic previously assessed in the EIA process for the New NPP ETE Project will therefore not be exceeded.

G.IV.3.2. Ionizing radiation impacts

During operation of a nuclear power plant (and therefore also of the SMR ETE Project), the impacts of ionizing radiation may arise from small, controlled, and monitored quantities of radioactive substances released into the environment in the form of airborne discharges (ventilation stack) and discharges to a watercourse (the Vltava River at the Kořensko profile).

The assessment of the impacts of ionizing radiation examines whether the specified limits or generally binding limit values are complied with. The Atomic Act and the implementing Decree on Radiation Protection specify the general dose limit for members of the public and dose constraints for nuclear facility operators. The general dose limit from all artificial sources (with the exception of medical applications) for an individual member of the public is 1 mSv/year.

A nuclear facility operator is required to ensure that the dose constraint of 0.25 mSv (250 μSv) per year for a representative person from the public is not exceeded as a result of the discharge of radioactive substances into the environment. The total individual effective dose, comprising the sum of effective doses from external exposure and committed effective doses from internal exposure, must not exceed 0.2 mSv (200 μSv) per year for airborne discharges and 0.05 mSv (50 μSv) per year for discharges to surface water. Where several nuclear facilities are located at one site (as is the case at the Temelín site), the combined impacts of ionizing radiation from all nuclear facilities at the site are assessed.

The assessment of the impacts of ionizing radiation therefore assesses the impact of SMR ETE both separately and, in particular, in combination with the currently operating ETE1,2, the planned New NPP ETE, and the expanded spent nuclear fuel storage facility of the existing ETE1,2 (SVJP ETE). The assessment is based on calculation of the maximum annual and lifetime individual effective dose to the representative person for the combined effect of the facilities listed above. These doses are assessed both against compliance with statutory limits and dose constraints and as a basis for assessing impacts on public health (see above).

The assessment relates to the so-called representative person, i.e. an individual from the public who is potentially most highly exposed from the source concerned. For radioactive airborne discharges from nuclear facilities at the Temelín site, this is a resident of one of the municipalities surrounding the Temelín site (varying depending on the meteorological conditions in the given year); for radioactive discharges to a watercourse, it is a resident living along the Vltava River downstream of the discharge point at the Kořensko profile. Doses in more distant areas, including other countries (Austria, Germany, Poland, and Slovakia), are also assessed. Finally, doses to plants and animals are also assessed.

The basic input for assessing the impacts of ionizing radiation is determination of the so-called source term, i.e. the maximum anticipated radioactive discharges from SMR ETE and other existing or planned nuclear facilities at the site (ETE1,2, New NPP ETE); the contribution from SVJP ETE is also taken into account. Numerical values of the source term are provided above in Chapter G.II.2. Data on outputs, specifically the part concerning ionizing radiation.

The assessment results show that the maximum annual effective dose from all existing and planned nuclear power sources at the Temelín site (the SMR ETE Project together with the existing ETE1,2 and the planned New NPP ETE, also taking into account the expanded spent nuclear fuel storage facility at the ETE site) is:

- for airborne discharges, up to 1.47 μSv/year (or 2.05 μSv/year when the contribution from the ambient dose equivalent from the expanded SVJP is taken into account; although SVJP is not a source of airborne discharges, it also contributes to the annual effective dose in the immediate vicinity of SVJP); the representative person is a resident of the municipality of Kočín,
- for discharges to a watercourse, up to 3.89 μSv/year; the representative person is a resident of the municipality of Újezd and Chaty Pašovice,
- for the greatest combined effect of airborne discharges and discharges to a watercourse, up to 4.33 μSv/year; the representative person is a resident of Chaty Pašovice.

In Austria, the total maximum annual effective dose from all existing and planned nuclear power sources at the Temelín site to the representative person (a resident of Rottal in the cadastral area of the municipality of Haugschlag) is up to 0.05 μSv/year. In Germany, the total maximum annual effective dose to the representative person (a resident of Schnellenzipf in the cadastral area of the municipality of Haidmühle) is up to 0.07 μSv/year. Doses for Poland and Slovakia are negligible.

In all cases, the general dose limit of 1 mSv/year (= 1,000 μSv/year) is complied with, as is the dose constraint of 0.25 mSv/year (= 250 μSv/year), comprising 0.2 mSv/year (= 200 μSv/year) for airborne discharges and 0.05 mSv/year (= 50 μSv/year) for discharges to surface water.

These values can be compared with the annual effective dose from natural sources, which is approximately 5,930 μSv/year (5.93 mSv/year) at the Temelín site. It is evident that the level of exposure from natural sources is more than a thousand times higher than the combined exposure from all existing and planned nuclear power sources at the Temelín site.

The results of the assessment of the impacts of ionizing radiation on plants and animals show that dose values for both terrestrial and aquatic representatives of fauna and flora are well within the reference value range established by the International Atomic Energy Agency and also below natural background levels.

The assessment also includes an evaluation of radiological water quality indicators in the Vltava River downstream of the discharge point. The basic statutory requirements for permissible pollution and good ecological potential are reliably met at all assessed profiles of the Vltava River. In view of water abstraction for drinking-water supply, the indicative values for the use of water for drinking-water purposes are also assessed for the tritium (H-3) indicator at the Solenice and Prague-Podolí profiles. This assessment shows that under adverse conditions involving the concurrence

of maximum discharges and low river flows, the indicative value for tritium activity concentration for drinking-water supply purposes (100 Bq/l) could potentially be exceeded, reaching up to 338 Bq/l at Solenice and up to 151 Bq/l at Prague-Podolí (and 72 Bq/l at the Hřensko profile). However, the limit value for the activity concentration of radionuclides, including tritium, in drinking water for public supply and in bottled water placed on the market (3,500 Bq/l; reference level 1,000 Bq/l) will be reliably complied with. Irrespective of this, a measure is proposed to prevent exceedance of the indicative tritium activity concentration value, consisting in coordination of discharges from the individual nuclear facilities at the Temelín site with each other and with the flow conditions in the river.

As regards impacts on groundwater, there will be no radioactive discharges from SMR ETE to groundwater. A hypothetical undetected minor leak (through an undetected leakage point) would be identified by the monitoring system.

G.IV.3.3. Impacts of other physical and biological factors

Vibration impacts will not be significant and will not differ significantly from the existing situation, which is reliably within the applicable limits. This applies both to vibration from the SMR ETE technology (and other existing and planned projects in the area) and to potential vibration generated by traffic.

The impacts of non-ionizing radiation (i.e. magnetic and electric fields in the vicinity of electrical equipment) will not be significant and will comply with the applicable limit. All SMR equipment significant in terms of electromagnetic field generation (i.e. electrical equipment) will be located within the enclosed power plant or substation site. The only elements located in publicly accessible areas will be the overhead line for power evacuation from the SMR ETE site to the Kočín transformer station (400 kV) and the underground line providing backup supply for power plant auxiliary power from the Kočín transformer station (110 kV). These lines will be designed so as to ensure compliance with the applicable limit, including their combined effect with other power lines in the area, by specifying the minimum permissible height of conductors above ground level (or the minimum permissible depth of conductors below ground level). The limit for the maximum permissible value of the modified electric field strength will be reliably complied with, by a very substantial margin.

The SMR ETE site will be illuminated. As at the existing ETE1,2, the lighting will include red aviation obstruction lights installed on vertical structures (where required by aviation regulations), as well as lighting of roads and operating areas within the SMR site. The aviation obstruction lights will comply with the applicable regulations; consequently, there is no scope to minimize their impact on light pollution in terms of their location, orientation, or luminous intensity. These are essential safety devices. The Project itself will be illuminated in a manner that minimizes light pollution of the surrounding area; luminaires limiting light emission in unnecessary directions (i.e. towards the sky) will be used. However, the characteristics of the lighting (location, orientation, and luminous intensity) will be subordinate to physical protection requirements. The SMR ETE site can therefore be expected to remain clearly visible at night even after implementation of the measures described above. This also applies during Project construction, when the construction site will be illuminated at night; however, this impact will be temporary.

Shading impacts on the surrounding area are also assessed, including both shading by the structures of the SMR ETE Project (also in combination with other existing and planned projects at the site) and shading by vapor plumes emitted from the cooling towers. Shading modeling shows that the SMR ETE Project itself will not have a significant effect on shading of the surrounding area, with any effect amounting to no more than a few minutes per day. This is due primarily to the relatively small dimensions of the Project structures. A more significant cumulative effect will occur from the overall combined effect of all facilities considered at the site (SMR ETE + ETE1,2 + New NPP ETE), where shading of up to approximately one hour per day can be expected during certain periods of the year (at points in the municipality of Temelín). At these locations, however, shading will be caused exclusively by the structures of ETE1,2 and New NPP ETE; the SMR ETE Project makes no contribution to the overall shading there. Overall, it can be concluded that any shading caused by SMR ETE structures will not cause nuisance to residents at any location within the assessed area and will not adversely affect ecosystems.

G.IV.4. Impacts on surface water and groundwater (non-radiological)

G.IV.4.1. Impacts on surface water

Implementation of the Project will result in the paving of areas currently used for agriculture or covered by grassland, where stormwater currently drains or infiltrates naturally. The increase in paved areas will therefore result in an increase in stormwater runoff of up to 175,000 m^3/year. Conditions at the SMR ETE site are unsuitable for stormwater infiltration. Stormwater will therefore be discharged through a separate sewer system to surface waters, together with groundwater pumped from the SMR ETE site to lower the groundwater level in the area of the reactor building and other buildings, depending on the depth of their foundations. Stormwater from the inner fenced SMR ETE site will be discharged via a retention tank at the north-eastern edge of the SMR ETE area through the existing ETE1,2 sewer system to Strouha Stream and subsequently to the Vltava River. The outer part of the SMR ETE area will be drained by the stormwater sewer system into Dvorčice Pond and Dvorčický Stream, to which stormwater from the SMR ETE area currently drains naturally. This will maintain the water regime of Dvorčice Pond and Dvorčický Stream, whose headwater area is located within the SMR ETE construction area. Part of the captured stormwater may also be discharged via suitable retention facilities into Karlovec Pond. No significant change in the drainage characteristics of the area is therefore expected.

In terms of the quantitative characteristics of watercourses (i.e. water quantity), the supply of raw water to the SMR ETE Project and other projects at the Temelín site (the existing ETE1,2 and the planned New NPP ETE) is ensured. Water for SMR ETE and the other projects at the Temelín

site is and will be abstracted from the Vltava River (at the Hněvkovice Reservoir), into which wastewater will also be discharged (upstream of the reservoir formed by the Kořensko weir). The reliability of water supply and impacts on the minimum residual flow in the Vltava River are assessed using a simulation model that evaluates flow conditions and water management in the storage zones of the Lipno I, Římov, Kořensko, Orlík, Slapy, Švihov, and Vrané reservoirs and reflects the requirements of the applicable operating rules for these waterworks, including provision of the required minimum flows downstream of the waterworks. Given the long-term operating horizon of the Project, climate change up to 2080 (covering the period up to 2095) is also taken into account in the assessment. The impacts of climate change are assessed for a global emissions development scenario corresponding to the middle-of-the-road pathway, in which environmental systems undergo degradation; three global climate models and one regional climate model are taken into account. For both current hydrological conditions and a scenario involving warming of 2°C compared with current conditions, the reliability of meeting water abstraction requirements for the Temelín site is assessed as uninterrupted for all time horizons. For the reference years 2060 and 2080, three climate models demonstrate uninterrupted water supply, while one extremely conservative climate model indicates possible disruptions to water supply reliability. In all models in which uninterrupted water abstraction for the Temelín site is demonstrated, the required minimum flows downstream of the waterworks are also ensured in accordance with their applicable operating rules. The assessment showed that, for most of the hydrological options assessed, the impact of the SMR ETE Project on surface-water quantity is acceptable in terms of water supply reliability. However, the system is sensitive to the combination of the cumulative water demand (SMR ETE+ETE1,2+New NPP ETE) and adverse climate development represented by one extremely conservative climate model, which indicates possible disruptions to water supply reliability in the 2060 and 2080 time horizons. In view of this, the hydrological data will be periodically updated and appropriate adaptation measures will be taken into account on that basis. It should be added that the water supply referred to above relates to power operation of the nuclear power sources; any disruptions to supply would therefore only affect the economic indicators of electricity generation, not nuclear safety. Water consumption under non-power operating conditions is negligible compared with power operation (it essentially covers only residual heat removal from the reactors of shut-down units), and water for these purposes is reliably ensured. The nuclear facilities at the Temelín site (ETE1,2, including New NPP ETE and SMR ETE) can be maintained in a shut-down state for approximately 30 days without the need for additional water supply, using only the water reserves available at the site and, where applicable, the water reserves in the gravity-fed reservoir. If the raw water supply from the Hněvkovice pumping station is still not restored after this 30-day period, water can be supplied by alternative means to maintain the shut-down reactors in a safe state (delivery of water to the site by tanker trucks, use of the drinking-water distribution system, emergency pumping of water from available sources using fire hoses, etc.).

In terms of the qualitative characteristics of watercourses (i.e. water quality), the impact of the SMR ETE Project, like that of the existing ETE1,2 and the planned New NPP ETE, will be only minor. This is because the amount of pollution in the wastewater will essentially correspond to the pollution abstracted with the raw water; the introduction of pollution into the wastewater as a result of SMR ETE operation (water treatment, adjustment of chemical regimes, etc.) will be minimal, and the contribution of SMR ETE wastewater to the pollutant load of the assessed parameters in the receiving water body will be in the order of tenths of a percent to a few percent. The overall mass balance of pollution will therefore be essentially balanced; however, due to concentration of the wastewater as a result of evaporation, the concentrations of the individual water quality parameters in the wastewater will be proportionally higher. This situation already exists at the site (as a result of ETE1,2 operation) and will remain after implementation of SMR ETE and New NPP ETE. The results of the assessment of impacts on water quality at the discharge profile (profile downstream of the Kořensko Reservoir) show that, under normal flow conditions, permissible pollution levels for $CHSK_{Cr}$, TOC, and BSK_5, the PAU fluoranthene, and benzo[a]pyrene may be exceeded under the combined effect of all the sources referred to above. For these parameters, however, statutory requirements are already not being met at present, primarily because of the unsatisfactory water quality in the Lužnice River (a tributary of the Vltava immediately upstream of the discharge at the Kořensko profile). The situation is similar or better under low-flow conditions because the influence of inflow from the polluted Lužnice River is reduced, as this inflow is less significant during dry periods than under normal flow conditions. A similar situation also occurs at other profiles further downstream on the Vltava River. With regard to the use of surface water for drinking-water supply (Solenice profile), impacts on fish waters (VNO Zvíkovský most profile for cyprinid waters; the section from the Štěchovice Reservoir dam to the confluence with the Sázava River for salmonid waters), and impacts on bathing waters (profiles downstream of the Kořensko Reservoir and VNO Zvíkovský most), water quality in the Vltava River is not entirely satisfactory. However, this situation already exists at present, and the contribution from the Project (in combination with other projects at the Temelín site) is negligible.

Operation of the SMR ETE Project, whether alone or in combination with other sources at the Temelín site (ETE1,2 and New NPP ETE), will not have a significant adverse impact on the future achievement of good status in the affected surface-water bodies. Most of these water bodies already fail to achieve good status, with the main causes originating in the catchment upstream of the Project.

G.IV.4.2. Impacts on groundwater

Implementation of the Project will result in development of approximately 29.7 ha of currently unpaved land, where stormwater currently drains or infiltrates naturally. Hydrogeological investigations have confirmed that conditions at the SMR ETE site are unsuitable for stormwater infiltration systems. This is due in particular to the risk of waterlogging of structures and facilities, especially in combination with groundwater lowering to prevent contact between the deeply founded reactor building and groundwater. Stormwater will therefore be discharged to surface waters, partly to Strouha Stream (and subsequently to the Vltava River) and partly to Dvorčice Pond, to which stormwater from the future SMR ETE area currently drains naturally. This will maintain the water regime of Dvorčice Pond and Dvorčický Stream, whose headwater area is located within the SMR ETE construction area. The anticipated amount of stormwater discharged to Dvorčice Pond is approximately 1.2 l/s. This will be supplemented by groundwater pumped from beneath the foundations of the reactor building at a rate of approximately 1.5-2.0 l/s. During SMR ETE operation, potential climate-change impacts will have a significant effect on the water balance of the area, manifested as reduced infiltration of precipitation into groundwater. The impacts of artificial groundwater lowering by means of drainage wells at the SMR site will be local only. There is no significant

hydrogeological structure with substantial groundwater reserves in the area; the groundwater level may be affected by groundwater pumping at the SMR ETE site only within a maximum distance of 100-200 m (also based on experience with similar works at the neighboring ETE1,2 site). There are no groundwater sources currently used or potentially suitable for use within this distance that could be adversely affected. Potential groundwater sources in the wider area suitable for drinking-water supply and located more than 200 m from the SMR ETE area will not be affected in any way by the planned drainage or otherwise affected; the yield and quality of the groundwater abstracted will be determined solely by the natural characteristics of the area. The small Karlovec Reservoir is located south-east of the SMR ETE area within the zone where groundwater abstraction could potentially have an effect; direct impacts on its water level from pumping beneath the reactor building foundations are excluded. As regards the impact on the nearest municipality (Kočín), the hydrogeological conditions in the municipality are unrelated to those in the SMR ETE area and therefore cannot be affected by them. There are no protected areas of natural groundwater accumulation or surface-water or groundwater sources in the affected territory that could be adversely affected by implementation and operation of the Project.

The Project has no potential to affect the qualitative or quantitative parameters of the affected groundwater bodies.

G.IV.5. Impacts on soil

Impacts on soil result from land take involving land included in the agricultural land fund (ZPF), land designated for the fulfillment of forest functions (PUPFL), or from impacts on soil quality in general. The most significant effect will be permanent land take, amounting to approximately 29.7 ha for the SMR ETE area, of which approximately 21.3 ha forms part of the agricultural land fund and the remaining approximately 8.4 ha comprises other land; land designated for the fulfillment of forest functions is not affected by the permanent land take for the SMR ETE area. The land of the agricultural land fund within the SMR ETE area is classified in protection class III; these are soils with very low productive capacity and a medium level of protection that may be used for development in spatial planning. Permanent land take within the Project electrical connection corridor will be limited to the area occupied by tower foundations and will therefore be low overall.

Temporary land take for construction site facility areas amounts to approximately 74.0 ha, of which approximately 72.4 ha forms part of the agricultural land fund and approximately 1.6 ha comprises other land; land designated for the fulfillment of forest functions is not affected. Reserve areas with a total area of approximately 117.8 ha are also considered; their temporary use is not anticipated or is anticipated only to a limited extent and for a limited period. Before construction commences, the humus-rich topsoil layer will be stripped and stockpiled. Stockpiles of stripped topsoil or other erosion-prone material will be secured in accordance with statutory requirements. After construction is completed, the original soil profile will be restored, the land will be reclaimed, and its original use will be reinstated.

Land take is generally an adverse impact, but it will be justified in accordance with the requirements of the Agricultural Land Fund Protection Act. Agricultural land will only be affected by the SMR ETE Project to the minimum extent necessary, justified by the public interest in the energy sector.

G.IV.6. Impacts on natural resources

Natural resources and mineral resources will not be affected by the Project. Registered geological or paleontological monuments will not be adversely affected. Existing construction mineral deposits will be used for construction in accordance with their plans for opening, preparation, and extraction; the Project does not create a direct requirement to open new sources of construction materials.

G.IV.7. Impacts on biodiversity

The Project is not in direct spatial conflict with specially protected areas, Natura 2000 sites, nature parks, or memorial trees. A significant adverse effect on the qualifying features and integrity of Natura 2000 sites has been excluded. The affected territory consists predominantly of agricultural and anthropogenically affected areas; however, habitats of nature conservation value, significant landscape features, ÚSES elements, and habitats of specially protected species occur locally.

The overall impact of the Project on biodiversity is assessed as predominantly slightly adverse, while more significant but spatially limited impacts may arise particularly in connection with the removal of woody vegetation and forest stands and indirect impacts on wetlands and more species-rich habitats.

A number of measures are proposed to minimize and compensate for impacts on the biotic component of the environment (flora, fauna, and ecosystems); provided these measures are implemented, the overall level of adverse impact is considered acceptable and the SMR ETE Project does not represent a significant change in the affected territory in terms of biodiversity.

G.IV.8. Impacts on landscape

Based on the visibility analysis and analysis of the actual visibility of structures within the existing ETE1,2 site, the structures of the SMR ETE Project will be visible primarily from the south and west, where they will not be screened by the existing ETE1,2 structures (from the north and north-east) or by the structures of the planned New NPP ETE Project (from the north and north-west). The SVJP structure will screen the SMR ETE structures only partially from north-westerly directions. In combination with the projects referred to above, the SMR ETE site will form an integral whole that will become part of the overall visual character of the Temelín site. In terms of scale and character, the SMR ETE structures

will not differ from the overall character of the site. The SMR ETE structures will therefore be seen together with the other structures at the Temelín site, resulting in a change in the visual character of the site within the landscape. This change will be apparent primarily in the immediate Project area and will be perceived in the landscape within the south-east – south – south-west – west sector; it will therefore primarily reinforce the existing impacts of the Temelín site, currently represented by the impacts of the existing ETE1,2 site, on landscape character, specifically its aesthetic value, harmonious scale, and harmonious relationships within the landscape. In the context of all the above changes associated with the planned construction of New NPP ETE and the expansion of SVJP, and cumulatively with these projects, this reinforcing effect is assessed as slight to moderate. On this basis, the Project can be considered acceptable in terms of landscape character conservation.

G.IV.9. Impacts on tangible assets and cultural heritage

The Project does not affect any tangible assets belonging to third parties (buildings, etc.). Most of the plots required for SMR ETE construction are owned by the investor; however, some plots required for construction and establishment of the construction site are owned by third parties, and the relationship to the affected land is being addressed outside the environmental impact assessment process.

Immovable architectural or historical monuments will not be affected by the Project. During construction, minor monuments located in the affected territory will be protected; during Project operation, the condition of monuments in the surrounding area will be maintained and their purpose and the character of their setting will be preserved. Advance archaeological investigation is currently being carried out within the Project areas. If archaeological finds are subsequently discovered during construction (earthworks), a rescue archaeological excavation will be carried out.

G.IV.10. Impacts on transport and other infrastructure

The SMR ETE Project will use the existing road infrastructure in the affected territory and may also use the existing railway siding serving the Temelín site.

The traffic volume generated by the SMR ETE Project during its operational phase will amount to up to 185 vehicles/24 h, of which approximately 35 will be heavy vehicles (arrivals; the number of departures will be identical). The traffic volume generated by the New NPP ETE Project will amount to up to 630 vehicles/24 h, of which approximately 130 will be heavy vehicles (arrivals; the number of departures will be identical). The total traffic demand under the combined effect of SMR ETE and New NPP ETE will therefore not exceed approximately 815 vehicles/24 h, of which approximately 165 will be heavy vehicles (arrivals; the number of departures will be identical). The traffic volume generated by the existing ETE1,2 is already included in the existing traffic volumes on the road network and therefore does not represent an additional traffic demand. Transportation will take place mainly on Road II/105, which runs alongside the Temelín site, using a section of Road II/138 from which the entrance to the SMR ETE site will be provided. The existing traffic volume on Road II/105 in the area of the Temelín site is approximately 6,345 vehicles/24 h, of which approximately 435 are heavy vehicles (according to the latest ŘSD traffic census from 2020); the forecast for the reference year 2034, reflecting natural changes in traffic, is approximately 6,900 vehicles/24 h, of which approximately 475 are heavy vehicles. The SMR ETE Project therefore does not introduce any unexpected traffic load on the road network; the anticipated change in traffic volumes on the road network as a result of the SMR ETE Project is within the range of natural changes in traffic. From this perspective, the Project does not require any special or additional measures; the road network in the affected territory is capable of accommodating this change. This conclusion can also be extended to transport routes on the wider (adjoining) road network, where the proportion of Project-related traffic will decrease further as traffic disperses over the wider area (i.e. into an increasing number of directions).

Taking into account the combined (cumulative) effect of the SMR ETE Project with other planned (New NPP ETE) and existing (ETE1,2) facilities at the site, it is evident that the Temelín site is and will remain a significant origin and destination of traffic. This is due to the transport significance and traffic demand of this extensive industrial site, combined with the low attractiveness of the area for other traffic. Even in this case, however, the anticipated change in traffic volumes on the road network will be in the low tens of percent (rising to several tens of percent during the peak construction period of New NPP ETE), which is acceptable from a purely traffic perspective and will not affect road capacity. An important consideration from the transport perspective is that construction of the SMR ETE Project will be coordinated with construction of the New NPP ETE Project so that the main construction activities of SMR ETE and New NPP ETE do not overlap. Construction of SMR ETE, which will precede construction of New NPP ETE, will therefore take place concurrently with the initial/preparatory phase of New NPP ETE construction, for which heavy-vehicle traffic demand will be approximately half that of the main New NPP ETE construction phase (for which the New NPP ETE EIA Documentation assumes inbound traffic of approximately 890 vehicles/24 h, including approximately 490 heavy vehicles, with the same number of departures). Under the combined effect of SMR ETE construction traffic and New NPP ETE construction traffic (initial/preparatory phase), the total volume of heavy construction traffic previously assessed in the EIA process for the New NPP ETE Project will therefore not be exceeded.

During construction of SMR ETE, Road II/138 will be closed to public traffic in the section between Roads II/105 and II/141 (i.e., in the area of the SMR ETE construction site and related construction facilities). Existing traffic will be diverted via Roads II/141 and II/105; the closed section of Road II/138 will only remain accessible to traffic associated with SMR ETE construction. For construction purposes, Road II/138 will be widened in the section between Road II/105 and the ETE service road.

As regards railway transport, the impact of its use can be considered insignificant; the rail connection to the site has more than sufficient spare capacity, and the use of railway transport for construction purposes is therefore both unproblematic and desirable. Impacts on other transport infrastructure in the affected territory (aviation, cycling, etc.) will be practically negligible.

Apart from the infrastructure networks required for operation of the Project itself (power evacuation to the transmission system, backup supply from the distribution system, water supply system, and wastewater discharge system), which are managed either directly by the developer (ČEZ Group) or by other energy infrastructure operators (ČEPS, EG.D), implementation of the Project will have no further impact on the infrastructure of the area. Any changes to the affected infrastructure networks will be restored to their original condition or to the condition required by their owners or operators. During implementation of the Project, the supply of electricity and other utilities (heat, water, gas, etc.) to service points will be maintained.

G.IV.11. Other environmental impacts

No other environmental impacts will arise. Implementation of the Project only has a minimal impact on the geological environment; the direct impact of construction works (foundation works) involves disturbance of the upper layers of the rock mass down to sufficiently load-bearing strata. The impact is only limited to the construction area; neither the integrity nor the quality of the geological environment will be affected during operation. No old environmental burdens, landslide areas, or undermined areas have been identified or registered within the Project area or its immediate surroundings.

G.V. Brief characteristics of environmental risks

During operation of a nuclear generating unit, as with any other industrial facility or human activity, the possibility of an extraordinary event (failure, incident, accident) cannot generally be completely excluded. The consequences of potential extraordinary events are therefore also assessed as part of the environmental impact assessment. The assessment uses conservative bounding assumptions so that the consequences of actual events for any selected SMR ETE design will always be less severe than those assessed.

G.V.1.Radiological risks

G.V.1.1. Introductory information on the assessment of radiological risks

Despite the robust safety characteristics of SMRs, as with any other industrial facility or human activity, the possibility of abnormal operating conditions or accident conditions cannot be completely excluded.

A specific feature of nuclear facilities, including SMRs, is that they contain radioactive substances that could potentially be released into the environment under accident conditions. This risk can be effectively minimized by a range of tools and measures, but cannot be completely eliminated. Nevertheless, even taking this risk into account, electricity generation at nuclear power plants is no more hazardous in terms of risks to human health and life than generation from other sources. This can be demonstrated using operating nuclear power plants on the basis of international organizations' statistics comparing the risk to life associated with individual types of energy sources (for example, the OECD/NEA 2010 report Comparing Nuclear Accident Risks with Those from Other Energy Sources). For new nuclear power plants, including SMRs, this risk will be further significantly reduced.

Under Czech legislation and WENRA and IAEA recommendations for new nuclear power sources, the permissible radiological consequences of extraordinary events are collectively restricted such that releases of radioactive substances during design basis accidents must not require any protective action outside nuclear facilities and, even in the case of severe accidents, radioactive releases must not cause significant radiation exposure or health detriment to residents in the immediate vicinity of the nuclear power plant or result in long-term and large-scale restrictions on food-chain regulation or the use of land or water bodies. The environmental risk associated with radiation extraordinary events is thereby limited to an acceptable level.

Analyses of a design basis accident, a severe accident, and external hazards are performed to assess the consequences of radiation extraordinary events. SÚJB and WENRA criteria are applied to assess the acceptability of the risks:

SÚJB criteria:

1. No accident not involving reactor core melt or damage to irradiated nuclear fuel in storage pools will result in a radionuclide release requiring the implementation of protective measures consisting of sheltering, iodine prophylaxis, or public evacuation anywhere in the vicinity of the New NPP. (Criterion K2)

2. For postulated accidents involving reactor core melting or damage to irradiated nuclear fuel in storage pools, design provisions must be adopted so that evacuation of the population in the immediate vicinity is not required and long-term restrictions on food consumption do not need to be introduced. (Criterion K3)

3. Accidents involving reactor core melting that could lead to early or large releases must be practically eliminated. An early release means a release that, for postulated core-melt accidents, would not allow the timely introduction of protective measures consisting of sheltering and iodine prophylaxis. A large release means a release that would require measures precluded by this criterion. (Criterion K4)

SÚJB Criteria K2 and K3 correspond substantively to the WENRA recommendations set out below concerning the consequences of accidents without fuel melting (Criterion K2) and accidents with fuel melting (Criterion K3).

WENRA criteria: For design basis accidents, as well as design extension conditions without fuel melting, WENRA recommendations require no or only minor radiological consequences, i.e. no need to implement urgent protective actions for the population in the vicinity of SMR ETE and no or only minor need (limited in time and area) to impose restrictions on food and agricultural products. The requirements concerning the implementation of restrictions on food and agricultural products are interpreted in accordance with the relevant European Commission regulations.

For severe accidents (design extension conditions with fuel melting), WENRA recommendations require radiological consequences limited in area and time, ensuring that the following requirements are met:

- no need for evacuation at distances greater than approximately 3 km,
- no need for sheltering and iodine prophylaxis at distances greater than approximately 5 km,
- agricultural products at distances greater than approximately 5 km will be suitable for consumption one year after the radiation accident,
- no permanent relocation anywhere outside the power plant site (for practical application, interpreted as no permanent relocation at distances greater than 800 m from the reactor).

The assessment is performed within a 100 km radius of SMR ETE, which also extends into the neighboring countries of Austria and Germany. For the analysis of potential short-term impacts on agricultural production and the placing of food on the market, the area analyzed is extended to a distance of up to 400 km from SMR ETE in the case of Slovakia and Poland.

The radiological consequences of radiation extraordinary events are analyzed using an internationally recognized bounding approach. Under this approach, both the representative source term (characterizing the magnitude of the radionuclide release to the environment for the assessment of radiological consequences) and other parameters (e.g. meteorological conditions) are specified so that, with an adequate margin, the analyzed radiological consequences will be less favorable than those that, taking uncertainties into account, will result from later safety analyses conducted as part of the licensing process under the Atomic Act. This ensures that the potentially least favorable extraordinary conditions are taken into account in the EIA process. As part of the environmental impact assessment (EIA) process, impacts on the surrounding area and population are assessed for the following representative cases (scenarios) of accident conditions:

- design basis accident (DBA), and
- severe accident with fuel melting (DEC-B).

Both scenarios are characterized by a conservatively determined (bounding) source term for radionuclides released to the environment, comprising principal and derived radionuclides, the duration of the release, the release characteristics (a ground-level release, which results in greater radiological consequences than an elevated release), and the forms of released iodine isotopes, as one of the principal radionuclides in terms of radiological impacts. The source term is based on data for the reference unit concerning the composition of irradiated nuclear fuel in the reactor, maximum fuel burnup, assumptions regarding fuel cladding failure or fuel melting and the duration of the event in accordance with international standards, WENRA and EUR requirements for limiting the consequences of radiation extraordinary events for new reactors, and the requirement for a maximum permissible conservatively assumed containment volumetric leakage rate of 0.2% per day. The source term is compared with the available safety documentation for SMRs and large PWR reactors and is assessed as sufficiently conservative.

G.V.1.2. Radiological consequences of a design basis accident (DBA)

The complete rupture of a primary circuit pipe inside the SMR ETE containment is selected as the representative accident that does not result in reactor core melting or damage to irradiated nuclear fuel in storage pools and at the same time results in the greatest radiological impacts.

The analysis of the bounding design basis accident (DBA) case leads to the following conclusions:

- At any location in the vicinity of SMR ETE, exceedance of the intervention level for sheltering (10 mSv over 2 days) is excluded for all age groups.
- At any location in the vicinity of SMR ETE, exceedance of the intervention level for evacuation (100 mSv over 7 days) is excluded for all age groups.
- At any location in the vicinity of SMR ETE, exceedance of the intervention level for iodine prophylaxis (100 mSv over 7 days) is excluded for all age groups.
- The reference level for relocation (20 mSv over 365 days) is not exceeded anywhere in the vicinity of SMR ETE.

The SÚJB criteria for this category of events are therefore met.

The analysis of the bounding DBA case further shows that:

- In the deterministic analysis (weather stability categories A/D/F, with or without rain), none of the intervention levels for protective actions are exceeded in any of the cases assessed, i.e. neither for sheltering (“staying indoors”), evacuation, nor iodine prophylaxis.
- In Austria, none of the intervention levels for Austrian “intervention measures” are exceeded, i.e. neither for sheltering (“staying indoors”), evacuation, nor iodine prophylaxis.
- The Austrian intervention level for temporary relocation (30 mSv over 30 days) is not exceeded anywhere in the vicinity of SMR ETE.

- The Austrian intervention level for permanent relocation (100 mSv over 365 days) is not exceeded anywhere in the vicinity of SMR ETE.
- The Austrian criterion for initiating agricultural measures, represented by the time-integrated activity concentration in the ground-level air layer (TIC), which is 360 Bq·h/m^3 (i.e. 1.3E+06 Bq·s/m^3) for Cs-137 and 170 Bq·h/m^3 (i.e. 6.1E+05 Bq·s/m^3) for I-131, is not exceeded anywhere in Austria.
- The Austrian criterion for initiating agricultural measures, represented by deposition, which is 650 Bq/m^2 for Cs-137, is not exceeded anywhere in Austria. The I-131 deposition criterion of 700 Bq/m^2 is not exceeded in Austria, except in a small area along the border with the Czech Republic, at a distance of 50 km from SMR ETE, where a possible minor exceedance of the Austrian reference level is identified with a probability of 5%.
- All of the above criteria are also met in Germany.
- In the Czech Republic, for the individual food commodities monitored, exceedance of the intervention levels for prohibiting the placing of a commodity on the European Union market cannot be completely excluded on the basis of calculated potential specific activity. This applies to periods 2 days and 7 days after the event, at distances of up to 50-100 km from SMR ETE, and exceptionally 30 days after the event (in the case of iodine activity in goat's and sheep's milk, at distances of up to 50 km from SMR ETE). One year after the event, exceedance of the intervention levels for prohibiting the placing of a commodity on the European Union market is excluded throughout the entire analyzed area surrounding SMR ETE.
- In Austria, no prohibitions on the placing of food on the market are identified, with one exception: with a probability of 5%, impacts exceeding the criterion value for prohibiting the placing of goat's and sheep's milk on the market are identified in Austria within 100 km of SMR ETE at 2 days and 7 days after the release. The same result is identified for Germany.
- In Slovakia and Poland (within a distance of 400 km from SMR ETE), no exceedance of intervention levels for prohibiting the placing of food on the European Union market is identified.

In view of the conservative determination of the source term for the DBA event, the above conclusions also apply to DEC-A events, i.e. multiple failures that do not result in severe damage to the fuel system (fuel melting).

G.V.1.3. Radiological consequences of a severe accident (DEC-B)

A severe accident involving fuel melting while maintaining the protective function of the containment falls within design extension conditions. The representative case of an accident involving reactor core melting is selected as a complete melt of the reactor core fuel with simultaneous failure of the primary circuit pressure boundary and release of radioactive substances from the fuel into the containment. In-vessel retention is assumed for SMR ETE, whereby, in a severe accident, the integrity of the reactor pressure vessel is maintained and the containment function also remains preserved, although containment leakage above the design value is conservatively assumed.

The analysis of the representative bounding severe accident case (DEC-B) leads to the following conclusions:

- At any location in the vicinity of SMR ETE, exceedance of the intervention level for evacuation (100 mSv over 7 days) is excluded for all age groups. This conclusion applies to both probabilistic and deterministic analyses with respect to the modeling of meteorological conditions. The basic SÚJB criterion for this category of events is thereby met.
- Under actual meteorological conditions, the Czech intervention level for sheltering (10 mSv over 2 days) is exceeded at a distance of 1 km from SMR ETE for all age groups and at a distance of 3 km for the 6-15 age group. The Czech intervention level for sheltering is not exceeded anywhere else in the vicinity of SMR ETE. The deterministic analyses give slightly less favorable results for weather stability categories D and F; however, the assumption used in the deterministic analyses that a single meteorological situation persists throughout the entire 24-hour release and throughout the entire impact calculation period can be considered overly conservative and therefore unrealistic.
- The reference level for relocation (20 mSv over 365 days), assuming that most time is spent indoors rather than in the open air, is not exceeded anywhere in the vicinity of SMR ETE.

The analysis of the representative DEC-B case further shows that:

- Nowhere in Austria are any intervention levels for Austrian "intervention measures" exceeded, i.e. neither for sheltering ("staying indoors"), evacuation, nor iodine prophylaxis. Neither the Austrian intervention level for temporary relocation (30 mSv over 30 days) nor that for permanent relocation (100 mSv over 365 days) is exceeded anywhere in the vicinity of SMR ETE or anywhere in Austria. The same conclusions also apply to Germany.
- The intervention levels for sheltering, evacuation, or iodine prophylaxis are not exceeded anywhere in Poland or Slovakia.
- The Austrian criterion for initiating agricultural measures, represented by the time-integrated activity concentration in the ground-level air layer (TIC), which is 360 Bq·h/m^3 (i.e. 1.3E+06 Bq·s/m^3) for Cs-137, is not exceeded anywhere in Austria. For I-131, the value of 170 Bq·h/m^3 (i.e. 6.1E+05 Bq·s/m^3) is exceeded throughout the analyzed Austrian territory within 100 km of SMR ETE.
- For the Austrian criterion for initiating agricultural measures represented by deposition, which is 650 Bq/m^2 for Cs-137, a minor exceedance of the Austrian reference level is identified with a probability of 5% within 75 km of SMR ETE. For I-131 deposition of 700 Bq/m^2, exceedance of the Austrian reference level is identified throughout the analyzed area within 100 km of SMR ETE.
- In the Czech Republic, for the individual food commodities monitored, exceedance of the intervention levels for prohibiting the placing of a commodity on the European Union market cannot be excluded on the basis of calculated potential specific activity. This applies to many

commodities and to periods 2 days, 7 days, and 30 days after the event. One year after the event, exceedance of the intervention levels for prohibiting the placing of a commodity on the European Union market is excluded throughout the entire analyzed area surrounding SMR ETE; this also excludes long-term restrictions on agricultural production and therefore satisfies the second basic SÚJB criterion for this type of event.

- In Austria, no prohibitions on the placing of food on the market are identified, with the following short-term exceptions:
  - With a probability of 5%, impacts exceeding the criterion value for prohibiting the placing of leafy vegetables on the market are identified in Austria within 100 km of SMR ETE at 2 days and 7 days after the release.
  - With a probability of 5%, impacts exceeding the criterion value for prohibiting the placing of cow's milk on the market are identified in Austria within 100 km of SMR ETE at 2 days and 7 days after the release.
  - With a probability of 5%, impacts exceeding the criterion value for prohibiting the placing of sheep's and goat's milk on the market are identified in Austria within 100 km of SMR ETE at 30 days after the release.
  - Restrictions on the placing of sheep's and goat's milk on the market 2 days and 7 days after the event are probable throughout the analyzed Austrian territory (50% quantile).
- In Germany, no prohibitions on the placing of food on the market are identified, with the following short-term exceptions:
  - With a probability of 5%, impacts exceeding the criterion value for prohibiting the placing of leafy vegetables on the market are identified in Germany within 100 km of SMR ETE at 2 days after the release.
  - With a probability of 5%, impacts exceeding the criterion value for prohibiting the placing of cow's milk on the market are identified in Germany within 100 km of SMR ETE at 2 days after the release.
  - With a probability of 5%, impacts exceeding the criterion value for prohibiting the placing of sheep's and goat's milk on the market are identified in Germany within 100 km of SMR ETE at 2 days and 7 days after the release.
- In Poland, no prohibitions on the placing of food on the market are identified, with the short-term exception that, with a probability of 5%, impacts exceeding the criterion value for prohibiting the placing of goat's and sheep's milk on the market are identified within 400 km of SMR ETE at 2 days and 7 days after the release.
- In Slovakia, no prohibitions on the placing of food on the market are identified, with the short-term exception that, with a probability of 5%, impacts exceeding the criterion value for prohibiting the placing of goat's and sheep's milk on the market are identified within 400 km of SMR ETE at 2 days and 7 days after the release.

G.V.1.4. Assessment of the radiological consequences of radiation extraordinary events for biota

The assessment of radiological consequences for biota is performed for the same cases (scenarios) of accident conditions, i.e. a design basis accident (DBA) and a severe accident (DEC-B). The assessment is performed for the following reference animals and plants: deer (large mammal), rat (small mammal), duck (aquatic bird, living both on water and on land), frog (amphibian, living both in water and on land), bee (insect), earthworm (annelid), pine tree (large plant), grass (small plant), and trout (freshwater fish). The assessment is performed within 100 km of SMR ETE, with radiological impacts on nearby protected areas assessed specifically. Reference levels according to guidance of the International Atomic Energy Agency (IAEA) are used for the assessment. The results lead to the following conclusions:

Design basis accident: All radiological parameter values are at least one order of magnitude below the derived reference values according to the IAEA. The impact of the bounding DBA event on flora and fauna populations can therefore be considered negligible, and the level of protection of flora and fauna adequate. This conclusion also applies to the selected specific protected areas and their qualifying features.

Severe accident: For the reference animals and plants – deer, rat, and pine tree – the maximum calculated values of the radiological parameters (within 3 km of SMR ETE) are at the level of the derived reference levels according to the IAEA. For the duck (within the 6-10 km zone from SMR ETE, where the nearest water body considered is located and which also includes the Zelendárky Nature Monument), the 95% quantile is slightly above the upper bound of the derived reference level according to the IAEA. The upper bound of the IAEA derived reference level is not exceeded for any other protected area or for any species occurring there.

The IAEA derived reference levels are reference values, not limits, and are intended primarily for assessing long-term radiological exposure. A more detailed analysis shows that, for the duck, the upper bound of the IAEA derived reference level is exceeded slightly only on the first day after the event. In view of this, the level of radiological protection can be considered adequate.

G.V.1.5. Other radiological risks

The assessment also takes into account other potential radiological risks:

Risk of terrorist attack: The risk of SMR ETE being threatened by a terrorist attack will be assessed and addressed in the subsequent phases of Project preparation and implementation using standard means and procedures for the physical protection

of nuclear facilities employed in current practice in accordance with the requirements of international and national legislative regulations. More detailed information cannot be provided due to confidentiality requirements.

All SMR ETE design suppliers, including the reference RR SMR design, have confirmed in their technical information that their nuclear generating units are resistant to aircraft impact, including the impact of a large commercial aircraft. To demonstrate compliance with the requirement for resistance to the impact of a large commercial aircraft, it must be demonstrated that the reactor core remains cooled (or that containment integrity is maintained) and that cooling of irradiated/spent nuclear fuel is maintained (or that the integrity of the spent fuel pool is ensured). With regard to threats posed by unmanned aircraft (drones), plant protection will be provided by a multi-layer drone detection system. Protection will address all types of drones. The airspace in the wider vicinity of the SMR will be monitored by the Czech Armed Forces and Air Navigation Services. In the event of an intervention, the Police of the Czech Republic will cooperate with the Czech Armed Forces and the nuclear facility security unit, using a combination of different methods.

In view of modern cyber security threats, strong emphasis will be placed on the digital and cyber protection of SMR ETE through isolation. The plant control systems that control the reactor and safety features will be physically isolated from the external Internet, which practically excludes an external cyberattack.

Transport of nuclear material: The principal movements of nuclear material and radioactive waste associated with SMR ETE operation are the transport of fresh nuclear fuel from the manufacturer (supplier) to the SMR ETE site, transport of conditioned RAO from SMR ETE to an RAO repository, transport of spent nuclear fuel from SMR ETE to the spent nuclear fuel storage facility, and transport of spent nuclear fuel from the spent nuclear fuel storage facility to the final disposal facility (deep geological repository). Risk management for the transport of nuclear material and RAO is based on principles laid down in the applicable legislation (in particular SÚJB Decrees). Compared with the transport of other dangerous goods (or, from an energy perspective, the transport of other types of fuel), the transport of radioactive substances presents substantially lower risks to the environment and population, while the quantities transported and frequency of transport are low. The potential for releases of radioactive substances into the environment during transport is minimized. Procedures are prepared for each transport operation to limit the potential radiological consequences of an accident so that the health of the population is not endangered.

Radiological risks associated with human activities at the site and in its surroundings: The SMR ETE Project is designed to withstand loads resulting from human-induced impacts. These impacts originate in the vicinity of the SMR ETE siting area. They arise primarily from industrial or agricultural activities in the region, the transport of hazardous substances along transport routes near the plant, including roads and railways, and air traffic hazards, including an aircraft crash. Other potential external sources of human-induced hazards that must be considered during SMR ETE preparation include accidents involving the storage and transport of hazardous substances at the ETE1,2 site, and in the vicinity of the SMR ETE siting area. Potential hazard sources within the ETE1,2 site include, in particular, the storage and internal transport of toxic, explosive, flammable, oxidizing, asphyxiating, and radioactive substances, typically including hydrogen, ammonia, diesel fuel, hydrazine, oxygen, nitrogen, other chemicals used at the plant, and the transport of radioactive waste and spent nuclear fuel.

A specific external human-induced impact is the potential occurrence of a radiation extraordinary event at other nuclear facilities located at the ETE1,2 site, involving releases of radioactive substances into the surroundings, or a radiation extraordinary event at any of the New NPP ETE units. This would primarily involve a severe accident at a nuclear facility at the ETE1,2 or New NPP ETE site.

As part of the assessment of other potential external human-induced impacts in the vicinity of the SMR ETE site, potential sources were screened in accordance with the requirements of the SÚJB Decree on nuclear facility siting, IAEA standards and recommendations, and the SÚJB Safety Guide, and potential sources of human-induced hazards in the vicinity of SMR ETE were identified.

The sources are divided into external (stationary and mobile) and internal (stationary and mobile) sources. External sources represent human activities outside the SMR siting area, while internal sources represent activities within the ETE1,2 site that could pose a hazard to SMR ETE. The stationary sources identified included stationary industrial and military facilities and forest stands that could represent potential hazard sources for the SMR. The mobile sources identified similarly included road and rail routes used to transport hazardous substances and aviation, pipeline, and water routes near the SMR. Potential hazard sources within 10 km of the SMR ETE siting area were analyzed.

Measures for radiation extraordinary event management: Organizational measures for radiation extraordinary event management are established at several levels. At the highest, national level, this is the National Radiation Emergency Plan; at the regional level, the Off-site Emergency Plan; and at the site level, the On-site Emergency Plan.

The National Radiation Emergency Plan is a strategic document prepared by the State Office for Nuclear Safety (SÚJB) in cooperation with the Ministry of the Interior, which establishes the organization of the state in responding to radiation accidents with consequences extending beyond the usual emergency planning zones or originating

outside the territory of the Czech Republic. The document constitutes the national framework for crisis management in the event of radiation accidents. It is a strategic plan that defines the responsibilities of public authorities, establishes principles for the protection of the population, coordinates cooperation between ministries, regions, and components of the Integrated Rescue System (IZS), addresses post-accident recovery of the affected area, and ensures links to international crisis-management cooperation systems.

The On-site Emergency Plan is a document containing a set of measures to ensure response preparedness and management of radiation extraordinary events within the nuclear facility site. Under the Atomic Act, an On-site Emergency Plan will be prepared for the SMR ETE site and will form part of the documentation for the licensed activity of nuclear facility construction. The On-site Emergency Plan for a nuclear facility is approved by SÚJB.

The Off-site Emergency Plan is a document containing a set of measures for managing extraordinary events within the emergency planning zone of the nuclear facility concerned. These measures are intended to ensure the protection of the population, the environment, livestock, property, and cultural assets. It is a non-public document accessible only to components of the Integrated Rescue System (IZS) and authorities involved in managing the extraordinary event concerned. The Off-site Emergency Plan forms part of the documentation of the Integrated Rescue System (IZS).

In accordance with the requirements of the Atomic Act and the Decree on details of ensuring radiation extraordinary event management, an emergency planning zone (ZHP) will be established for SMR ETE. This is an area surrounding the nuclear facility site in which, on the basis of analysis and assessment of a radiation extraordinary event, requirements apply for preparedness to implement urgent protective actions and other measures for the protection of the population as a result of anticipated exceedance of reference levels. Determination of the emergency planning zone will form an integral part of the SMR ETE construction licensing process and will be subject to approval by SÚJB.

Liability for nuclear damage: The liability of the nuclear facility operator for nuclear damage is established by Act No. 18/1997 Coll., on the Peaceful Utilization of Nuclear Energy and Ionizing Radiation (Atomic Act), as amended, and is also governed by the provisions of the Civil Code and by the Vienna Convention on Civil Liability for Nuclear Damage, by which the Czech Republic is bound. The nuclear facility operator is liable for proven nuclear damage up to CZK 8 billion (in the case of nuclear facilities for energy purposes, spent nuclear fuel storage facilities and repositories intended for such facilities, or nuclear materials arising from the processing of such fuel), or CZK 2 billion (in the case of other nuclear facilities and transport), and is required to maintain liability insurance at least in the minimum amount specified by law. The state provides a guarantee for the satisfaction of recognized claims for compensation for nuclear damage that are not covered by compulsory insurance.

International conventions governing liability for damage caused by nuclear accidents are divided into two international regimes:

- the Paris Convention on Third Party Liability in the Field of Nuclear Energy (Paris Convention) and the Brussels Convention Supplementary to the Paris Convention on Third Party Liability in the Field of Nuclear Energy (Brussels Supplementary Convention). Germany and Austria, among others, are signatories to the Paris and Brussels Conventions; however, Austria ultimately did not ratify either Convention and they are therefore not binding on Austria.
- The second international regime is the Vienna regime, comprising the Vienna Convention on Civil Liability for Nuclear Damage (Vienna Convention) and the Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage. The Vienna Convention establishes a nuclear liability and compensation regime similar to that established under the Paris Convention. The Vienna Convention is open for accession by any State. The Protocol to Amend the Vienna Convention improves the original Vienna Convention regime by requiring increased funds to compensate a greater number of victims through a higher compensation limit. Parties to the Vienna Convention include the Czech Republic, Slovakia, Hungary, and Poland.

The two regimes are linked by the Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention (Joint Protocol) and also by the Convention on Supplementary Compensation for Nuclear Damage. Parties to the Joint Protocol include the Czech Republic, Germany, Hungary, Poland, and Slovakia.

G.V.2. Non-radiological risks

From a non-radiological perspective, the SMR ETE Project essentially represents a conventional industrial operation that does not give rise to a significant risk of accident events with adverse consequences for the environment and/or population. During operation, accident situations involving releases of contaminated wastewater (due to loss of sewer system integrity or failure of the oily-water treatment plant), releases of stored substances (chemicals, motor fuels, lubricants and heat-transfer fluids, cleaning agents, etc.) from storage tanks or pipe bridges, or releases during transport cannot be completely excluded. The possibility of ignition of operating media or other materials likewise cannot be completely excluded.

The risks referred to above have a low probability of occurrence, and no special preventive or mitigation measures are required beyond those normally applied or prescribed by the relevant regulations (construction, safety, fire, transport, or other regulations), including the Major Accident Prevention Act. The consequences of events of this type can be managed using readily available means.

G.VI. Brief summary of the proposed measures to prevent or reduce adverse impacts

The basic measures incorporated into the Project to prevent, avoid, and reduce adverse impacts, or, where appropriate, compensate for them, cover the following areas:

- siting the Project outside specially protected areas and in an area with readily available infrastructure,
- use of the best available Generation III+ reactor technologies,
- ensuring nuclear safety, radiation protection, security of the nuclear facility and nuclear material, and measures for radiation extraordinary event management in accordance with the requirements of applicable Czech legislation, WENRA and IAEA recommendations, and other relevant industry standards,
- minimization of radiological impacts on the population, construction workers, and employees in accordance with the ALARA principle and, where relevant and justifiable, ALARP,
- minimization of demands on environmental resources and releases to the environment,
- compliance with all statutory provisions and standards relating to environmental and public health protection.

In addition to this basic framework of measures, specific measures are proposed on the basis of findings identified during preparation of this Documentation, aimed at providing additional protection for individual environmental components and public health; these measures will become part of the conditions of proceedings and administrative decisions during Project preparation, construction, and operation. Compliance with measures arising from applicable legislation and technical standards is also a matter of course.

G.VII. Overall summary

The extent of the impacts of the SMR ETE Project is predominantly local, determined by the extent of the areas required for siting the Project and their immediate surroundings. A wider extent of impacts may only occur through environmental outputs from the Project (typically radioactive and non-radioactive discharges to air and watercourses, noise, or other factors) and through visual impacts.

As regards radioactive discharges, given their very low levels, the impacts of radioactive discharges from other existing and planned nuclear facilities at the Temelín site, and the generally insignificant contribution of nuclear energy to population exposure, no significant adverse impacts of the Project are expected, even taking into account the combined (cumulative) effect of the other nuclear facilities at the site. The extent of the Project impacts will therefore correspond, both quantitatively and qualitatively, to that of the existing nuclear facilities at the site, whose impacts are insignificant (well within the permitted limits) and are subject to regular monitoring and control.

In terms of other factors, the site has sufficient space and capacity for the siting of a new power source. The separation distance between the Project and its individual components and residential areas or other protected areas (e.g. specially protected areas of nature conservation value) is sufficient to prevent adverse impacts or reduce them to an acceptable level. No significant change in the existing quality of the environment can therefore be expected as a result of the Project. Visual impact (i.e. impact on the landscape) must be regarded as a significant factor in terms of its extent. The Project will comprise spatially dominant structures. On the other hand, this impact is already present at the site as a result of the visual impacts of the existing ETE1,2 and also the planned New NPP ETE, whose structures are considerably larger. The extent of the area visually affected by the SMR ETE Project will therefore increase to an acceptable degree, while qualitatively remaining consistent with the existing situation.

Another significant factor identified is impacts on the qualitative characteristics of surface water. These impacts are already present in the area under current conditions, irrespective of the operation of the existing ETE1,2, which makes only a minor contribution in terms of water quality parameters. The contribution of ETE1,2 is manifested primarily in the concentration of wastewater relative to the abstracted raw water, and consequently in increased concentrations of individual water quality parameters. In terms of the balance, i.e. pollutant load, however, the impact is minor. This ratio will remain unchanged following the implementation of SMR ETE and New NPP ETE.

Noise impacts must also be included among the more significant impacts, both due to noise from the operation of the SMR ETE Project itself and due to the associated traffic on the wider road network, particularly during the Project construction period. This impact has also been present in the area for a long time as a result of overall background traffic, while the contribution of ETE1,2 (and, in the future, New NPP ETE) to total traffic volumes is very low and of low significance in acoustic terms.

As follows from the above data, no circumstances indicating potential significant adverse impacts of the Project on the environment, exceedance of the applicable statutory limits, or (where no limits are established) unacceptable impacts were identified in any of the areas assessed in preparing this Documentation (population and public health, air and climate, noise, radiation and other physical or biological characteristics, groundwater and surface water, soil, the geological environment and natural resources, fauna, flora and ecosystems, tangible assets and cultural heritage, transport infrastructure, or other areas).

Similar conclusions also apply to the assessment of Project risks. The analysis of the consequences of radiation extraordinary events shows that the risk acceptance criteria specified by SÚJB and WENRA will not be exceeded for representative cases of design basis accidents and a severe accident. The assessment also takes into account other potential risks associated with the natural characteristics of the site and risks associated with human activities at the site. Measures for radiation extraordinary event management are described.

The Project is (or will be) designed in accordance with the applicable regulations, in particular the requirements of the Atomic Act and related regulations. These also take into account the relevant climatic parameters (temperature, rainfall, snowfall and snow loads, icing, hail, lightning, flooding, and rare meteorological phenomena, including combinations thereof) and other design parameters (e.g. site seismicity). The Project is thus designed to withstand the relevant climatic and other loads. In this regard, the Project takes into account legislative requirements for periodic safety review, i.e. periodic reviews of climatic or other loads, thereby following the principles of adaptive management, i.e. readiness to take newly acquired knowledge into account on an ongoing basis, in accordance with the recommendation specified in the document Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (EU, 2013). This document also requires “no net loss” of biodiversity to be ensured. The Project will not result in degradation of ecosystem services, loss or degradation of natural habitats, loss of species diversity, or loss of genetic diversity.

All statutory and other requirements for the protection of the environment and public health applicable to the SMR ETE Project relate to the affected territory and population groups in its immediate vicinity. Both the affected territory (i.e. within the meaning of the Environmental Impact Assessment Act, “the territory whose environment and population could be significantly affected by implementation of the Project”) and the representative person (i.e. within the meaning of the Atomic Act, “an individual from the population representing a selected group of natural persons who are most exposed from a given source and through a given exposure pathway”) are located in the immediate vicinity of the Project location.

The nearest residential areas of the surrounding municipalities are only a few kilometers away. All requirements for the protection of the environment and public health are met even within this nearest area. By contrast, the Project is tens to hundreds of kilometers from the national borders of the neighboring countries, as follows:

- Republic of Austria 49 km,
- Federal Republic of Germany 59 km,
- Republic of Poland 191 km,
- Slovak Republic 198 km.

In this context, provided that the requirements of the Atomic Act and the requirements for the protection of the environment and public health are met in the nearest affected territory, significant transboundary impacts resulting from operation of the Project can therefore be excluded. This is demonstrated by the results of the assessment of radiological impacts on the representative person in the countries concerned. Similarly, in the event of radiation extraordinary events (design basis accident, severe accident), the intervention levels for the protection of the population (evacuation, sheltering, iodine prophylaxis) are not exceeded in the territories of the countries concerned; however, short-term measures to restrict agricultural production (placing food on the market) cannot be ruled out.

As follows from the above information, the direct impacts of the Project are limited to the Project area and its immediate surroundings, with no significant impacts on the wider area. The potential impacts of the Project on public health and on all components of the environment, including the combined effect of other facilities at the site and the environmental background, do not exceed the levels prescribed by the applicable legislation. The same applies to the associated environmental risks. The Project will therefore not result in damage to the environment or public health. Significant transboundary impacts are excluded.

No circumstances were identified during preparation of the Documentation in any area of the environment or public health that would, from an environmental perspective, prevent preparation, implementation, operation, or subsequent decommissioning of the assessed Project.

PART H
(ANNEXES)

PART H ANNEXES
Map, visual, graphical, and similar Annexes:
Statement of the nature conservation authority, where required pursuant to Section 45i(1) of the Nature and Landscape Conservation Act:

The Annexes are included after the main text of this Documentation.

List of Annexes:

Annex 1 Maps and Site Plans
- 1.1 Project location, ecological relationships in the area

Annex 2 Assessment of Impacts on Population
- 2.1 Assessment of impacts on public health
- 2.2 Assessment of radiological impacts
- 2.3 Assessment of the impacts of air pollution and noise exposure

Annex 3 Assessment of Impacts on Nature and Landscape
- 3.1 Biological assessment
- 3.2 Assessment of impacts on landscape character

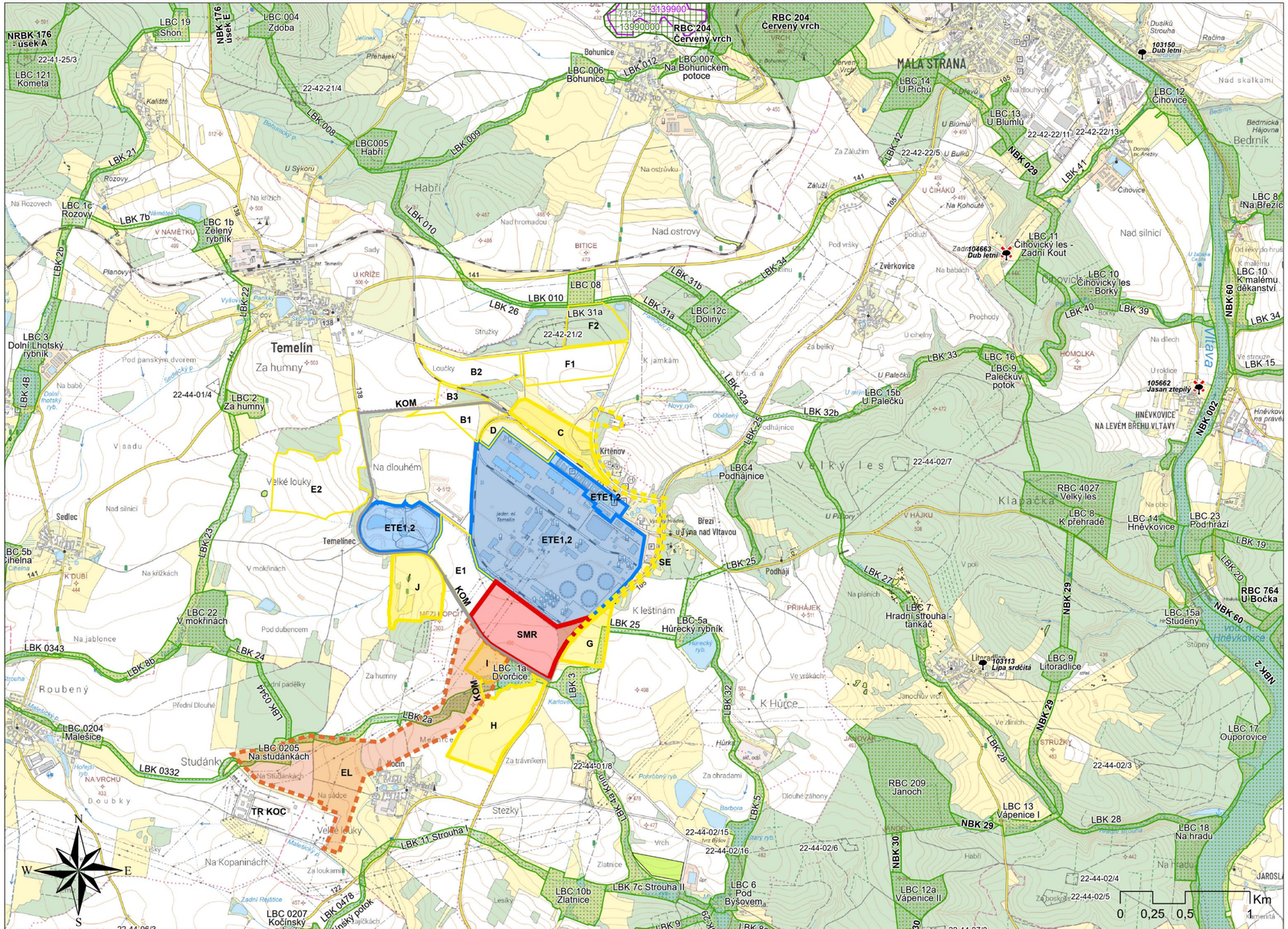
Annex 4 Assessment of Impacts on Surface and Groundwater
- 4.1 Assessment of impacts on surface water and groundwater

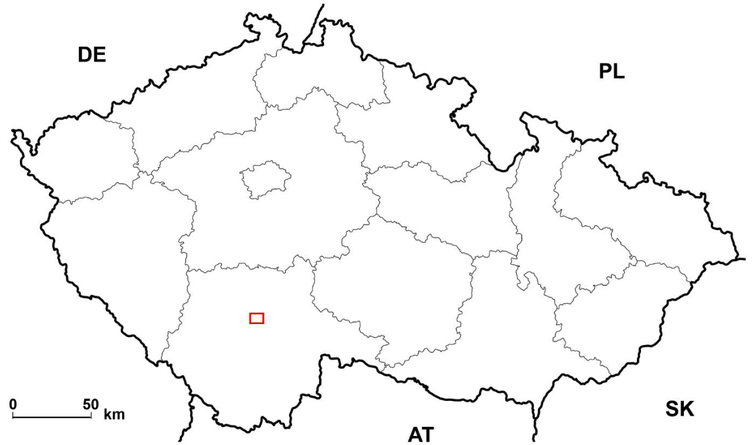
Annex 5 Other Areas of Assessment
- 5.1 Assessment of radiological impacts
- 5.2 Acoustic Study
- 5.3 Air Dispersion Study
- 5.4 Assessment of impacts of non-ionizing radiation

Annex 6 Documents
- 6.1 Statement of the nature conservation authority pursuant to Section 45i of Act No. 114/1992 Coll.
- 6.2 Information from the Ministry of the Interior of the Czech Republic on the system for protecting nuclear facilities against terrorist attacks
- 6.3 Information from SÚRAO on the management of RAO and VJP

END OF THE MAIN TEXT OF THE DOCUMENTATION

The reference list of sources used is provided in Chapter D.V.3. Source documents and sources, the date of preparation of the Documentation, the Documentation preparer, and the list of persons involved in preparing the Documentation are provided in its introductory part.





LEGEND

Project

- SMR siting area, main construction site
- existing Temelín NPP areas
- temporary construction-site facility areas
- other/reserve temporary construction-site facility areas
- power evacuation corridor
- construction-site power supply corridor
- ETE transport corridors (widening of Road No. 138, I-H connecting corridor, service road)

Nature conservation categories

- specially protected area (NNR, NR, NNM, NM)
- Natura 2000 - Site of Community Importance
- Natura 2000 - Special Protection Area
- ecologically significant landscape element (ESLE) designated in the public land register (LPIS)
- registered significant landscape feature
- nature park

Territorial system of ecological stability

- TSES designated in municipal land-use plans

Memorial trees and avenues

- memorial tree - solitary tree
- memorial tree - group
- memorial tree - protection revoked

Other land-use constraints

- inactive mining areas
- active mining areas
- deposit - non-reserved minerals
- deposit - reserved area
- protected deposit area
- undermined areas
- undermined areas
- water-source protection zone (Zones 1 and 2)
- water-source protection zone (Zone 1)
- areas with archaeological finds

Scale 1: 25,000

Appendix 1.1

(Project siting and ecological relationships in the area)

NEW SMR POWER PLANT
AT THE TEMELÍN SITE
EIA DOCUMENTATION

amentum

Assessment of Radiological Effects of Operation of SMR ETE

Final version 20 July 2026

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1 Risks associated with radiation exposure from nuclear power plant operation

1.1 Ionising radiation and its biological effects

Radiation is generally the **propagation of energy** through space. When it strikes an object, part of the energy transmitted may be transferred to the object and cause a range of physical, chemical, and biological changes.

Ionising radiation is radiation capable of directly or indirectly ionising atoms and molecules. Practical/regulatory limits vary depending on the purpose of the assessment.

Several types of ionising radiation are distinguished. Alpha radiation has high ionising power but low penetrating power and can be stopped by a sheet of paper or the skin. Beta radiation is more penetrating but can still be shielded relatively easily by thin layers of aluminium or plastic. Gamma and neutron radiation are among the most penetrating types and therefore require substantial shielding (lead, concrete, or water).

The basic types of ionising radiation are:

- **Alpha radiation** (helium particles, positive charge): high ionising power, low penetrating power, hazardous in the event of internal contamination.
- **Beta radiation** (electrons/positrons): moderate penetrating power, capable of causing superficial tissue damage, and also hazardous in the event of internal exposure.
- **Gamma radiation** (photon radiation): high penetrating power; the main source of external exposure.
- **Neutron radiation**: **It** is a type of **indirectly ionising particle radiation**, consisting of a stream of free neutrons with no electric charge. It is produced primarily in **nuclear reactions**, during the **fission of heavy nuclei**, in **nuclear reactors**, particle accelerators, or certain radionuclide processes.
- The **destructive effect** of ionising radiation on living matter consists in **damage to biomolecules, primarily DNA, proteins, and lipids** in the cell. This occurs in two ways: through a **direct effect**, in which electrons are ejected from chemical bonds, and an **indirect effect**, in which water molecules, which make up most of the cell content, are ionised first. This produces free radicals, particles with unpaired electrons that are highly reactive and readily react with biomolecules. Both effects usually occur simultaneously, and the type of radiation determines which is more significant. Direct effects are more significant in case of proton, neutron, and alpha radiation, while indirect effects are more significant for beta and gamma radiation.

The human body is a functional whole composed of individual tissues and organs that differ in their sensitivity to exposure to ionising radiation, known as **radiosensitivity**. A fundamental law

of radiobiology, formulated by the French radiologists **J. Bergonié** and **L. Tribondeau** as early as 1906, states that ***radiosensitivity*** *is directly* ***proportional to the mitotic activity of cells****. Radiosensitive tissues therefore include those containing poorly differentiated and actively dividing cells, whereas tissues with differentiated cells that divide little or not at all are classified as* ***radioresistant***.

Some organs and tissues can be broadly ranked in order of decreasing **radiosensitivity** as follows: lymphoid organs, active bone marrow, gonads, intestine, skin and epithelial linings (pharynx, oesophagus, stomach), lens of the eye, mature cartilage and bone, respiratory system, digestive glands, endocrine glands, muscles, and the central nervous system. Children are generally more sensitive than adults.

From the perspective of the mammalian organism as a whole, the effects of ionising radiation are divided into **deterministic**, which inevitably occur when a certain radiation dose is reached, and **stochastic**, for which the probability of damage increases with increasing dose. Current terminology **of the ICRP (International Commission on Radiological Protection)** prefers the term **harmful tissue reactions**, as it better reflects the biological nature of these effects. For the sake of terminological continuity and clarity, the traditional term ***deterministic effects*** **will continue to be used in this document.**

1. **Deterministic effects**

- occur only after a certain threshold dose has been exceeded; for whole-body exposure, the threshold dose for deterministic effects is 0.7 Gy; for localised exposure, the threshold dose for effects such as skin damage is 3–4 Gy; fertility decreases in men at doses above 0.5 Gy and in women at doses above 2 Gy**,**
- examples include radiation dermatitis, acute radiation syndrome, and damage to the lens of the eye,
- Under normal operation, deterministic effects in the public are not expected in view of the calculated doses.

2. **Stochastic effects**

- the probability of occurrence, rather than the severity, depends on the dose (the higher the dose, the higher the risk),
- the severity of the effect is independent of the dose – once the effect occurs (e.g. cancer), it has the same clinical severity regardless of whether it resulted from a low or high dose,
- the linear no-threshold model is a conservative regulatory model for radiation protection, rather than direct epidemiological evidence of an effect at every microdose; at low doses (in the range of **µSv/year–mSv/year**), the risk is statistically insignificant and cannot be distinguished from the natural incidence of disease.

Table 1 Comparison of deterministic and stochastic effects.

Property	Deterministic effects	Stochastic effects
Cause	Direct damage to a large number of cells	Damage to individual cells (DNA)
Threshold dose	Yes – the effect only occurs after a certain dose has been exceeded	No – the risk exists even at a very low dose
Relationship to dose	The severity of the effect increases with dose	The probability of the effect increases with dose
Severity of the effect	Depends on the dose (the higher the dose, the more severe the damage)	Independent of the dose – if the effect occurs, its severity is the same
Typical manifestations	Acute radiation syndrome, skin erythema, bone marrow damage, cataract	Cancer, genetic mutations (heritable)
Time course	Occur soon after exposure (hours, days, or weeks)	Occur after a latency period – years to decades
Description of health detriment	**Specific clinical damage to tissues/organs**	**Increased risk of cancer or a heritable disease**

The ultimate outcome of the effects of ionising radiation on cells and tissues is determined not only by the mechanisms of damage but also by the action of recovery mechanisms, known as **repair mechanisms**. Repair mechanisms play a more significant role in fractionated or protracted exposure.

At low doses, damage is often successfully repaired, whereas at high doses it accumulates and leads to cell death or mutations. The principal long-term risk is cancer.

1.2 Brief explanation of the main terms, quantities, and units

Radioactivity: A **property of substances, rather than a physical quantity**, describing the spontaneous transformation of atomic nuclei accompanied by the emission of ionising radiation (a natural phenomenon).

Activity: The number of nuclear transformations of a radionuclide per unit time. It is a **physical quantity** in the SI system.

Becquerel: The SI unit of activity. One becquerel [Bq] is equal to one nuclear transformation per second [1/s]. Specific activity is expressed in Bq per kilogram [Bq/kg], activity concentration in Bq/m^3 or Bq/l, and surface activity in Bq/m^2 or Bq/cm^2.

Dose: The amount of energy imparted to a substance by ionising radiation per unit mass. It describes the magnitude of the effects of ionising radiation.

Dose rate: The rate at which the dose changes. The unit is the gray per second [Gy/s], per hour [Gy/h], etc.

Gray: The SI unit of absorbed dose; 1 gray [Gy] is the absorbed dose at which a substance with a mass of 1 kg absorbs 1 joule [J/kg] of energy from ionising radiation.

Exposure (irradiation): being subjected to ionising radiation. Exposure may be either external or internal.

Exposure pathways: Pathways by which a radioactive substance may expose a person to radiation.

Equivalent dose: A quantity that takes account of differences in the effects of different types of ionising radiation on human tissue cells, expressed as the product of the dose and the radiation weighting factor for the relevant type of radiation. The greater the ionisation density, the greater the effects of the radiation and, accordingly, the higher the radiation weighting factor. For beta, gamma, and X-ray radiation, a dose of 1 mGy corresponds to an equivalent dose of 1 mSv; for alpha particles and neutrons, depending on their energy, a dose of 1 mGy corresponds to a higher equivalent dose in accordance with the radiation weighting factors for these types of radiation.

Effective dose: A quantity used to assess the exposure of the human body as a whole, even when the body is exposed non-uniformly. Effective dose is the sum of the tissue-weighted equivalent doses in specified organs and tissues. Annual exposure limits for individuals are specified in terms of this quantity. It is expressed in sieverts.

Sievert: The SI unit of equivalent and effective dose; 1 sievert [Sv] is, like 1 Gy, equal to 1 joule per kilogram [J/kg].

Gy and Sv are units of different quantities. The gray (Gy) expresses the physical effect of radiation, i.e. the absorbed dose, whereas the sievert (Sv) expresses the biological effect of radiation on the human body. Although both units have the dimension $J \cdot kg^{-1}$, they cannot be interchanged with one another.

External exposure: exposure of the human body caused by a source of ionising radiation located outside the body.

Internal exposure: exposure of the human body resulting from internal contamination by radionuclides taken into the body by inhalation or by consuming food and water. The measure of internal exposure is the effective dose that an individual receives from a radionuclide while it remains in the body. It is expressed by the quantity **committed effective dose**. The **committed effective dose** depends on the intake, i.e. the activity of the radionuclide that has entered the body via the given pathway. Following the intake of a radionuclide, the body is not exposed uniformly. Certain organs and tissues preferentially accumulate a given radionuclide, such as the thyroid gland,

which concentrates radioactive iodine. Organs and tissues at greater risk of damage are referred to as **critical organs**.

Representative person: a member of the public representing a model group of natural persons who receive the highest exposure from the given source and via the given pathway.

Lifetime cumulative effective dose from ionising radiation – the sum of all effective doses that an individual receives over their lifetime from various radiation sources (natural background radiation, medical examinations, occupational exposure, and emergency exposure) and from various external and internal sources.

Lifetime radiation exposure – When estimating lifetime radiation exposure, a conservative scenario assuming a constant annual effective dose over a period of 70 years is used in some situations. The lifetime dose is then determined as 70 times the annual dose. This approach is used primarily when assessing the long-term exposure of a representative person and is based on an assumed lifespan of 70 years.

1.3 Characteristics of the dose–effect relationship for ionising radiation

The **linear no-threshold (LNT) model** is used to assess the relationship between the dose and the effects of ionising radiation. It is based on the assumption that the risk of stochastic effects is directly proportional to the dose and that there is no safe threshold. This approach is conservative and is used as a precautionary measure to protect the public.

Risk characterisation is based on the probability of occurrence of stochastic effects. The ICRP states that the risk of fatal cancer is approximately 5% per 1 Sv of effective dose received. Lower values are assumed for non-fatal cancers and heritable effects.

A conservative procedure for estimating risk according to the ICRP, published in ICRP Publication 103 (ICRP 103, 2009), may be used to assess the stochastic effects of ionising radiation. This publication specifies risk coefficients for estimating **health detriment from the stochastic effects of low-dose radiation**.

Based on cancer incidence data, the detriment-adjusted nominal risk coefficients for cancer are **5.5×10^{-2} Sv^{-1}** for the whole population and **4.1×10^{-2} Sv^{-1}** for adult workers.

The probability coefficients for heritable diseases, adjusted for detriment affecting the first two subsequent generations, are **0.2×10^{-2} Sv^{-1}** for the whole population and **0.1×10^{-2} Sv^{-1}** for adult workers.

The total detriment-adjusted nominal risk coefficient for stochastic effects from exposure to low-dose-rate radiation is **5.7×10^{-2} Sv^{-1}.**

Because small risks are difficult to detect in epidemiological studies, the dose-specific risk estimates in ICRP Publication 103 are based primarily on acute doses of 200 mSv and above.

However, many of the more challenging issues in radiation protection involve continuous or fractionated exposures with individual fractions of a few mSv or less. Experimental research tends to support the finding that fractionated or protracted doses are associated with a lower risk, suggesting that dose-specific estimates derived from high doses received during acute exposure should be **divided by the dose and dose-rate effectiveness factor (DDREF)** when applied to low continuous or fractionated doses.

The dose and dose-rate effectiveness factor is an estimated factor that generally characterises the usually lower biological effectiveness per unit dose of exposure at low doses and low dose rates compared with exposure at high doses and high dose rates.

A **DDREF value of 2** is generally consistent with data from animal studies. Despite all the uncertainties, the ICRP recommends that a DDREF value of 2 continue to be used for radiation protection purposes (ICRP 103, 2009).

This uncertainty is the main reason why it is generally impossible to determine solely on the basis of epidemiological evidence whether or not radiation exposure of the order of several tens of mSv or less increases the risk of cancer.

In calculating the lifetime risk of health detriment, the same calculation algorithm (DDREF = 1) was used as in report (Kotulán, 2010) to allow the results to be compared.

Table 2 Detriment-adjusted nominal risk coefficients [μSv^{-1}] for stochastic effects from exposure to low-dose-rate radiation (ICRP 103, 2009), (ICRP, 1991).

Exposed population	Cancer		Heritable effects		Total	
	ICRP 103	ICRP 60	ICRP 103	ICRP 60	ICRP 103	ICRP 60
Whole population	5.5	6.0	0.2	1.3	5.7	7.3
Adults	4.1	4.8	0.1	0.8	4.2	5.6

Although there is still no direct evidence that parental exposure to radiation leads to an increase in heritable diseases in their offspring, it has been convincingly demonstrated that radiation causes heritable effects in experimental animals (according to the ICRP).

The risk of heritable effects therefore continues to be included in the system of radiation protection.

In its 2012 report, UNSCEAR stated that epidemiological evidence of health effects at effective doses below 100 mSv is limited and uncertain, making any increase in health risk at this level of exposure difficult to demonstrate (UNSCEAR, 2012).

It also states, among other things, that the uncertainties surrounding low doses are so great that UNSCEAR "**does not recommend multiplying very low doses by large numbers of individuals to estimate numbers of radiation-induced health effects within a population exposed to incremental doses at levels equivalent to or lower than natural background levels**."

At the effective doses typically received by the public in the vicinity of nuclear power plants, which are of the order of several μSv per year, the increase in the risk of **stochastic effects** is **entirely negligible** in statistical terms. Epidemiological studies of residents living near nuclear facilities have not confirmed an increased incidence of cancer when the plant is operating normally.

Under normal operation and at the exposure levels considered, deterministic effects are not expected because the doses remain well below the thresholds required for their occurrence. Risks are assessed using conservative models that deliberately overestimate potential radiation exposure to ensure an adequate level of protection for the public.

1.4 Principles and objectives of radiation protection

The main objective of radiation protection is to **protect people and future generations from the harmful effects of ionising radiation** by:

1. **Preventing deterministic effects** – i.e. protecting against doses so high that they would inevitably result in tissue damage (e.g. radiation burns or damage to the haematopoietic system).
2. **Limiting stochastic effects** – i.e. reducing the probability of cancer and heritable diseases to a level that is as low as reasonably achievable.
3. **Protecting the environment as well**, so that human health is not indirectly endangered.

The health objective of radiation protection is therefore to prevent deterministic effects and minimise the probability of stochastic effects. This is achieved through four principles: **justification, optimisation (ALARA), dose limitation, and security of source**.

Basic principles of radiation protection

Justification

- No use of ionising radiation may be introduced unless **its benefits outweigh the risks**.

Example: The operation of a nuclear power plant is acceptable from the perspective of radiation protection because radiation doses to workers and the public are consistently maintained well below the established limits and are further minimised in accordance with the ALARA principle. The lifetime cumulative dose from operation does not represent a significant increase in health risk compared with natural background radiation. The benefits of operating a nuclear power plant outweigh the potential risks, thereby satisfying the justification requirement.

Optimisation (ALARA – As Low As Reasonably Achievable)

- Radiation doses must be kept **as low as reasonably achievable**, taking into account technical capabilities and economic and societal factors.
- The objective is not merely to reduce the dose, but to achieve an **optimum balance between quality, cost, and protection**.

Dose limitation

- No one may be exposed to doses exceeding the **established limits**.
- These limits apply to radiation workers and the general public.
- Exception: patients undergoing examination or treatment are not subject to a dose limit because the dose is "justified by the therapeutic benefit". Patients are not subject to dose limits, but **reference levels** are used as an optimisation tool.

Security of source

The aim is to ensure that ionising radiation sources or radionuclides do not fall into unauthorised hands and are not misused.

This mainly concerns:

- the control and record-keeping of radioactive substances and sources (e.g. in hospitals, laboratories, and industry),
- the physical protection of facilities where sources are stored or used,
- the prevention of the loss or theft of sources ("orphan sources" pose a major risk when they are no longer under control),
- security during the transport of radioactive materials.

This principle therefore concerns **security** rather than **safety**, but is an integral part of the overall radiation protection system.

The principles of radiation protection constitute general conditions for carrying out activities associated with the use of nuclear energy and activities within exposure situations. They are laid down in **Section 62 of the Atomic Energy Act**, which states: ***"Any person carrying out an activity within a planned exposure situation shall limit the exposure of a natural person so that the total exposure caused by the combination of exposures arising from these activities is justified, optimised, and does not, in aggregate, exceed the exposure limits."*** (Česko, 2016).

1.5 Limits in radiation protection

The International Commission on Radiological Protection (ICRP) establishes recommended dose limits. These are implemented in the legislation of individual countries. Protection of the public in

the Czech Republic is enshrined in the Atomic Energy Act (Act No. 263/2016 Coll., as amended) and its implementing regulations, particularly Decree No. 422/2016 Coll., on Radiation Protection and Security of a Radionuclide Source (Česko, 2016), (Česko, 2016a).

An exposure limit is a quantitative indicator used to restrict the total exposure of a natural person arising from activities within planned exposure situations.

Exposure limits:

- **general limits for the public** – apply to exposure from all activities resulting in exposure, with the exception of the exposures referred to above, medical exposure, exposure of persons participating in interventions in the event of a radiation accident, and cases of exposure subject to special limits. These general limits apply to the average exposure in the critical group of the public from all exposure pathways and all activities,
- **limits for radiation workers** – apply to exposure incurred in direct connection with their work, i.e. by Category A or Category B workers,
- **limits for pupils and students** – apply to exposure knowingly and voluntarily incurred, after being informed of the associated risks, by persons undergoing specialised training for occupations involving sources of ionising radiation.

Basic general limits:

- **1 mSv per calendar year** for the sum of effective doses from external exposure and committed effective doses from internal exposure,
- **15 mSv per calendar year** for the equivalent dose to the lens of the eye,
- **50 mSv per calendar year** for the average equivalent dose to any 1 cm^2 of skin, irrespective of the size of the exposed area.

Basic limits for radiation workers:

- **20 mSv per calendar year** for the sum of effective doses from external exposure and committed effective doses from internal exposure, or a value approved by the State Office for Nuclear Safety pursuant to Section 63(4) of the Atomic Energy Act. However, the dose must not exceed **100 mSv** over five consecutive calendar years or **50 mSv** in any single calendar year,
- **100 mSv** over five consecutive calendar years for the equivalent dose to the lens of the eye, with a maximum of **50 mSv** in any single calendar year,
- **500 mSv** per calendar year for the average equivalent dose to any 1 cm^2 of skin, irrespective of the size of the exposed area.

The limits for radiation workers apply to occupational exposure, i.e. exposure incurred in direct connection with the work performed.

The limits for radiation workers apply to the sum of doses from all exposure pathways and all work activities performed by a radiation worker, whether for a single licensee, concurrently for several licensees authorised to handle sources of ionising radiation, or as an independent holder of an authorisation to handle sources of ionising radiation.

The limits for radiation workers are deemed not to be exceeded if the quantitative indicators expressed in measurable quantities (hereinafter referred to as "derived limits") are not exceeded.

Derived limits for external exposure:

- **500 mSv** per calendar year for the **personal dose equivalent at a depth of 0.07 mm**,
- **20 mSv** per calendar year for the **personal dose equivalent at a depth of 3 mm**,
- **20 mSv** per calendar year for the **personal dose equivalent at a depth of 10 mm**.

Derived limits for internal exposure in a calendar year resulting from radionuclide intake:

- by ingestion:
  - the **value obtained by dividing 20 mSv by the ingestion dose coefficient h_{ing}** for the relevant radionuclide taken in by a radiation worker,
- by inhalation:
  - the **value obtained by dividing 20 mSv by the inhalation dose coefficient h_{inh}** for the relevant radionuclide taken in by a radiation worker.

The Atomic Energy Act, i.e. Act No. 263/2016 Coll., introduced a requirement to establish **dose constraints (DCs)**.

A dose constraint is an upper bound on prospective individual doses established for the purposes of optimising radiation protection for the relevant source in a planned exposure situation.

When establishing dose constraints for a radiation practice or a source of ionising radiation, the following must be taken into account:

- previous experience with similar activities and sources of ionising radiation, so that the level of radiation protection is not lower than that already achieved,
- the effects of other activities and sources of ionising radiation, so that there is no risk of the exposure limits being exceeded.

For the relevant source, this constitutes the upper bound for optimisation. The upper dose constraint may be compared to an annual investigation level (it is not a limit!). If the dose constraint is exceeded, the reason for the exceedance is investigated, since an exceedance is not expected under normal circumstances.

Dose constraints are established:

- for radiation workers – by the licensee,
- for the public – by the regulatory body.
-

Any person carrying out activities within a planned exposure situation is required, for the purposes of optimising public exposure, to comply with the dose constraint of **0.25 mSv/year** for the representative person.

Pursuant to Section 82(1) of Act No. 263/2016 Coll., the Atomic Energy Act, as amended by Act No. 83/2025 Coll., a dose constraint of 0.25 mSv per calendar year for the representative person is used in the optimisation of radiation protection of the public. In the case of a nuclear power facility, this dose constraint applies collectively to all nuclear facilities within the relevant nuclear facility siting area. At the same time, a value of 0.20 mSv per year is established for discharges of radioactive substances to the atmosphere and 0.05 mSv per year for discharges to surface water (Česko, 2025).

At the same time, the following applies to a nuclear power facility:

- **0.20 mSv/year** for discharges to the atmosphere,
- **0.05 mSv/year** for discharges to surface water.

Authorisations for the discharge of radioactive substances during normal operation are issued to operators by the State Office for Nuclear Safety (SONS). Models of radionuclide dispersion in the environment and models for calculating doses to humans are used to determine the effective dose equivalent for residents living closest to a nuclear power plant. SONS has established **authorised limits** for both nuclear power plants in the Czech Republic. For the Temelín NPP (ETE1,2), these are:

- **10 µSv/year** for gaseous discharges,
- **4 µSv/year** for liquid discharges.

1.6 Individual components of radiation exposure of the public

Since the formation of the Earth, its environment, including all living organisms, has been exposed to ionising radiation from both outer space and radioactive material contained in the Earth's crust and core. Radioactivity is an integral part of the Earth and has always existed. Naturally occurring radioactive materials are present in the Earth's crust, in the floors and walls of our homes, schools, and offices, and in the food we eat and the water we drink. Radioactive gases are present in the air we breathe. Our own bodies – muscles, bones, and tissues – contain naturally occurring radioactive elements.

The **effective dose** from external exposure and the **committed effective dose** from internal contamination received by a person are used to assess the extent of the overall effects.

The total effective dose from external exposure and the committed effective dose from internal contamination will collectively be referred to as **total radiation exposure** (or radiological exposure).

Depending on the location of the source of ionising radiation, two categories are distinguished:

- radiation exposure from external exposure,
- radiation exposure from internal contamination (internal exposure).

Depending on the origin of the source of ionising radiation, a further distinction is made between:

- radiation exposure from natural sources of ionising radiation,
- radiation exposure from artificial sources of ionising radiation.

Table 3 Main natural sources of radiation exposure of the public.

Exposure source	Radiation exposure		
	Internal exposure		External exposure
	inhalation/ingestion	Inhalation of Rn	
Natural radionuclides (terrestrial radionuclides)	Internal exposure to terrestrial radionuclides (excluding Rn)	Internal exposure to radon ^{222}Rn and its decay products	External exposure to terrestrial radionuclides
		Internal exposure to radon ^{220}Rn and its decay products	
Cosmic radiation and cosmogenic radionuclides	Internal exposure to cosmogenic radionuclides	Internal exposure to cosmogenic radionuclides	Cosmic radiation

1.6.1 Radiation exposure from natural sources of ionising radiation

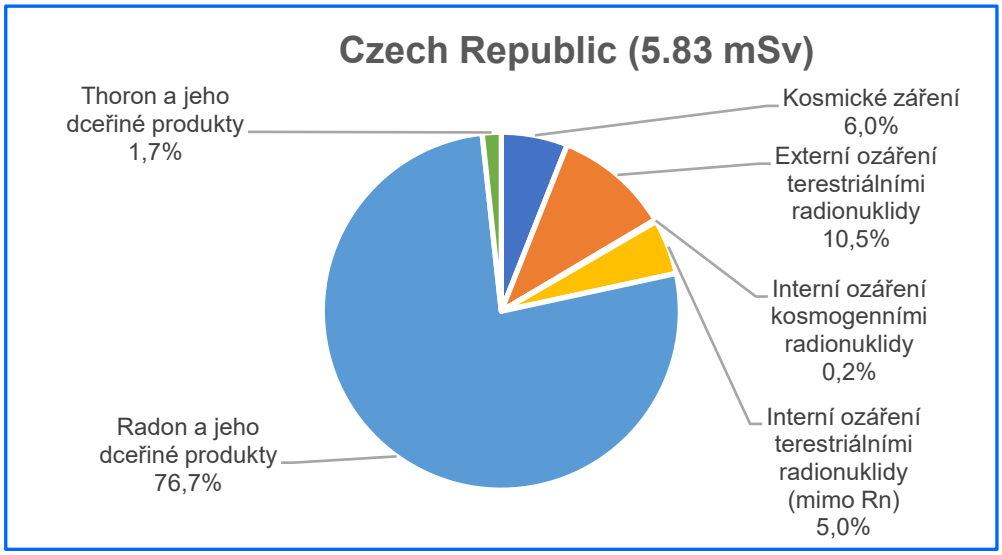
The dose from cosmic radiation depends primarily on altitude, so low-lying countries, such as the Netherlands, Denmark, and the Baltic States, are less affected than Turkey, Switzerland, or Austria. The average effective dose from cosmic radiation is estimated at 0.34 mSv/year for the EU and **0.38 mSv/year** worldwide. For European countries, it ranges from 0.31 mSv/year in Denmark, Estonia, Finland, Ireland, Latvia, the Netherlands, and Sweden to 0.41 mSv/year in Switzerland and 0.42 mSv/year in Turkey. **For the Czech Republic, it is estimated at 0.35 mSv/year.** The effective dose from external exposure to terrestrial radionuclides is estimated at **0.61 mSv/year** (Cinelli, 2019). The average annual effective dose per capita from natural background radiation therefore totals approximately **1 mSv per year** (0.96 mSv), which corresponds to an ambient dose equivalent rate of approximately **115 nSv/h**.

In the case of exposure from natural radionuclides, the greatest radiation exposure is caused by internal contamination with **radon** and its decay products. In the following sections of this document, the term “radon” will be used for the isotope ^{222}Rn, which is the most significant in this context. The term “thoron” denotes the isotope ^{220}Rn.

Doses from radon and its decay products are the main contributors to exposure in European countries, accounting for approximately 60% of the total dose of 3.2 mSv/year in Europe, compared with approximately 50% of the average worldwide total dose of 2.4 mSv/year. The estimated effective dose from internal contamination with radon and its decay products in the Czech Republic is **4.47 mSv/year.** In Europe, the estimated total radiation exposure from natural sources ranges from 1.48 mSv/year in the Netherlands to **5.83 mSv/year** in the Czech Republic and 6.16 mSv/year in Finland (Cinelli, 2019).

Table 4 Estimated average annual effective dose [mSv] per capita from natural background radiation in selected countries (Cinelli, 2019).

Country	Average annual effective dose [mSv] per capita from natural background radiation						
	External exposure		inhalation/ingestion		Inhalation of Rn		Total
	Cosmic radiation	External exposure to terrestrial radionuclides	Internal exposure to cosmogenic radionuclides	Internal exposure to terrestrial radionuclides (excluding Rn)	Radon ^{222}Rn and its decay products	Radon ^{220}Rn and its decay products	
Czech Republic	**0.35**	**0.61**	**0.01**	**0.29**	**4.47**	**0.1**	**5.83**
USA	0.33	0.2	0.01	0.29	2.18	0.1	**3.11**
EU	0.34	0.5	0.01	0.29	1.96	0.1	**3.20**
World	0.38	0.48	0.01	0.29	1.15	0.1	**2.41**



Thoron a jeho dceřinné produkty	Thoron and its decay products
Kosmické záření	Cosmic radiation
Externí ozáření terestriálními radioniklidy	External exposure to terrestrial radionuclides
Interní ozáření kosmogenními radionuklidy	Internal exposure to cosmogenic radionuclides

Interní ozáření terestriálními radionuklidy (mimo Rn)	Internal exposure to terrestrial radionuclides (excl. Rn)
Radon a jeho dceřinné produkty	Radon and its decay products

Fig. 1 Percentage contribution of the weighted annual average effective dose [%] from the various natural radiation sources to the total effective dose in the Czech Republic[1] (Podzimek, 2024).

The tables and figure above show that radon and its decay products account for the predominant proportion of radiation exposure from natural sources in the Czech Republic.

1.6.2 Radiation exposure from natural sources in the Temelín area of interest

- **External exposure**

The primary source comprises data from the Monitoring of the Radiation Situation in the Czech Republic (**MonRaS**), performed mainly through the nationwide **Radiation Monitoring Network** – the Early Warning Network and the integral measurement network.

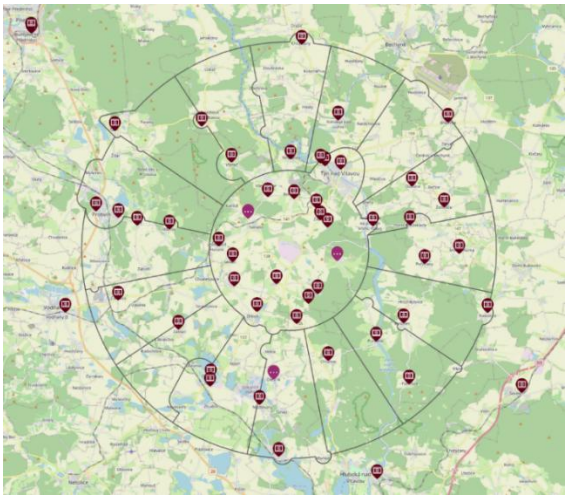


Fig. 2 Location of MonRaS measurement points in the vicinity of the Temelín NPP.

Table 5 Average quarterly ambient dose equivalent rate values in [nSv/h] measured by the local integral measurement network (TLDs) in the vicinity of the Temelín NPP and in the Czech Republic in 2025 (SÚJB, 2026b).

Measuring site	1st quarter	2nd quarter	3rd quarter	4th quarter
Dívčice	132	127	131	138
Hluboká nad Vltavou	114	121	130	124

[1]This is a weighted average of the values for the individual settlements, weighted by the population of each settlement.

Litoradlice	117	119	123	128
Mydlovary	128	120	132	129
Olešník	120	124	131	125
Protivín	150	149	157	157
Radonice	116	120	120	126
Ševětín	156	157	156	167
Temelín	117	119	124	125
Týn nad Vltavou	133	129	132	138
Vodňany	135	140	142	143

Czech Republic				
Brno	115	115	118	124
Brno b	132	135	140	135
České Budějovice	128	132	125	138
České Budějovice b	159	154	161	156
Hradec Králové	100	93	92	99
Hradec Králové b	101	100	97	102
Jihlava	116	122	127	130
Jihlava b	162	162	168	163
Karlovy Vary	131	136	139	136
Czech Republic				
Measuring site	**1st quarter**	**2nd quar-ter**	**3rd quarter**	**4th quarter**
Karlovy Vary b	82	76	78	81
Liberec	169	171	168	179
Liberec b	155	156	157	167

Olomouc	88	88	90	94
Olomouc b	107	104	110	109
Ostrava – Syllabova	93	100	90	109
Ostrava – Syllabova b	157	158	161	160
Pardubice	99	101	93	106
Plzeň	108	107	106	110
Plzeň b	121	123	123	128
Prague 1 – SONS	108	106	100	105
Prague 1 – SONS b	117	119*	–	125
Prague 4 – SÚRO	112	114	108	114
Prague 4 – SÚRO b	126	121	120	126
Ústí nad Labem – Habrovice	79	77	80	81
Ústí nad Labem – Habrovice b	137	122	121	136
Zlín	97	102	109	104
Zlín b	85	94	94	97

Table 5 presents the results of monitoring in the vicinity of the Temelín NPP, conducted by SONS, as reported in the SONS Annual Report for 2025 (SÚJB, 2026b).

In 2025, the average quarterly ambient dose equivalent rate values (ADER) in the vicinity of the Temelín NPP ranged from **114 to 167 nSv/h**. The lowest value was measured at **Hluboká nad Vltavou** in the first quarter (114 nSv/h), and the highest at **Ševětín** in the fourth quarter (167 nSv/h). For comparison, values ranging from **76 nSv/h** (Karlovy Vary b) to **179 nSv/h** (Liberec) were recorded across the territorial integral measurement network in the Czech Republic (SÚJB, 2026b).

The results obtained to date show that the measured values exhibit certain fluctuations caused primarily by the location, seasonal effects, changes in weather, etc. The values measured at the point of interest fall within the stated range of values for the Czech Republic as a whole.

No exceedances of monitoring levels were recorded during 2025. The measurement results obtained from the Early Warning Network (EWN) and the territorial network of thermoluminescent dosimeters (TLDs) in 2025 were comparable, as in previous years.

The average ambient dose equivalent rate at the Temelín measuring site in 2025 was **121.3 nSv/h**. Assuming continuous residence at the location, this value corresponds to an annual ambient dose equivalent of approximately **1.06 mSv**. Since, for photon radiation under external exposure conditions, the ambient dose equivalent may be considered approximately equal to the effective dose for the purposes of an indicative assessment, the measured dose rate corresponds to an effective dose of approximately **1.06 mSv per year**.

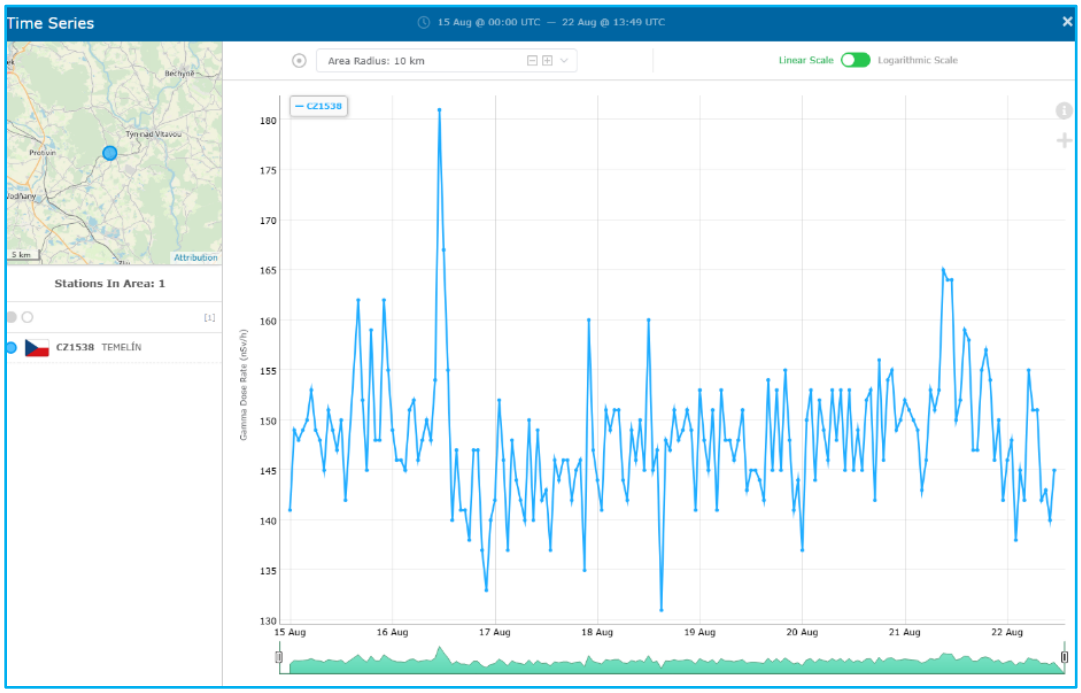


Fig. 3 Photon dose equivalent rate (PDER) at the Temelín site according to the European EURDEP database for the period 15–22 August 2025.

Fig. 3 shows the time course of the ambient dose equivalent rate H(10) measured by an automatic monitoring station at the Temelín site. The data were obtained from the EURDEP database (European Radiological Data Exchange Platform) and processed as a time series of values in units of $nSv \cdot h^{-1}$ for the monitored period in 2025. The selected period is considered to be representative for assessing the radiation situation at the site because it includes normal operating conditions and captures seasonal changes in the natural radiation background. The observed fluctuations in dose-rate values correspond mainly to natural changes in the radiation background, particularly the effects of meteorological conditions and the variable presence of natural radionuclides in the environment.

- **internal contamination**

The Temelín site is located in an area with a medium radon index, which expresses the radon potential of the geological bedrock. However, the actual exposure of residents to radon primarily depends on the radon concentration in the indoor air of buildings and therefore cannot be determined directly from the radon index. According to national data on public exposure, inhalation of

radon (^{222}Rn), thoron (^{220}Rn), and their decay products results in an average annual effective dose of approximately **4.57 mSv**. The contribution from inhalation and ingestion of other natural terrestrial radionuclides is approximately 0.3 mSv per capita per year.

The total annual **radiation exposure from natural sources** at the Temelín site can be estimated at **5.93 mSv per year**, which is also consistent with the estimated value for the Czech Republic as a whole (**5.83 mSv**) (Cinelli, 2019).

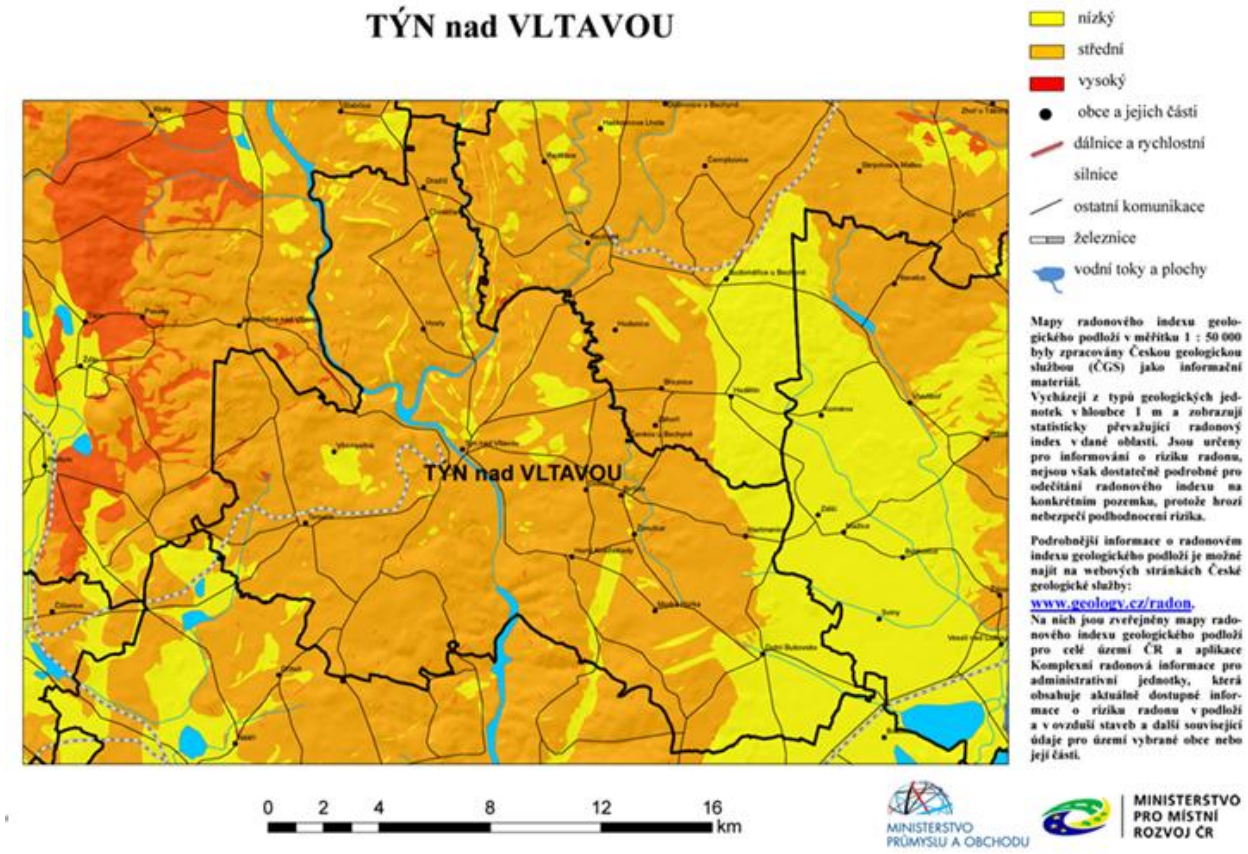


Fig. 4 Radon index in the Týn nad Vltavou area (ČGS, mapy.geology.cz/radon/, 2023).

TÝN nad VLTAVOU	TÝN nad VLTAVOU
Nízký	Low
Střední	Medium
Vysoký	High
Obce a jejich části	Municipalities and their parts
Dálnice a rychlostní silnice	Motorways and expressways
Ostatní komunikace	Other roads

Železnice	Railways
Vodní toky a plochy	Watercourses and bodies of water
Mapy radonového indexu geologického podloží v měřítku 1 : 50 000 byly zpracovány Českou geologickou službou (ČGS) jako informační materiál.	Radon index maps of the geological bedrock at a scale of 1 : 50,000 were prepared by the Czech Geological Survey (CGS) for information purposes.
Vycházejí z typu geologických jednotek v hloubce 1 m a zobrazují statisticky převažující radonový index v dané oblasti. Jsou určeny pro informování o riziku radonu, nejsou však dostatečně podrobné pro odečítání radonového indexu na konkrétním pozemku, protože hrozí nebezpečí podhodnocení rizika.	They are based on the type of geological units at a depth of 1 m and show the statistically prevailing radon index in the relevant area. They are intended to provide information on radon risk but are not sufficiently detailed to determine the radon index for a specific plot of land, as this could result in the risk being underestimated.
Podrobnější informace o radonovém indexu geologického podloží je možné najít na webových stránkách České geologické služby: www.geology.cz/radon	More detailed information on the radon index of the geological bedrock is available on the website of the Czech Geological Survey: www.geology.cz/radon
Na nich jsou zveřejněny mapy radonového indexu geologického podloží pro celé území ČR a aplikace Komplexní radonová informace pro administrativní jednotky, která obsahuje aktuálně dostupné informace o riziku radonu v podloží a v ovzduší staveb a další související údaje pro území vybrané obce nebo její části.	The website provides radon index maps of the geological bedrock for the entire Czech Republic and the Comprehensive Radon Information for Administrative Units application, which contains currently available information on radon risk in the bedrock and indoor air of buildings, together with other related data for the territory of a selected municipality or part thereof.

1.6.3 Radiation exposure from artificial sources of ionising radiation

- **external exposure**

Radiation exposure from artificial sources of ionising radiation primarily includes exposure from the following areas:

- **medical examinations** – diagnostic procedures such as X-rays, CT scans, or nuclear medicine,

- **operation of nuclear power and research reactors** – such as Dukovany, Temelín, and the research reactors at Řež and Prague,
- **mineral extraction and remediation of uranium sites,**
- **other industrial sources (food irradiation and sterilisation),**
- **fallout from nuclear accidents and atmospheric nuclear tests.**

In the first decade of the twenty-first century, the annual effective dose per capita worldwide from medical exposure was **0.62 mSv**, predominantly as a result of diagnostic X-ray examinations. Diagnostic nuclear medicine examinations accounted for only 5%. The situation in the Czech Republic is described in the 2021 SONS publication Assessment of Medical Exposure (Petrová, 2021).

The population dose from medical exposure in the Czech Republic was updated for 2019, taking account of the current frequency of individual examinations, and amounts to **1.16 mSv** per capita. The average annual effective dose per capita from nuclear medicine in the Czech Republic can be estimated at approximately **0.1 mSv**, while the average annual effective dose from medical applications is estimated at approximately **1.3 mSv**.

The assessment of **radiation exposure from industrial applications** in the Czech Republic is regularly reported in the SONS annual reports (SÚJB, 2026b). The **2025 Annual Report** states:

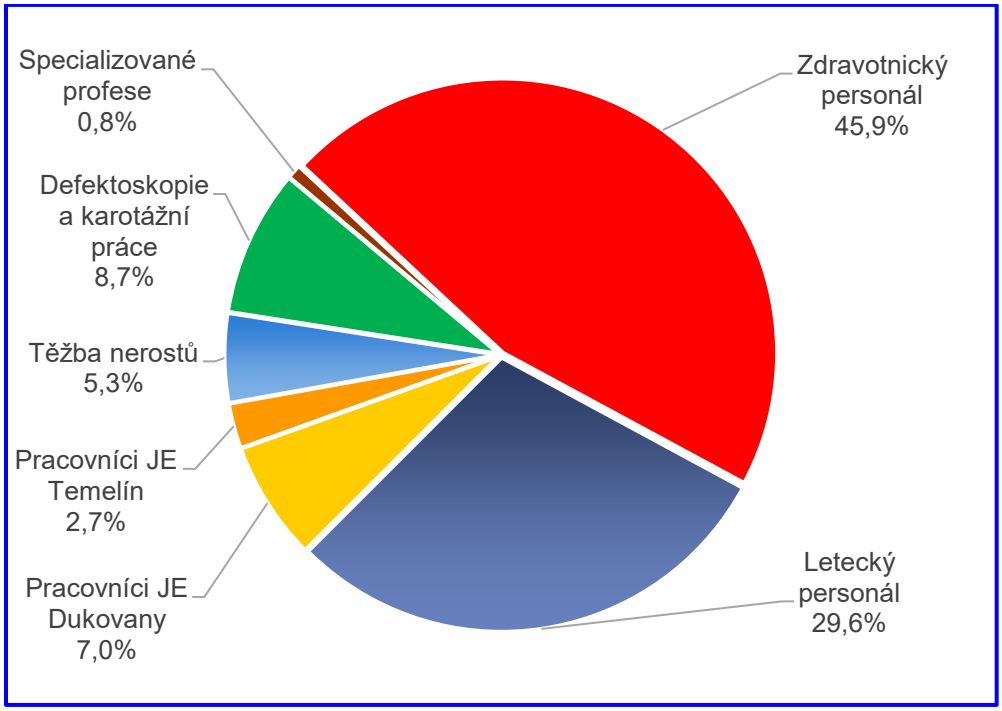
A total of 19,584 workers were monitored by dosimetry services in 2025. The decrease in the number of monitored radiation workers compared with 2024 (21,581 workers) is due to dosimetry services having ceased reporting the doses of Category B radiation workers monitored using personal dosimeters with a three-month evaluation period. Reporting the doses of these workers had not previously been mandatory either; nevertheless, until 2024 these doses were reported and entered, together with the doses of Category A radiation workers, in the Central Register of Occupational Exposure (CRPO) maintained by SONS. Effective doses:

- At the Dukovany NPP, 3,027 radiation workers were monitored, comprising 1,155 ČEZ, a. s., employees and 1,872 contractor employees. The total annual collective effective dose was **972.31 mSv** (including all doses exceeding 0.001 mSv), of which **154.94 mSv** was received by ČEZ, a. s., employees and **817.37 mSv** by contractor employees. The highest annual individual effective dose was **5.06 mSv** for a ČEZ, a. s., employee and **8.14 mSv** for a contractor employee.
- At the Temelín NPP, 2,545 radiation workers were monitored, comprising 969 ČEZ, a. s., employees and 1,576 contractor employees. The total annual collective effective dose was **195.19 mSv** (including all doses exceeding 0.001 mSv), of which **57.26 mSv** was received by ČEZ, a. s., employees and **137.93 mSv** by contractor employees. The highest annual individual effective dose was **1.49 mSv** for a ČEZ, a. s., employee and **2.71 mSv** for a contractor employee.
- At DIAMO, s. p., workplaces where activities associated with the extraction of radioactive minerals are carried out, a total of 835 radiation workers were monitored. Of these, 574 were Category B workers and 261 were Category A workers. The annual collective

effective dose of Category A workers was **0.5 Sv**, the average annual individual effective dose was **1.9 mSv**, and the highest annual individual effective dose was **11.57 mSv**.

- 864 workers were monitored in other industrial applications, with an average annual individual effective dose of **0.69 mSv**; occupations monitored by SONS over the long term include industrial radiography (**0.52 mSv**) and well logging (**0.31 mSv**).
- At healthcare workplaces using sources of ionising radiation, doses were evaluated for 10,326 workers, more than 70% of whom had an annual individual effective dose below the recording level (0.1 mSv); the average annual individual effective dose of the remaining workers was **1.53 mSv**, while the average annual individual effective dose of physicians performing interventional procedures was **2.40 mSv**.
- Workers in specialised occupations, such as servicing and inspecting sources of ionising radiation, numbering 4,870 in total, received an average annual individual effective dose of **0.23 mSv**.
- In 2025, the total annual collective effective dose was evaluated at **8.08 Sv** and the average individual effective dose per monitored worker at **0.36 mSv**.

To date, the most significant occupational group whose doses are routinely evaluated in this field has comprised **aircrew on board aircraft flying at altitudes above 8 km**. In aviation, 2,026 workers were monitored in 2024 (the latest data available; there were 1,119 in 2021, 1,486 in 2022, and 1,613 in 2024). The maximum effective dose received by a worker in this occupational group ranged from **0.55 to 2.56 mSv/year** (the maximum dose in 2023 was **2.53 mSv/year**). No person with a dose exceeding 6 mSv/year was reported to the Central Register of Occupational Exposure.



Specializované profese	Specialized professions

Zdravotnický personal	Healthcare staff
Defektoskopie a karotážní práce	Flaw detection and logging
Těžba nerostů	Minerals mining
Pracovníci JE Temelín	Temelín NPP staff
Pracovníci JE Dukovany	Dukovany NPP staff
Letecký personal	Aviation staff

Fig. 5 Approximate contributions of the individual monitored groups to the collective dose in 2020 (according to the latest available data) (Podzimek, 2024).

Compared with the total collective dose to patients from medical exposure, the contribution from industrial applications (including nuclear power plant operation and aviation) is **less than 1‰ (one thousandth)**.

- **Internal exposure**

Large quantities of artificial radionuclides were discharged into the environment during the era of atmospheric nuclear testing. Significant quantities of radioactive material also entered the environment during the nuclear reactor accidents at Chernobyl and Fukushima.

Low activity levels of ^{137}Cs, which entered the environment primarily following the Chernobyl accident and atmospheric nuclear weapons testing, are still measurable in monitored environmental and food-chain items and in the human body; the measured ^{137}Cs activity levels now remain almost unchanged. In 2025, as in several preceding years, the ^{137}Cs content of many samples was below the detection limit.

Very low activity levels of ^{90}Sr, ^{239}Pu, and ^{240}Pu in the air and of ^{90}Sr in milk and mixed diet samples are also measurable during certain periods; these originate primarily from nuclear weapons testing.

In 2025, no significant activity levels of artificial radionuclides were detected in the air in the Czech Republic; the measured values (^{137}Cs and ^{131}I) did not differ from their long-term averages or from the usual levels of artificial radionuclides in the environment.

No unusual activity levels of artificial radionuclides were detected in other European countries either.

1.6.4 Radiation exposure from artificial sources in the Temelín area of interest

The Temelín NPP report entitled “Results of Monitoring of Discharges and the Radiation Situation in the Vicinity of the Temelín Nuclear Power Plant in 2025” evaluates the monitoring of

atmospheric discharges and the percentage of the authorised limit used, as calculated using the RDETE software, which takes account of the actual meteorological situation at the Temelín NPP site in 2025 and the relevant radionuclide intake pathways. (SÚJB, 2026b)

The sum of the effective dose from external exposure and the committed effective dose from internal exposure calculated in this manner was highest for children aged 0–5 years in the municipality of Litoradlice (3–5 km east of the NPP), amounting to **0.025 μSv**; this constituted **0.25%** of the annual authorised limit of **10 μSv**.

^{14}C discharges accounted for the largest proportion (**78.27%**) of total atmospheric discharges. Balance measurements of radionuclide activity in liquid discharges from the Temelín NPP confirm that the annual authorised limit of 4 μSv for liquid discharges was not exceeded in 2025. When calculating the percentage of the annual authorised limit used for discharges to watercourses, the RDETE software enables the actual hydrological situation and the relevant exposure pathways to be taken into account.

The calculated sum of the effective dose from external exposure and the committed effective dose from internal exposure was highest for children aged 0–5 years in the populated area of **Dvůr Újezd**, 5–7 km north of the discharge point, amounting to **0.995 μSv**; this constituted **24.88%** of the authorised limit of 4 μSv. ^{3}H discharges accounted for **99.48%** of total liquid discharges (SÚJB, 2026b).

Table 6 Overview of monitored environmental and food-chain items in the vicinity of the Temelín NPP in 2024 (data provided by SONS and SÚRO) (SÚJB, 2026b).

^{137}Cs				
Monitored item	**Unit**	**Highest value**	**Total number of measurements**	**>MSA**
aerosols[1])	Bq/m³	$<3.8 \cdot 10^{-6}$	52	0
fallout	Bq/m²	<0.358	24	0
soil	Bq/kg	33.7	4	4
soil – in situ	Bq/m²	679.9	24	24
sediments	Bq/kg	10.2	2	2
drinking water	Bq/l	<0.170	4	0
surface water	Bq/l	<0.012	22	0
groundwater – boreholes	Bq/l	<0.018	31	0
raw cow's milk	Bq/l	<0.153	26	0
forest fruits	Bq/kg	2.056	1	1

fruit	Bq/kg	<0.082	1	0
agricultural crops	Bq/kg	<0.090	4	0
fish	Bq/kg	<0.079	2	0

^{90}Sr

Monitored item	Unit	Highest value	Total number of measure-ments	>MSA
aerosols[2])	Bq/m³	$<1.932 \cdot 10^{-7}$	1	0
surface water – water-courses	Bq/l	$11.6 \cdot 10^{-3}$	4	0
raw cow's milk[3])	Bq/l	<0.061	1	0
soil[4])	Bq/kg	<3.151	1	0

^{3}H

Monitored item	Unit	Highest value	Total number of measure-ments	>MSA
rainwater	Bq/l	<2.9	12	0
surface water – water-courses	Bq/l	122.1	40	15
surface water – reservoirs	Bq/l	<2.9	4	0
drinking water	Bq/l	<2	18	0
groundwater – boreholes	Bq/l	<2	6	0

^{131}I

Monitored item	Unit	Highest value	Total number of measure-ments	>MSA
gaseous iodine	Bq/m³	$< 0.345 \cdot 10^{-3}$	52	0

Notes:

- Activity concentration, surface activity, and specific activity of radionuclides in environmental compartments and food chains (including in situ measurements) – sampling and

measurements by the Temelín NPP Environmental Radiation Monitoring Laboratory – results taken from the Temelín NPP report (SÚJB, 2026b).
- MSA refers to the minimum significant activity.

1) Composite measurements are performed on samples from 8 sampling sites. If the investigation level is exceeded, the individual samples are measured separately.

2) The composite annual sample consists of half of all aerosol filters from all sites.

3) A pooled annual sample from all fortnightly samples.

4) A composite sample from 4 sampling sites, from the 0–5 cm layer.

Monitoring in the vicinity of the Temelín NPP has shown that there are no significant differences between radionuclide concentrations in the individual environmental items monitored in the vicinity of nuclear power plants and those in the rest of the country, with the exception of ^{3}H concentrations in watercourses affected by NPP discharges.

1.7 Characteristics of risks from NPP operation

1.7.1 Risk from atmospheric discharges from the NPP

Atmospheric discharges are the main pathway by which trace amounts of radionuclides may enter the environment. These are primarily noble gases (krypton and xenon), iodine isotopes, and tritium. Radionuclides are dispersed through the atmosphere, may be deposited on vegetation, and, to a lesser extent, enter the food chain. ^{14}C discharges account for the largest proportion of total atmospheric discharges from the NPP. It is produced mainly in the reactor coolant and structural materials through nuclear reactions:

$$^{14}N(n,p)^{14}C,\ ^{17}O(n,\alpha)^{14}C,\ ^{13}C(n,\gamma)^{14}C.$$

It may enter the environment **through gaseous and liquid discharges.** It is most commonly in the form of carbon dioxide or methane. Once discharged to the atmosphere, ^{14}C is rapidly incorporated **into the global carbon cycle** (plants → food chain → humans). Because of its half-life (5,730 years), it accumulates in the environment over the long term, but its concentrations are very low.

The effective dose to the public from ^{14}C discharges from a single nuclear power plant is several μSv/year – and is therefore **negligible** compared with natural background radiation.

Public exposure occurs primarily through inhalation and the consumption of locally produced food. Monitoring data from Czech nuclear power plants show that effective doses to the public from these pathways do not exceed a few hundredths of μSv per year. This is much less than 1% of the limit established for the public.

Atmospheric dispersion models that take account of meteorological conditions, stack heights, and discharge rates are used to model the dispersion of radionuclides in the atmosphere. Calculations are performed for conservative scenarios to ensure safety even under adverse conditions.

The following may be discharged to the atmosphere in particular:

- **radioactive noble gases (argon, krypton, xenon), ^{14}C,**
- **^{131}I (with a short half-life and significance for the thyroid gland),**
- **tritium (in the form of water vapour).**

Exposure pathways:

- **inhalation** – breathing air containing radionuclides,
- **ingestion** – the food chain (deposition of radionuclides on plants → milk, vegetables).

Dispersion models show that even in the nearest municipalities, the dose to the public is well below the limit of 1 mSv/year, typically <0.005 mSv.

Safety measures:

- filtration systems, fuel assembly integrity, suitability of the materials used, optimisation of chemical regimes, and minimisation of inter-circuit leaks,
- real-time monitoring of discharges,
- mandatory reporting to SONS.

1.7.2 Risk from discharges to watercourses from the NPP

Discharges to watercourses primarily contain tritium and trace amounts of activation and corrosion products, such as ^{60}Co or ^{54}Mn. These radionuclides may enter surface waters and subsequently drinking water sources or food chains (fish and irrigated crops).

However, public exposure via this pathway is very low – typically of the order of a few μSv per year. It is, however, higher than exposure from atmospheric discharges. Tritium behaves similarly to water in the body and is therefore readily excreted, while its radiological effect is relatively low. The monitoring of radioactivity in watercourses forms part of mandatory monitoring programmes, which confirm long-term stable values well below the limits.

At Czech nuclear power plants, discharges to watercourses are strictly regulated and subject to authorisation. Monitoring results show that this pathway does not pose a health risk even to the most highly exposed population groups.

Discharges to water contain primarily:

- **tritium** (the most common radionuclide, with low biological effectiveness),
- **corrosion products** (^{60}Co, ^{54}Mn, ^{59}Fe),
- **trace amounts of actinides.**

Exposure pathways:

- **drinking water,**
- **fish from watercourses,**
- **recreational activities (swimming, fishing).**

Measures:

- monitoring of radioactivity in surface waters, fuel assembly integrity, suitability of the materials used, optimisation of chemical regimes, minimisation of inter-circuit leaks and, for discharges to water, controlled discharge following sufficient dilution,
- establishment of discharge limits,
- immediate reporting if reference values are exceeded.

Measured concentrations are usually well below the detection limit. Calculations of effective doses indicate values of the order of a few μSv/year even under conservative scenarios.

The **health risk** is therefore considered **negligible**, particularly in comparison with other factors affecting public health (e.g. air quality and lifestyle).

1.8 Risk of radiation exposure from operation of SMR ETE

A project for the siting of a small modular reactor (SMR) with an installed electrical capacity of up to 500 MW_e, designated **SMR ETE**, is currently being prepared at the ETE site.

As part of the preparation of the SMR ETE project and in accordance with the applicable legislation, a study of the radiological effects of normal operation of SMR ETE was prepared (Abmerit – nuclear and space, 2026).

The calculation of the radiological consequences of normal operation of SMR ETE was performed using the ESTE Annual Impacts software, which makes it possible to identify representative persons for different exposure pathways, determines individual effective doses and 50-year (adults) or 70-year (children) committed individual effective doses, determines doses to the average inhabitant, and calculates collective doses from them.

The software calculates the effects of discharges to the atmosphere and to watercourses; in the case of discharges to the atmosphere, it makes it possible to enter a discharge and calculate the dispersion of radionuclides from different points at the site (ventilation stacks or cooling towers). The methodological procedures and algorithms used by the software take account of all potential exposure pathways and a large number of radionuclides in a potential discharge. The methodology and calculation model are described in greater detail in the study of the radiological effects of normal operation of SMR ETE.

The report analyses the results using 3 scenarios for exposure from atmospheric discharges and 3 scenarios for exposure from discharges to watercourses.

The original 2025 report was revised in 2026 to take account of changes resulting from the amendment to Decree No. 422/2016 Coll., which was published in the Collection of Laws and

International Treaties on 29 January 2026 as No. 13/2026 Coll., with the following effective date: 1 February 2026 (SUJB, 2026a).
Based on meteorological data from 2018 to 2024, an analysis of wind direction at the selected SMR ETE site and an analysis of the flow rate of the Vltava River were performed. Weather conditions did not change significantly during the selected period. Based on the meteorological data, 2018, 2023, and 2024 were selected as representative years: **2018** was considered a **dry year** with a lower flow rate in the Vltava River at Kořensko, while **2023** was selected as an **average year** corresponding to the long-term annual average at the Kořensko profile. The year **2024** was selected as a **wet year**.

The study (Abmerit – nuclear and space, 2026) identified inhabited locations in the vicinity of SMR ETE where the highest effective dose values for the representative person were found. In terms of atmospheric discharges, three locations were identified in this way – **Kočín, Litoradlice, and Zvěrkovice**. In terms of liquid discharges, this was the location of **Neznašov, including Újezd and the Pašovice cottage area**. The effective doses determined for bounding discharges from SMR ETE to the atmosphere and hydrosphere are presented in Table 7 and Table 8.

The following quantities were determined for the individual locations of interest:

Discharges to the atmosphere

- committed effective dose (50 or 70 years) from inhalation for the (given) age category (sum over all nuclides) [Sv],
- committed effective dose (50 or 70 years) from ingestion for the (given) age category (sum over all nuclides) [Sv],
- effective dose from external exposure from deposition (sum over all nuclides) [Sv],
- effective dose from external exposure from the cloud (sum over all nuclides) [Sv].

ATMOSPHERE: Total effective dose and committed effective dose via all considered pathways [Sv].

Discharges to the hydrosphere

- committed effective dose (50 or 70 years) from ingestion (sum over all nuclides) [Sv],
- drinking water, committed effective dose (50 or 70 years) from ingestion for the (given) age category (sum over all nuclides) [Sv],
- irrigation, watering of animals, and fish, committed effective dose (50 or 70 years) from ingestion for the (given) age category (sum over all nuclides) [Sv],
- effective dose from external exposure during swimming [Sv],
- effective dose from external exposure during boating [Sv],
- effective dose from external exposure during time spent on the riverbank [Sv].
- HYDROSPHERE: Total effective dose and committed effective dose via all considered pathways for the (given) age category [Sv].

ATMOSPHERE + HYDROSPHERE: Total effective dose and committed effective dose via all considered pathways for the (given) age category [Sv]:

Study (Abmerit – nuclear and space, 2026) identified two age groups of the population as those for which the maximum annual effective dose values from atmospheric discharges apply, namely the 6–15 years and 16+ years age groups. For hydrospheric discharges, the age groups of interest were identified as the foetus and children aged 0–5 years, for whom the maximum annual doses from discharges to the hydrosphere apply.

Table 7 Summary results, effective dose including the committed dose to the representative person as a result of bounding discharges from SMR ETE – atmosphere.

Radiological effect of discharges to the atmosphere			
Year	2018	2023	2024
Height of ventilation stack [m]	56	56	56
Location	Kočín	Zvěrkovice	Zvěrkovice
Age group	6–15 years (16+ years)	6–15 years (16+ years)	6–15 years (16+ years)
Total annual effective dose and committed effective dose via all considered pathways [Sv/year]	1.4E-07 (1.3E-07)	**1.78E-07 (1.73E-07)**	1.57E-07 (1.52E-07)

Cells shaded in gray indicate the maximum calculated values of the effective dose.

Table 8 Summary results, dose including the committed effective dose to the representative person as a result of bounding discharges from SMR ETE – hydrosphere.

Radiological effect of discharges to the hydrosphere			
Year	2018 (dry)	2023 (average)	2024 (wet)
Location	Újezd location and Pašovice cottage area		
Age group	Foetus (0–5 years)	Foetus (0–5 years)	Foetus (0–5 years)
Total annual effective dose and committed effective dose via all considered pathways [Sv/year]	**2.80E-07 (2.05E-07)**	1.48E-07 (1.09E-07)	1.31E-07 (9.60E-08)

Cells shaded in gray indicate the maximum calculated values of the effective dose.

The results are presented for a reference ventilation stack height of 56 m and the meteorological conditions in the selected representative years 2018, 2023, and 2024. According to the study, meteorological conditions influence the identification of the representative person, particularly with respect to direction.

In the process of identifying the primary radionuclides, the primary and secondary radionuclides contributing most to the annual effective doses of the representative person were determined.

Primary and secondary radionuclides contributing to the annual effective dose of the representative person from SMR ETE (atmosphere) are presented in Table 9. All radionuclides that contribute at least 2% to the annual effective dose are considered primary radionuclides.

Table 9 Primary and secondary radionuclides contributing to the annual effective dose of the representative person from SMR ETE (atmosphere).

Height of ventilation stack [m]	56
Primary radionuclides contributing to the annual effective dose	^{41}Ar (58.09%), ^{14}C (21.13%), ^{3}H (7.92%), ^{138}Xe (3.86%), ^{88}Kr (2.27%), ^{85}Kr (2.06%)
Secondary radionuclides contributing to the annual effective dose	^{135}Xe, ^{135m}Xe, $^{131}I_{gas}$, ^{87}Kr, $^{131}I_{aer}$, ^{85m}Kr, ^{133}Xe, ^{133m}Xe, ^{60}Co

A **key factor for discharges** to the hydrosphere is the **water flow rate** of the Vltava River (Kořensko). For the selected representative dry year 2018 (24.4 m^3/s), the annual effective dose values for the representative person are almost double those for 2023 (an average year in terms of flow rate, 47.4 m^3/s) and more than double those for the wet year 2024 (with a flow rate of 63.3 m^3/s).

The principal exposure pathways for the representative persons are contributions from:

- committed doses from the **ingestion of drinking water** (56.8%),
- committed doses from the **ingestion of food** (irrigation, watering of animals, and fish consumption) (43.2%).

From SMR ETE discharges, tritium accounts for approximately 99.9% of the total annual effective dose from the hydrosphere.

Table 10 Primary and secondary radionuclides contributing to the annual effective dose of the representative person from SMR ETE (hydrosphere).

Primary radionuclide contributing to the annual effective dose	^{3}H (99.92%)
Secondary radionuclide contributing to the annual effective dose	^{134}Cs (0.05%) ^{137}Cs (0.03%)

The annual effective dose values for the representative person from SMR ETE hydrospheric discharges are at the level of **0.1 μSv/year** for average years.

The contribution of the total annual effective dose and committed effective dose from all SMR ETE pathways considered is **approximately 4.2%** of the total annual effective dose and committed effective dose from all pathways considered when the contributions from ETE1,2 and New NPP ETE are included.

In terms of annual effective dose per 1 MW_e of installed capacity, the SMR ETE contribution is **approximately 47%** of the combined contribution from ETE1,2 and New NPP ETE per 1 MWe, and is therefore approximately half as large.

Table 11 Identification of the representative person and the total dose to the representative person from all exposure pathways as a result of annual bounding discharges from SMR ETE in the individual scenarios analysed (Abmerit – nuclear and space, 2026).

Calendar year	2018	2023	2024
	"Dry year"	"Average year"	"Wet year"
Effect of atmospheric discharges			
Populated location with the highest effective dose [Sv] to the representative person			
Description of location	Cadastral areas of the municipalities of Dříteň and Temelín, "Kočín" location	Cadastral areas of the municipalities of Temelín and Týn nad Vltavou, "Zvěrkovice" location, "Zadní kohout"	Cadastral areas of the municipalities of Temelín and Týn nad Vltavou, "Zvěrkovice" and "Zadní kohout" locations
Effective dose	1.4E-07	**1.8E-07**	1.6E-07
Age group	16	16+ years	6–15 years, 16+ years
Effect of discharges to the Vltava River			
Populated location with the highest effective dose [Sv] to the representative person			
Description of location	Cadastral areas of the municipalities of Albrechtice and Chrášťany, the "Újezd" location and the "Pašovice" cottage area	Cadastral area of the municipality of Albrechtice, Chrášťany, "Újezd" location	Cadastral areas of the municipalities of Albrechtice and Chrášťany, "Újezd" location
Effective dose	**2.8E-07**	1.5E-07	1.3E-07
Age group	Children aged 0–5 years	0–5 years	0–5 years
Combined effect of atmospheric discharges and discharges to the Vltava River (resulting representative person)			
Populated location with the highest effective dose [Sv] to the representative person			
Description of location	Cadastral areas of the municipalities of Chrášťany and Všemyslice, "Neznašov" location	Cadastral areas of the municipalities of Temelín and Týn nad Vltavou, "Zvěrkovice" and "Zadní kohout" locations	Cadastral areas of the municipalities of Temelín and Týn nad Vltavou, "Zvěrkovice" and "Zadní kohout" locations
Effective dose	**3.0E-07**	**1.8E-07**	1.6E-07
Age group	Foetus, children aged 0–5 years	16+ years	6–15 years, 16+ years

The following conclusions can be drawn from Table 11:

- The maximum effective dose, including committed effective dose, to the representative person as a result of bounding atmospheric discharges from SMR ETE is **1.8×10^{-7} Sv**, in the "Zvěrkovice" and "Zadní kohout" locations in the cadastral areas of the municipalities of Temelín and Týn nad Vltavou.
- The maximum effective dose, including committed effective dose, to the representative person as a result of bounding discharges from SMR ETE to the hydrosphere is **2.8×10^{-7} Sv**, in the "Újezd" location and the "Pašovice" cottage area in the cadastral areas of the municipalities of Albrechtice and Chrášťany.
- The maximum effective dose, including committed effective dose, to the representative person as a result of bounding discharges from SMR ETE to the atmosphere and surface water was calculated at **3.0×10^{-7} Sv per year** (0.3 μSv/year). This value was determined for the "Neznašov" location in the cadastral area of the municipality of Všemyslice. Compared with the assumed annual effective dose from natural background radiation of **5.93 mSv**, the contribution from the bounding discharges represents approximately **0.005%** of this value.

For the three maximum effective dose and committed effective dose values specified above, a conservative model (annual rate · residence period) can be used to calculate the total radiation exposure for various periods of residence in the area of interest and subsequently the total health detriment (the product of the total radiation exposure and the detriment-adjusted nominal risk coefficient (5.7×10^{-2} Sv^{-1}) for stochastic effects from exposure to low-dose-rate radiation).

Based on the values presented in Tables 12 to 14, it can be concluded that the contribution of the source assessed to the radiation exposure of the public is low. The estimated health risk is low compared with the other components of public exposure, although the uncertainties associated with the model assessment used must be taken into account.

Table 12 Cumulative effect of atmospheric discharges from SMR ETE on the representative person.

Effect of atmospheric discharges from SMR ETE on the representative person			
Annual radiation exposure [Sv]	**Residence period [years]**	**Radiation exposure over the residence period [Sv]**	**Total health detriment**
1.8E-07	1	1.80E-07	1.03E-08
	5	9.00E-07	5.13E-08
	10	1.80E-06	1.03E-07
	20	3.60E-06	2.05E-07

	30	5.40E-06	3.08E-07
	50	9.00E-06	5.13E-07
	70	1.26E-05	7.18E-07

Table 13 Cumulative effect of discharges from SMR ETE to the hydrosphere on the representative person.

Effect of discharges from SMR ETE to the hydrosphere on the representative person			
Annual radiation exposure [Sv]	**Residence period [years]**	**Radiation exposure over the residence period [Sv]**	**Total health detriment**
2.8E-07	1	2.80E-07	1.60E-08
	5	1.40E-06	7.98E-08
	10	2.80E-06	1.60E-07
	20	5.60E-06	3.19E-07
	30	8.40E-06	4.79E-07
	50	1.40E-05	7.98E-07
	70	1.96E-05	1.12E-06

Table 14 Combined effect of discharges from SMR ETE to the atmosphere and hydrosphere on the representative person

Combined effect of discharges from SMR ETE to the atmosphere and hydrosphere on the representative person			
Annual radiation exposure [Sv]	**Residence period [years]**	**Radiation exposure over the residence period [Sv]**	**Total health detriment**
3.0E-07	1	3.00E-07	1.71E-08
	5	1.50E-06	8.55E-08
	10	3.00E-06	1.71E-07
	20	6.00E-06	3.42E-07
	30	9.00E-06	5.13E-07
	50	1.50E-05	8.55E-07
	70	2.10E-05	1.20E-06

1.9 Risk of radiation exposure from the operation of ETE1,2 and New NPP ETE

Two VVER-1000 V320 units with a total installed electrical capacity of 2 × 1,125 MW_e are currently in operation at the Temelín site. As part of the project for the siting of New NPP ETE at the Temelín site, two additional New NPP ETE units with an electrical capacity of up to 2 × 1,700 MW_e have long been planned at the site.

As part of the EIA Documentation for New NPP ETE, the effects of the two ETE1,2 units and New NPP ETE on the population and the environment were assessed. Under the original concept (4 × 1,000 MW_e), New NPP ETE constitutes an expansion of the power plant by the addition of new modern units.

The radiological effects of ETE1,2 and New NPP ETE are analysed in the report New Nuclear Power Plant at the Temelín site, including power evacuation to the Kočín substation, environmental impact assessment documentation (AMEC, 2010).

The calculation of the atmospheric radiological consequences of normal operation of ETE1,2 (two units) and New NPP ETE (2 × 1,700 MW_e) was performed using the NORMAL software, version 02, which was approved for use by Evaluation Commission No. 6 of the State Office for Nuclear Safety. The calculations of the radiological consequences of New NPP ETE and ETE1,2 were performed by dividing the surroundings of the ETE site into 16 directional and 20 distance zones. The software takes into account elevations, terrain roughness, and land surface types according to the actual situation at the Temelín site. Conservative assumptions (AMEC, 2010) were used to calculate and determine ground-level activity concentrations, deposition on the ground surface, and deposition rates.

In the environmental impact assessment documentation (AMEC, 2010), the radiological effects of discharges from ETE1,2 to the hydrosphere, expressed as annual effective doses and committed effective doses, were determined using the RDETE software. The software includes the dispersion of radioactive substances and their decay products in the aquatic environment, estimates of the effect of swimming in contaminated water, boating, time spent on sediment, time spent on irrigated soil, ingestion of drinking water, ingestion of fish living in contaminated water, ingestion of meat and milk from animals watered with contaminated water, and ingestion of agricultural products irrigated with contaminated water. The exposure pathways considered are evaluated for all age groups.

In the environmental impact assessment documentation (AMEC, 2010), annual effective doses are determined as the sum of the annual dose from the cloud, the annual dose from deposition in the given year, the committed effective dose from inhalation and ingestion, and committed effective doses from inhalation due to resuspension.

In the study of the radiological effects of atmospheric discharges from New NPP ETE and ETE1,2, annual effective doses to the population were determined, with the maximum annual dose calculated for the north-eastern direction. The study quantifies values given for this direction as the most unfavourable ones.

The values of the total effective dose and committed effective doses via all considered pathways for public exposure were calculated separately for New NPP ETE (2 units of 1,200/1,700 MW_e) and ETE1,2 (2 units). The calculated values of the total effective dose and committed effective doses via all considered pathways for the population are divided into 6 age categories:

- children aged 0–1 year, children aged 1–2 years, children aged 2–7 years, children aged 7–12 years, children aged 12–17 years, and adults.

Given the distances of the locations determined in the study of radiological effects of normal operation of SMR ETE on the **Kočín, Zvěrkovice, and Litoradlice** locations in terms of atmospheric discharges, the distances of interest are 2,333 m and 3,333 m from ETE1,2.

Following the publication of the amendment to Decree No. 422/2016 Coll. (SONS, 2026a), new annual effective dose and committed effective dose values from atmospheric discharges for the individual age groups of the population were determined in the report "Amentum DP29 – Revision of Study DP17B Taking into Account the Amendment to Decree No. 422/2016 Coll." (Amentum Clean Energy s.r.o., 2026). The newly calculated annual effective dose values are lower than those determined under the original wording of the Decree. However, when assessing the cumulative effects of the contributions from ETE1,2 and New NPP ETE, the annual effective dose values used in the EIA Documentation for New NPP ETE at the Temelín site (AMEC, 2010) were retained for conservative reasons. These values were therefore not updated to reflect the amendment to Decree No. 422/2016 Coll. If the conversion factors resulting from the amendment to the Decree were applied to the annual effective dose values for ETE1,2 and New NPP ETE, the resulting values would be reduced by approximately 6%.

Table 15 Sum of annual effective doses and committed effective doses via all considered pathways for individual age categories resulting from one year of operation of ETE1,2 and New NPP ETE (2× 1,700 MW_e), from atmospheric discharges, at selected distances of interest.

Distance	Total annual effective dose and committed effective dose via all considered pathways					
	Children aged 0–1 years	Children aged 1–2 years	Children aged 2–7 years	Children aged 7–12 years	Children aged 12–17 years	Adults
[m]	[Sv/year]	[Sv/year]	[Sv/year]	[Sv/year]	[Sv/year]	[Sv/year]
2,333	1.00E-06	1.35E-06	1.11E-06	1.07E-06	1.03E-06	1.03E-06
3,333	6.31E-07	8.85E-07	7.10E-07	6.77E-07	6.48E-07	6.47E-07

According to the New NPP ETE project, the two new units are to be located north-west of the existing ETE1,2 site. This increases the distance between New NPP ETE and the village of Litoradlice to 4.3 km; however, a distance of 3.3 km continues to be conservatively assumed for the subsequent analysis.

The discharged radioactive wastewater from ETE1,2 is diluted with all non-radioactive wastewater from the ETE1,2 power plant, primarily cooling tower blowdown, after which the water is discharged to the receiving water body (the Vltava River, Kořensko profile). The average flow rate of the Vltava River at the profile of wastewater discharge from ETE1,2 and the planned New NPP ETE was considered in the EIA Documentation for New NPP ETE to be 50 m^3/s.

The values in the following table were adjusted using proportional coefficients reflecting the increase in annual effective doses for the individual age groups resulting from Decree No. 13/2026 Coll., which amended Decree No. 422/2016 Coll. Since the annual effective dose values for ETE1,2 and New NPP ETE following the amendment by Decree No. 13/2026 Coll. are not directly available, the proportional coefficients for annual effective doses were derived from SMR ETE data based on the updated report Amentum DP29 – Revision of Study DP17B Taking into Account the Amendment to Decree No. 422/2016 Coll. (SUJB, 2026a). The annual effective dose and committed effective dose values from SMR liquid discharges are now higher than those obtained using the dose coefficients under the original wording of Decree No. 422/2016 Coll. A proportional increase factor was therefore also conservatively applied to the annual effective dose values for ETE1,2 and New NPP ETE.

Table 16 Annual effective dose and committed effective dose via all considered pathways from the use of water affected by discharges to the hydrosphere from ETE1,2 and New NPP ETE.

Age group [years]	Total annual effective dose and committed effective dose via all considered pathways from operational discharges to the hydrosphere from the two ETE1,2 units (2 × 1,000 MW_e) [Sv/year]	Total annual effective dose and committed effective dose via all considered pathways from design values of discharges to the hydrosphere from the two New NPP ETE units (2 × 1,700 MW_e) [Sv/year]	Sum of the total annual effective dose and committed effective doses via all considered pathways from discharges to the hydrosphere from ETE1,2 (2 × 1,000 MW_e) and New NPP ETE (2× 1,700 MW_e) [Sv/year]
0–1	1.03E-06	2.71E-06	3.74E-06
1–2	8.17E-07	2.24E-06	3.05E-06
2–7	9.30E-07	2.49E-06	3.42E-06
7–12	5.71E-07	1.59E-06	2.16E-06
12–17	4.66E-07	1.38E-06	1.85E-06
Adults	6.03E-07	1.84E-06	2.45E-06

1.10 Risk of radiation exposure from loaded packages in the SNFS following its expansion

At the Temelín site, preparations are also under way to expand the capacity of the spent nuclear fuel storage facility (SNFS) from 96 to 152 packages.

As part of the preparation of the EIA Documentation for the SNFS expansion, the radiation exposure from gamma radiation and neutrons from loaded packages in the SNFS after expansion was assessed (Podzimek, červen 2024).

The maximum expected dose equivalent rates at a distance of 2 m from the outer shell of the OS ŠKODA 1000/19 package, adopted for the model calculation, are presented in Table 11.

Table 17 Maximum dose equivalent rates at a distance of 2 m from the outer shell of the OS ŠKODA 1000/19 package, adopted for the model calculation.

	Neutrons	**Gamma radiation**	**Total**
	[µSv/h]	[µSv/h]	[µSv/h]
2 m from the central part of the outer shell	61.4	33.0	94.4

For the conservative target scenario, the ambient dose equivalent rate (ADER) in open space, taking account of shielding provided by the building, was determined for 38 packages located in the first row along the wall of the storage facility. The effect on the immediate vicinity and the nearest permanently inhabited area, Kočín, part of the municipality of Temelín, located approximately 1,600 m from the SNFS, was evaluated. The results are presented in Table 18.

Table 18 Ambient dose equivalent rates in open space, taking account of shielding provided by the SNFS building, for 38 packages – conservative target scenario.

	ADER [Sv/h] at 2 m	**Number of packages**	**Ambient dose equivalent rate in open space, taking into account building shielding [nSv/h]**				
			Distance from package [m]				
			2	7	100	1,000	1,600
gamma radiation	3.30E-05	38	1.96E+04	1.60E+03	7.84E+00	7.84E-02	3.06E-02
neutrons	6.14E-05	38	2.30E+04	1.87E+03	9.19E+00	9.19E-02	3.59E-02

gamma radiation + neutrons	**9.44E-05**	**38**	**4.26E+04**	**3.47E+03**	**1.70E+01**	**1.70E-01**	**6.65E-02**
Contribution from neutrons to the total ADER	65.0%		54.0%	54.0%	54.0%	54.0%	54.0%

The following conclusions can be drawn from the table:

- Under the conservative target scenario, in which the maximum number of 38 packages in the first row was considered, the contribution to the existing radiation exposure at the nearest settlement, i.e. the municipality of Temelín (Kočín part), represented by the **annual ambient dose equivalent** caused by the SNFS after expansion, is **5.83×10^{-7} Sv (0.583 µSv)**, which only constitutes a small fraction of the radiation exposure from natural background, which at this location is approximately **5.65 mSv** per year (Podzimek, červen 2024).
- At the same time, assuming year-round residence in Kočín, the expected annual ambient dose equivalent of **583 nSv** caused by the expanded SNFS corresponds to **0.058%** of the annual effective dose limit for the public.

As at 31 December 2025, the SNFS contained 48 CASTOR 1000/19 packages holding 912 fuel assemblies, 5 ŠKODA 1000/19 packages holding 95 fuel assemblies, and 22 ŠKODA 1000/19M packages holding 418 fuel assemblies.

1.11 Risk of radiation exposure from the operation of SMR ETE, ETE1,2, the SNFS, and New NPP ETE

In the analysis of the combined effect of ETE1,2, the ETE SNFS following its planned future expansion, and the proposed New NPP ETE and SMR ETE projects, an **area of interest** for atmospheric discharges was defined that includes **Kočín, Zvěrkovice, and Litoradlice**. The effect of the ETE SNFS is characterised by ambient dose equivalent rates in open space according to report (Podzimek, červen 2024).

The cumulative assessment is performed for the New NPP ETE 2× 1,700 MW_e bounding case, whose overall consequences exceed those of the 2× 1,200 MW_e power output option. For data on effective doses from ETE1,2 and New NPP ETE, the value for distances of 2,333 m and 3,333 m was conservatively adopted for atmospheric discharges. For the hydrosphere, the **Neznašov location, including the Újezd location and the Pašovice cottage area**, was selected.

Representative data on the maximum annual effective doses from atmospheric discharges from ETE1,2 and New NPP ETE were determined in the **north-east direction**. Hydrospheric discharges from all assessed power plants are routed to the **Vltava River – Kořensko profile**. Within the selected area of interest for atmospheric discharges, the municipality of **Kočín is situated south-south-west of ETE1,2**, **Litoradlice is situated east-south-east of ETE1,2**, and **Zvěrkovice is situated north-east of ETE1,2**. Given the locations of the municipalities, the actual

contributions to annual effective doses from ETE1,2 and New NPP ETE in these locations will be lower (and, for Zvěrkovice, the same at most) than the data conservatively selected for the north-east direction in the EIA Documentation for New NPP ETE (AMEC, 2010).

The study of the radiological effects of SMR ETE considered three conditions: a **dry, average, and wet year** (Abmerit – nuclear and space, 2026).

In determining the effect of individual power plants, different age categories of representative persons were selected, corresponding to the legislation in force at the time and the legislation currently in force. Therefore, when comparing the values, the overlap of the given age groups was considered, and the highest value of the annual effective dose from ETE1,2 and New NPP ETE discharges was conservatively selected. The contribution from SMR ETE and the combined contribution from ETE1,2 and New NPP ETE were then determined. For the purposes of assessing the cumulative effect of SMR ETE, the sum of the annual effective dose values from ETE1,2 and New NPP ETE is regarded as the background contribution to public exposure.

The contributions of the **annual effective dose and committed effective dose** via all considered pathways **from atmospheric discharges from SMR ETE are significantly lower than those from ETE1,2 + New NPP ETE** in all the scenarios analysed. For the considered SMR ETE ventilation stack height of 56 m, the maximum share of the annual effective dose to the representative person from atmospheric discharges from ETE site is 18% at most.

In terms of the annual effective dose contribution from atmospheric discharges per 1 MW_e of installed capacity, the contribution from SMR ETE is approximately 73% of that from ETE1,2 and New NPP ETE.

The contribution of **annual effective dose from discharges to the hydrosphere** from SMR ETE is approximately twelve times lower than the combined contribution from ETE1,2 and New NPP ETE. In the study of the radiological effects of normal operation of SMR ETE, annual effective dose values were determined for the dry year 2018, the average year 2023, and the wet year 2024. For ETE1,2 and New NPP ETE, however, values were only determined for an average year with a Vltava River flow rate of 50 m^3/s. The cumulative annual effective dose was therefore only determined for the average year 2023.

Table 19 Comparison of annual effective doses from hydrospheric discharges from SMR ETE and ETE1,2 + New NPP ETE.

Discharges to the hydrosphere	SMR ETE	ETE1,2 + New NPP ETE
Calculated average annual flow rate of the Vltava River – Kořensko [m^3/s]	47.4	50
Age group [years]	0–5, foetus	0–1
Total annual effective dose and committed effective dose via all considered pathways [Sv/year]	1.48E-07 (1.09E-07)	3.74E-06

The total annual effective doses and committed effective doses via all considered pathways from exposure due to SMR ETE hydrospheric discharges do not exceed 5% of the contribution from hydrospheric discharges from the ETE site, consisting of ETE1,2 and New NPP ETE.

To determine the cumulative maximum annual effective doses to the representative person, the maximum public exposure values from the individual power plants were summed. In reality, these values will be lower (for Zvěrkovice, at most the same), because the maximum radiological effect of ETE1,2 and New NPP ETE is determined for the north-east direction (Zvěrkovice). The Kočín (S–SW) and Litoradlice (E–SE) locations, at which the highest doses from SMR atmospheric discharges occur, lie in different directions. In reality, the doses in Zvěrkovice will also be lower, because a conservative distance from ETE1,2 was also considered for the planned New NPP ETE, which will be located farther away.

Table 20 Cumulative maximum annual effective doses to the representative person from ETE1,2, New NPP ETE, and SMR ETE.

Scenario	Location and age group of representative persons	Maximum cumulative annual effective dose (ETE1,2, New NPP ETE, SMR ETE) [Sv/year]
Exposure scenarios for atmospheric discharges		
Scenario 2a, ventilation stack 56 m, dry year 2018	Kočín, children aged 0–5 years	**1.47E-06**
Scenario 4a, ventilation stack 56 m, average year 2023	Zvěrkovice, children ages 0–5 years	1.05E-06
Scenario 6a, ventilation stack 56 m, wet year 2024	Zvěrkovice, children ages 0–5 years	1.03E-06
Exposure scenarios for hydrospheric discharges		
Scenario 1 h, average year 2023	Újezd location and Pašovice cottage area, foetus/children aged 0–5 years	**3.89E-06**

In terms of **atmospheric discharges**, the **maximum cumulative annual effective dose, including the committed effective dose**, to the representative person in the vicinity of the ETE site, will be **1.47 μSv/year** at most, with an SMR ETE ventilation stack height of 56 m. When the contribution of the ambient dose equivalent rate resulting from radiation from the expanded SNFS is included, the maximum value at the Kočín location will be **2.05 μSv/year**.

In terms of the cumulative doses to the representative person from **hydrospheric discharges**, the maximum annual cumulative effective dose to the representative person, including the committed effective dose, is **3.89 μSv/year**, assuming the average flow rate in the Vltava River in the Újezd location and the Pašovice cottage area.

Given the location of the representative person, there will be no contribution from the SNFS.

The following input data will be used to calculate the total radiation exposure and total health detriment:

- The maximum effective dose, including committed effective dose, to the representative person resulting from **bounding atmospheric discharges from ETE1,2, New NPP ETE, and SMR ETE is 1.47 × 10^{-6} Sv/year** at the Kočín location. At the Kočín location, the ambient dose equivalent rate from the SNFS will also contribute and may reach up to **5.81 × 10^{-7} Sv/year** following its expansion. The total radiation exposure at the Kočín location from the cumulative effects of all nuclear facilities at the Temelín site could therefore reach up to **2.05 × 10^{-6} Sv/year**.

- The maximum effective dose, including committed effective dose, to the representative person resulting from **bounding discharges from ETE1,2, New NPP ETE, and SMR ETE to the hydrosphere is 3.89 × 10^{-6} Sv/year** at the Újezd location and the Pašovice cottage area.

- At the **Pašovice** location, the annual contribution to the effective dose and committed effective dose from **ETE1,2 atmospheric discharges is 1.25 × 10^{-7} Sv/year** (AMEC, 2010)**.**

- At the **Pašovice** location, the annual contribution to the effective dose and committed effective dose from **New NPP ETE** atmospheric discharges is **2.95 × 10^{-7} Sv/year** (AMEC, 2010)**.**

- At the **Pašovice** location, the annual contribution to the effective dose and committed effective dose from SMR ETE atmospheric discharges is **1.6 × 10^{-8} Sv/year**

- The maximum effective dose, including committed effective dose, to the representative person resulting from **bounding discharges from ETE1,2, New NPP ETE, and SMR ETE to the hydrosphere and atmosphere is 4.33 × 10^{-6} Sv/year**.

Table 21 Effect of atmospheric discharges from the operation of SMR ETE, ETE1,2, the SNFS, and New NPP ETE on the representative person.

Effect of atmospheric discharges from the operation of SMR ETE, ETE1,2, the SNFS, and New NPP ETE on the representative person at the Kočín location			
Annual radiation exposure [Sv/year]	**Residence period [years]**	**Radiation exposure over the residence period [Sv]**	**Total health detriment**
2.05E-06	1	2.05E-06	1.17E-07
	5	1.03E-05	5.84E-07
	10	2.05E-05	1.17E-06
	20	4.10E-05	2.34E-06
	30	6.15E-05	3.51E-06
	50	1.03E-04	5.84E-06
	70	1.44E-04	8.18E-06

Table 22 Effect of hydrospheric discharges from the operation of SMR ETE, ETE1,2, the SNFS, and New NPP ETE on the representative person.

Effect of hydrospheric discharges from the operation of SMR ETE, ETE1,2, the SNFS, and New NPP ETE on the representative person at the Pašovice location			
Annual radiation exposure [Sv/year]	**Residence period [years]**	**Radiation exposure over the residence period [Sv]**	**Total health detriment**
3.89E-06	1	3.89E-06	2.22E-07
	5	1.95E-05	1.11E-06
	10	3.89E-05	2.22E-06
	20	7.78E-05	4.43E-06
	30	1.17E-04	6.65E-06
	50	1.95E-04	1.11E-05
	70	2.72E-04	1.55E-05

Table 23 Combined effect of discharges to the atmosphere and hydrosphere from the operation of SMR ETE, ETE1,2, the SNFS, and New NPP ETE on the representative person.

Combined effect of discharges from the operation of SMR ETE, ETE1,2, the SNFS, and New NPP ETE to the atmosphere and hydrosphere on the representative person at the Pašovice location			
Annual radiation exposure [Sv]	**Residence period [years]**	**Radiation exposure over the residence period [Sv]**	**Total health detriment**
4.33E-06	1	4.33E-06	2.47E-07
	5	2.17E-05	1.23E-06
	10	4.33E-05	2.47E-06
	20	8.66E-05	4.94E-06
	30	1.30E-04	7.40E-06
	50	2.17E-04	1.23E-05
	70	3.03E-04	1.73E-05

These annual effective dose values, both individually and in aggregate, are significantly lower than the dose constraint established in Section 82 of the Atomic Energy Act (Act No. 263/2016 Coll., as amended), which is 250 μSv per year for the representative person. In the case of nuclear power facilities, this value applies collectively to all nuclear facilities within the relevant nuclear facility siting area, with a value of 200 μSv per year established for atmospheric discharges and 50 μSv per year for discharges to surface water. The maximum calculated annual effective dose of 0.3 μSv per year corresponds to approximately 0.12% of the overall dose constraint of 250 μSv per year. In the assessment of atmospheric discharges, this value represents approximately 0.15% of the relevant dose constraint of 200 μSv per year.

Exposure from the spent nuclear fuel storage facility is assessed separately and is not included in the assessment against the dose constraint for discharges.

Radiation exposure over the residence period, and consequently the risk of health detriment, were determined very conservatively because:

- the highest dose identified for an age category was assumed to apply throughout the entire period, irrespective of the representative person’s actual age and changes in age over time,

- the directional effects of the combined atmospheric discharges from ETE1,2 and New NPP ETE were not taken into account, and the maximum value identified at a given distance was used,
- the SNFS was assumed to be filled to its maximum capacity, i.e. with 38 packages in the outermost row, which would not be the case throughout the calculation period.
- The total detriment-adjusted nominal risk coefficient of **5.7×10^{-2} Sv^{-1}** is a population average covering all age groups, including children. The value for adults, **4.2×10^{-2} Sv^{-1}**, is lower because, for the same dose, the lifetime risk of stochastic effects is lower in the adult population.
- In calculating the lifetime risk of health detriment, the same calculation algorithm (DDREF = 1) was used as in the report (Kotulán, 2010) to allow the results to be compared.
- Fractionated or protracted doses are, however, associated with a lower risk, suggesting that dose-specific estimates derived from high doses received during acute exposure should be divided by the dose and dose-rate effectiveness factor (DDREF) when applied to low continuous or fractionated doses.
- The dose and dose-rate effectiveness factor is an estimated factor that generally characterises the usually lower biological effectiveness per unit dose of exposure at low doses and low dose rates compared with exposure at high doses and high dose rates.
- A DDREF value of 2 is generally consistent with data from animal studies and, despite all the uncertainties, the ICRP recommends that DDREF = 2 continue to be used for radiation protection purposes (ICRP 103, 2009).
- If a DDREF value of 2 is used, the total health detriment will be half as high.

The **health risk** is considered **entirely negligible**, particularly in comparison with other factors affecting public health (e.g. air quality and lifestyle).

1.12 Risk of radiation exposure from the operation of ETE1,2, New NPP ETE, and SMR ETE in border areas

For the cumulative effect on Austria, the representative person was determined at the **Rottal location** in the 6–15 years age category.

The maximum annual effective dose from discharges from SMR ETE, ETE1,2, and New NPP ETE for this representative person will not exceed **50 nSv**. The contribution of SMR ETE to this value is less than 10%.

For the cumulative effect on Germany, the representative person was determined at the **Schnellenzipf location** in the 6–15 years age category.

The maximum annual effective dose from discharges from SMR ETE, ETE1,2, and New NPP ETE for this representative person will not exceed **65 nSv**. The contribution of SMR ETE to this value is less than 5%.

The annual effective doses for Germany are higher due to the doses from ETE1,2 and New NPP ETE, which are determined on the basis of older weather data, when the wind direction and meteorological effect on Germany were more significant. (Amentum Clean Energy s.r.o, 2026)

Due to the distance, the SNFS does not contribute to the exposure of the person at this location.

Table 24 Risk of radiation exposure from the operation of ETE1,2, New NPP ETE, and SMR ETE in border areas of Austria.

Risk of radiation exposure from the operation of ETE1,2, New NPP ETE, and SMR ETE in the border areas of Austria			
Annual radiation exposure [Sv/year]	**Residence period [years]**	**Radiation exposure over the residence period [Sv]**	**Total health detriment**
5.00E-08	1	5.00E-08	2.85E-09
	5	2.50E-07	1.43E-08
	10	5.00E-07	2.85E-08
	20	1.00E-06	5.70E-08
	30	1.50E-06	8.55E-08
	50	2.50E-06	1.43E-07
	70	3.50E-06	2.00E-07

The **health risk** is considered **entirely negligible**, particularly in comparison with other factors affecting public health (e.g. air quality and lifestyle).

Table 25 Risk of radiation exposure from the operation of ETE1,2, New NPP ETE, and SMR ETE in border areas of Germany

Risk of radiation exposure from the operation of ETE1,2, New NPP ETE, and SMR ETE in border areas of Germany			
Annual radiation exposure [Sv/year]	**Residence period [years]**	**Radiation exposure over the residence period [Sv]**	**Total health detriment**
6.50E-08	1	6.50E-08	3.71E-09
	5	3.25E-07	1.85E-08
	10	6.50E-07	3.71E-08
	20	1.30E-06	7.41E-08

	30	1.95E-06	1.11E-07
	50	3.25E-06	1.85E-07
	70	4.55E-06	2.59E-07

The **health risk** is considered **entirely negligible**, particularly in comparison with other factors affecting public health (e.g. air quality and lifestyle).

1.13 Conclusion

As part of the assessment of the planned exposure situation during normal operation of SMR ETE, the maximum annual effective doses to the representative person resulting from atmospheric and liquid discharges of radioactive substances were determined. At the same time, the dominant exposure pathways and the radionuclides making the largest contributions to the total annual effective dose were identified. This assessment is limited to the radiological effects of normal operation of the facility and does not include potential exposure during radiation emergencies, emergency preparedness, or the assessment of non-radiological effects on the environment and public health. These areas are addressed separately in the relevant sections of the documentation and in the subsequent safety analyses.

Following the analysis for SMR ETE, the radiological effect of SMR ETE was compared with the effect of ETE1,2 and New NPP ETE. Based on the comparison, it was shown that the annual effective doses from atmospheric bounding discharges from SMR ETE are **significantly lower** in general than the total annual effective doses from ETE1,2 and New NPP ETE. The assessment of the radiological effects of SMR ETE from discharges to the hydrosphere determined the main exposure pathways to be the committed effective dose from ingestion of food and drinking water. For discharges to the hydrosphere, the annual effective doses represented approximately **4%** of the total contribution from the ETE site.

The annual effective dose values for the representative person from SMR ETE hydrospheric discharges are at the level of **0.1 µSv/year** for average years.

The contributions of both atmospheric discharges and hydrospheric discharges from SMR ETE to public exposure are no more than approximately **0.30 µSv/year**.

The conservatively determined cumulative contributions from atmospheric discharges from ETE1,2, New NPP ETE, and SMR ETE reach maximum values of approximately **1.47 µSv/year**. SMR ETE accounts for no more than **18%** of these doses. When the contribution of the ambient dose equivalent rate resulting from radiation from the expanded SNFS is included, the maximum value is **2.05 µSv/year**.

The conservatively determined cumulative contributions from discharges to the hydrosphere from ETE1,2, New NPP ETE, and SMR ETE reach maximum values of approximately **3.89 µSv/year** in an average year.

The maximum effective dose, including committed effective dose, to the representative person resulting from **bounding discharges from ETE1,2, New NPP ETE, and SMR ETE to the hydrosphere and atmosphere is 4.33×10^{-6} Sv/year.**

The maximum value occurs at the Pašovice location and is attributable primarily to discharges to the hydrosphere from New NPP ETE and ETE1,2.

These cumulative **contributions are safely below the dose constraints established by the Atomic Energy Act** for discharges to the hydrosphere (**50 µSv/year**) and atmosphere (**200 µSv/year**), which apply collectively to all nuclear facilities at the Temelín site.

1.14 References

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1.15 List of abbreviations

Abbreviation	Meaning
ADER	ambient dose equivalent rate values
ALARA	As Low As Reasonably Achievable
CRPO	Central Register of Occupational Exposure
CT	Computed tomography
CGS	Czech Geological Survey
CR	Czech Republic
DDREF	Dose and dose-rate effectiveness factor
DNA	Deoxyribonucleic acid
DC	Dose constraint
EIA	Environmental impact assessment
ESTE	Temelín Environmental System
ETE	Nuclear facility comprising the two existing VVER-1000 units (ETE1,2) and the planned third and fourth units (New NPP ETE)
ETE1,2	Temelín Nuclear Power Plant (in-service units 1 and 2)
EURDEP	European Radiological Data Exchange Platform
ICRP	International Commission on Radiological Protection
NPP	Nuclear power plant
NF	Nuclear facility
LNT	Linear no-threshold model
MonRaS	Radiation Monitoring Network
New NPP ETE	New Nuclear Power Plant at the Temelín site
NORMAL	NORMAL calculation software for assessing radionuclide dispersion and determining radiological effects
MSA	Minimum significant activity
OS	Package
DER	Dose equivalent rate
PES	Planned exposure situation
PDER	Photon dose equivalent rate
RDETE	Software for calculating the dispersion of radioactive substances and their decay products in the aquatic environment
X-ray	X-radiation

Abbreviation	Meaning
SI	International System of Units (Système international d'unités)
SMR	Small modular reactor
SMR ETE	New SMR Power Plant at the Temelín site
SNFS	Spent nuclear fuel storage facility
EWN	Early Warning Network
SONS	State Office for Nuclear Safety
SÚRO	National Radiation Protection Institute
TLD	Thermoluminescent dosimeters
UNEP	United Nations Environment Programme
UNSCEAR	United Nations Scientific Committee on the Effects of Atomic Radiation
VK	Ventilation stack

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VÝZKUMNÝ ÚSTAV VODOHOSPODÁŘSKÝ T. G. MASARYKA
veřejná výzkumná instituce

Appendix No. 4 to the SMR ETE EIA Documentation

Summary Report on Surface Water and Groundwater for SMR ETE

Juranová E., Marešová D., Vyskoč P., Vizina A., Datel J. V., Hrabánková A., Eckhardt P., Prchalová H. and Rosendorf P.

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1 Introduction

The purpose of this report is to summarize surface-water and groundwater issues associated with the New SMR Power Plant at the Temelín site (SMR ETE), focusing on an assessment of the current situation and, in particular, the effects of SMR ETE on surface water and groundwater, including its cumulative effects with the other parts of ETE: the existing Temelín Nuclear Power Plant (Units 1 and 2) and the New Nuclear Power Plant at the Temelín site (New NPP ETE). The report is intended for use as Appendix No. 4 to the EIA Documentation for the SMR ETE project (SMR ETE EIA Documentation).

This report was prepared by the Výzkumný ústav vodohospodářský T. G. Masaryka, v. v. i. (VÚV TGM, v. v. i.); the client is Amentum Clean Energy s.r.o. Client purchase order No. WC003349; contractor contract No. SMLP-2026-022-000008.

The report primarily summarizes the studies conducted to date by VÚV TGM, v. v. i., for the SMR ETE project in the fields of surface water and groundwater and is divided into five main parts:

The first part is the Introduction, which defines the purpose of the report in accordance with the terms of reference. Chapter 2 describes surface water in the area of interest, namely the area affected by the SMR ETE project. It describes the current state of surface water and the estimated effect of the SMR ETE project on both surface-water quantity and quality, not only in the Vltava River, but also in the affected minor watercourses near the SMR ETE project. Chapter 3 addresses groundwater in the affected area, describes its current quantitative and qualitative status, and also describes the effect of the SMR ETE project on groundwater. Chapter 4 addresses the status of water bodies under the Water Framework Directive (2000/60/EC) [1], covering both surface water bodies and groundwater bodies, and describes their current status and the effect of the SMR ETE project. Chapter 5 provides an overall summary and addresses the water-related requirements arising from the conclusions of the EIA screening procedure.

2 Surface Water in the Affected Area

2.1 Surface-Water Quantity: Vltava River

Chapter prepared by: Ing. Adam Vizina, Ph.D., Ing. Petr Vyskoč
The chapter is based on background studies [2], [3] and [4].

2.1.1 Current State of Surface-Water Quantity

This chapter summarizes the current state of surface-water quantity in the area affected by the SMR ETE project, focusing on the Vltava River and the associated water-management system as far as the Kořensko weir-pool profile. It is based on the DP20 background study, Initial Assessment of the SMR ETE Project, of May 2025 [2]; the subsequent DP20A background report for the SMR ETE EIA Documentation, of November 2025 [3]; and the DP07 background study, Surface Water: Quantity, for the New NPP ETE [4]. For the purposes of this chapter, report DP20A [3] is regarded as the updated background document because it expands and refines the methodological sections, the description of climate models, and the scope of the hydrological data. The original report DP20 [2] is used primarily to explain the water-management modeling method and to establish continuity with earlier assessments.

This part describes the baseline hydrological and water-management conditions. The assessment of the effect of the SMR ETE project on surface-water quantity is presented in the following chapter 2.1.2. The conclusions presented here therefore do not assess the contribution of the new project itself, but characterize water availability, hydrological regimes, the available data series, the principal water-management relationships, and the current ability of the system to stabilize the flow regime in the affected reach of the Vltava River.

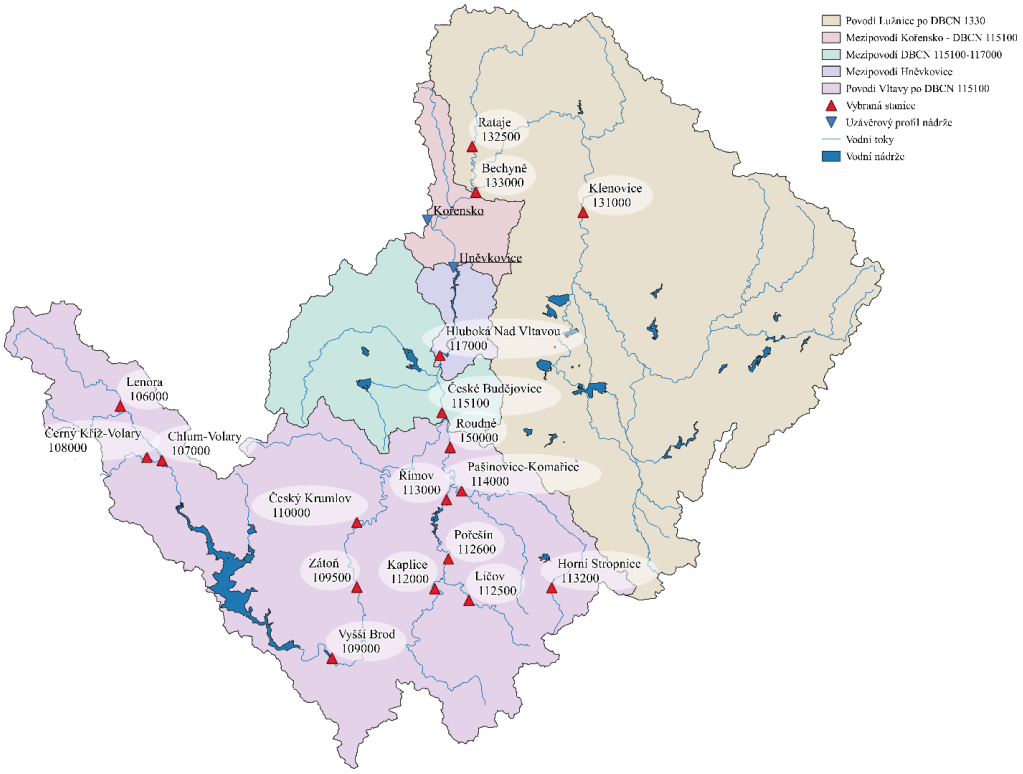
Definition of the affected area and principal water-management relationships

The affected area (Fig. 1) is defined as the Vltava River basin from the upper part of the Vltava Cascade to the Kořensko profile, including the major Malše and Lužnice tributaries. For the SMR ETE project, the decisive profiles are those at the Lipno I, Lipno II, Hněvkovice, and Kořensko waterworks, together with the Vyšší Brod, České Budějovice, Hluboká nad Vltavou, and Bechyně gauging stations. A key consideration in assessing the current situation is that the flow regime of the Vltava River in this part of the basin has long been affected by water storage and controlled releases from reservoirs. Observed discharges therefore cannot be interpreted solely as the natural response of the river basin, but as a combination of the natural hydrological situation and water-management operations.

The Hněvkovice waterworks is the water source for the Temelín site. In water-management calculations, wastewater discharge from the ETE site is considered at the Kořensko profile, which is also one of the principal control profiles for maintaining the minimum flow. Flow augmentation in the system is provided primarily by the storage volume of the Lipno I water

reservoir in cooperation with the Hněvkovice water reservoir. Consequently, both the local hydrological situation at Hněvkovice and the upper Vltava regime and long-term management of stored water reserves are relevant.

2 Surface Water in the Affected Area



Povodní lužnice po DBCN1330	Lužnice basin up to DBCN 1330
Mezipovodí Kořensko – DBCN 115100	Kořensko incremental catchment: DBCN 115100
Mezipovodí DBCN 115100-117000	Incremental catchment DBCN 115100–117000
Mezipovodí Hněvkovice	Hněvkovice incremental catchment
Povodí Vltavy po DBCN 115100	Vltava basin up to DBCN 115100
Vybraná stanice	Selected station
Uzávěrový profil nádrže	Reservoir closure profile
Vodní toky	Watercourses
Vodní nádrže	Water reservoirs

Fig. 1 Area of interest showing the delineation of individual incremental catchments, major gauging stations, and water reservoirs. Source: [4].

Dividing the area into individual incremental catchments makes it possible to supplement discharge series with the hydrological contribution of reaches for which continuous discharge measurements are unavailable. This procedure is particularly important between the České Budějovice profile, the inflow to the Hněvkovice water reservoir, the confluence with the Lužnice River, and the Kořensko profile. In these reaches, contributions from the incremental catchments were modeled using spatial climate data, the hydrological balance, and subsequent model calculations (see the list of selected profiles in Table 1).

Table 1 Selected profiles for which climatological data were derived and evaluated [3].

DBCN	Station	Watercourse	Area [km^2]
109000	Vyšší Brod	Vltava	997.38
112600	Pořešín	Malše	436.83
115100	České Budějovice	Vltava	2849.82
117000	Hluboká nad Vltavou	Vltava	3400.45
133000	Bechyně	Lužnice	4055.13

Data sources and processing

Two main groups of data were used for the current assessment. The first group comprises long-term climatological data, particularly precipitation totals and air temperatures, processed for the period 1961–2022. The second group comprises hydrological data, primarily observed discharge series, derived natural discharges, data on evaporation from water surfaces, and operating data from Povodí Vltavy. For the current assessment, daily data through 2023 were added to background study DP07 [4], making it possible to compare the current situation with the period used in preparing the earlier EIA Documentation for the New NPP ETE.

The climatological data were derived from a 500 × 500 m raster grid created from measurements by the Czech Hydrometeorological Institute. Processing included verification and homogenization of station data, followed by interpolation to a spatial grid using regression kriging with external parameters such as elevation, slope, skewness, terrain roughness, and other characteristics. Spatial averages for individual basins, sub-basins, water reservoirs, and other areas of interest were derived from this raster layer. This procedure ensures that the climatological inputs to the hydrological calculations are not tied solely to point stations, but represent the spatial conditions of the assessed river basins as a whole [3], [4].

The hydrological data include both observed discharges and so-called natural discharges. Natural discharges represent the flow regime derived after eliminating the effects of water-management uses, particularly water withdrawals, discharges, and operations at waterworks. Their use is essential both for calibrating the hydrological model and for modeling the water-management system, because it makes it possible to separate the natural hydrological response of the river basin from the effects of operational interventions. In practice, naturalized, or natural, series are therefore used alongside observed water-level series.

For the Hněvkovice water reservoir, background study DP07 [4] used non-homogenized daily data from Povodí Vltavy, for 2003–2023. These data include the date, reservoir water level, water and air temperatures, precipitation totals, information on snow and ice, reconstructed inflows, outflows, and withdrawals. Erroneous or implausible values were filtered, corrected, and supplemented, including by means of linear interpolation. The purpose of these adjustments was to obtain a consistent time series suitable for subsequent water-balance assessment. An overview of the data used is provided in Table 2.

Table 2 Overview of the data types used and their role in assessing the current state of surface-water quantity. Prepared according to [3], [4].

Data type	Data characteristics	Use in the chapter
Climatological data	Spatial averages of precipitation and air temperature at a daily time step	Assessment of climate trends and inputs to the BILAN model
Observed discharges	Series of measured or operationally recorded discharges	Description of the hydrological regime actually observed
Natural discharges	Discharges after removal of the effects of withdrawals, discharges, and reservoirs	Model calibration and comparison with the affected regime
Operating data for the Hněvkovice water reservoir	Water levels, outflows, withdrawals, temperatures, precipitation, and other data	Reconstruction of reservoir inflow and the water balance
Modeled contributions from incremental catchments	Runoff contributions derived using a hydrological model	Supplementation of discharges in reaches without direct measurements

Climatological characteristics of the current situation

From a climatological perspective (Table 3), the current situation is characterized by a clear increase in air temperatures and a less clear trend in precipitation totals. Background study DP20A gives basic statistical characteristics of precipitation and temperature for five principal river basins for the period 1961–2022. A highly statistically significant trend in air temperature was identified in all assessed basins, whereas a statistically significant trend in precipitation totals occurs only locally. This combination is important for the water balance: even with relatively stable annual precipitation totals, higher temperatures may result in higher potential evapotranspiration and changes in the seasonal distribution of runoff.

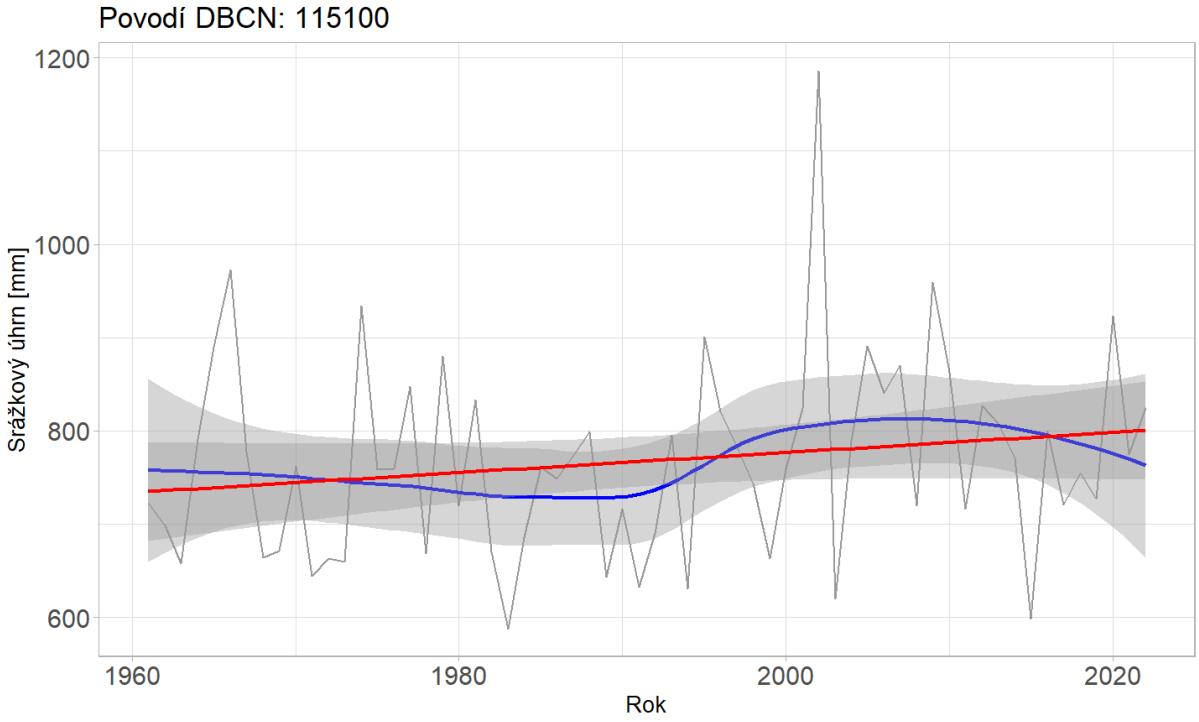
Table 3 Basic statistical air-temperature and precipitation-total variables for 1961–2022 [3].

DBCN	Station	Watercourse	Mean T [°C]	T p-value	Mean P [mm]	P p-value
109000	Vyšší Brod	Vltava	5.48	0.000	871.20	0.171
112600	Pořešín	Malše	6.65	0.000	777.85	0.046
115100	České Budějovice	Vltava	6.57	0.000	767.68	0.156
117000	Hluboká nad Vltavou	Vltava	6.86	0.000	740.73	0.160
133000	Bechyně	Lužnice	7.71	0.000	663.93	0.324

The results confirm a strong temperature signal throughout the river basin. In the Vyšší Brod basin, the mean temperature for the assessed period is 5.48 °C, whereas farther downstream, in the Lužnice basin up to Bechyně, it reaches 7.71 °C. The differences correspond to the elevation and spatial gradients, but the p-value for the temperature trend is reported as 0.000 for all profiles. This means that rising temperatures are one of the most important long-term factors affecting the hydrological balance under current conditions.

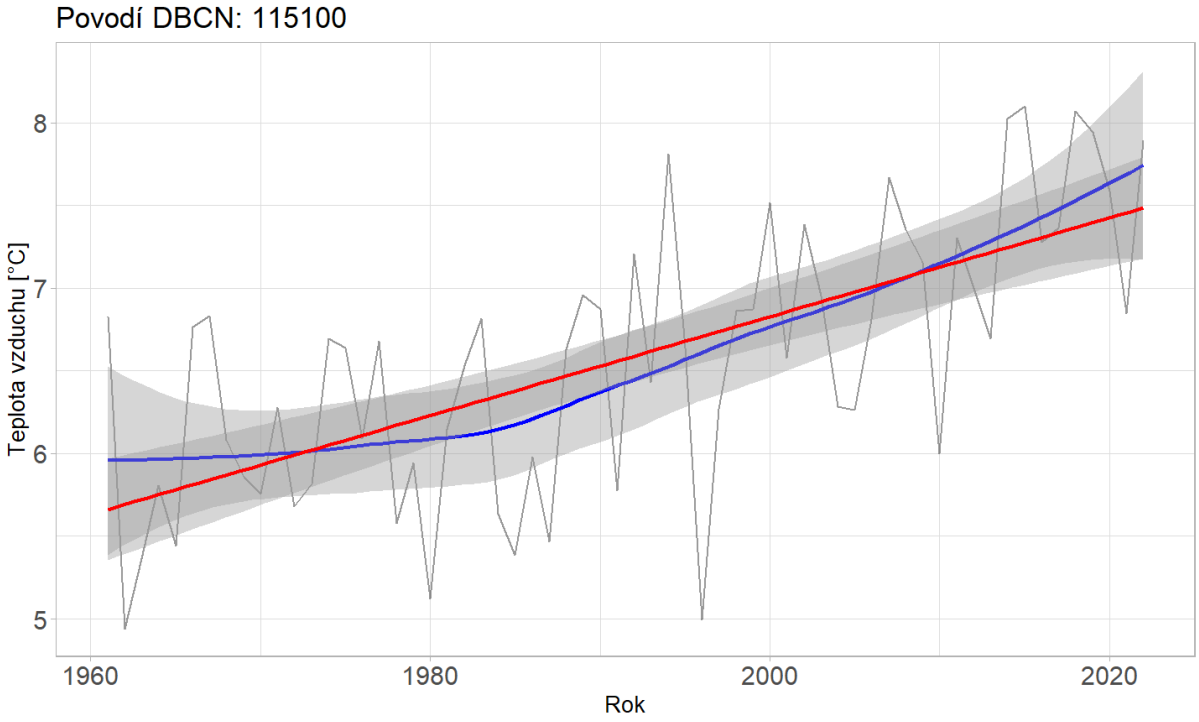
Precipitation totals exhibit a spatial gradient from higher values in the upper Vltava basin to lower values in the Lužnice basin. The mean annual precipitation total is 871.20 mm in the Vyšší Brod basin and 663.93 mm in the Bechyně basin. The long-term precipitation trend is not statistically significant in most cases; the exception is the Pořešín basin, for which the p-value is reported as 0.046. For the assessment of surface-water quantity, it is therefore important that precipitation alone does not explain the current state of water availability in full. Temperature, evaporation, and changes in seasonality also play important roles.

The development of precipitation totals and air temperatures for the entire area of interest as far as the Kořensko water reservoir, represented by the DBCN 115100 České Budějovice profile, is shown in Fig. 2 and Fig. 3.



Povodní DBCN: 115100	Basin DBCN: 115100
Srážkový úhrn [mm]	Precipitation total [mm]

Fig. 2 Trend in annual precipitation totals for the entire area of interest as far as the Kořensko water reservoir, using the DBCN 115100 České Budějovice profile as an example. Source: [3].



Povodní DBCN: 115100	Basin DBCN: 115100
Teplota vzduchu [°C]	Air temperature [°C]

Fig. 3 Trend in annual air temperatures for the entire area of interest as far as the Kořensko water reservoir, using the DBCN 115100 České Budějovice profile as an example. Source: [3].

The ongoing changes should also be described by comparing the periods 2003–2009 and 2010–2023. This comparison is important because 2003–2009 corresponds to the wetter reference period used in the earlier EIA Documentation for the New NPP ETE [5], whereas 2010–2023 is more representative of current hydrological conditions. For 2010–2023, the entire area of interest has a lower mean annual precipitation total and, at the same time, a higher mean air temperature than in 2003–2009. A summary is provided in Table 4.

Table 4 Difference in mean precipitation and temperature values for the entire area of interest. Adapted from [4].

Area	P 2003–2009 [mm]	P 2010–2023 [mm]	Change in P [mm]	T 2003–2009 [°C]	T 2010–2023 [°C]	Change in T [°C]
Entire area of interest	723.88	695.03	-28.85	8.06	8.55	0.49
Incremental catchment DBCN 115100–117000	636.62	615.05	-21.57	8.80	9.42	0.62
Vltava basin up to DBCN 115100	787.48	753.57	-33.91	7.65	8.06	0.41
Lužnice basin up to DBCN 133000	676.12	649.71	-26.41	8.37	8.94	0.57

Kořensko incremental catchment: DBCN 115100	608.07	611.27	3.20	8.59	9.23	0.64

Hydrological regime and discharge modeling

The hydrological regime of the area of interest is assessed using observed discharges, natural discharges, and modeled runoff series. Observed discharges reflect the actual situation in the river, meaning the situation affected by the operation of waterworks, water withdrawals, and discharges. Natural discharges represent the reconstructed regime without the direct effects of these water uses and serve as inputs to hydrological and water-management modeling. This dual perspective is essential for assessing the current situation: observed discharges describe the actual conditions in the watercourse, whereas natural discharges make it possible to determine whether changes in water availability are attributable primarily to climate trends or to operations and withdrawals.

The BILAN model was used to model the hydrological balance. This is a chronological catchment hydrological-balance model that calculates the fundamental balance relationships at the catchment surface, in the aeration zone, and in the groundwater zone at a daily or monthly time step. The inputs primarily comprise precipitation totals, mean temperatures, observed runoff depths, potential evapotranspiration, and water-use data. The model can simulate potential evapotranspiration, actual evapotranspiration, infiltration, percolation, snow-water storage, soil-water storage, and groundwater storage. Runoff is understood in the model as the sum of several components, including direct runoff and baseflow [3]. The list of profiles is provided in Table 5.

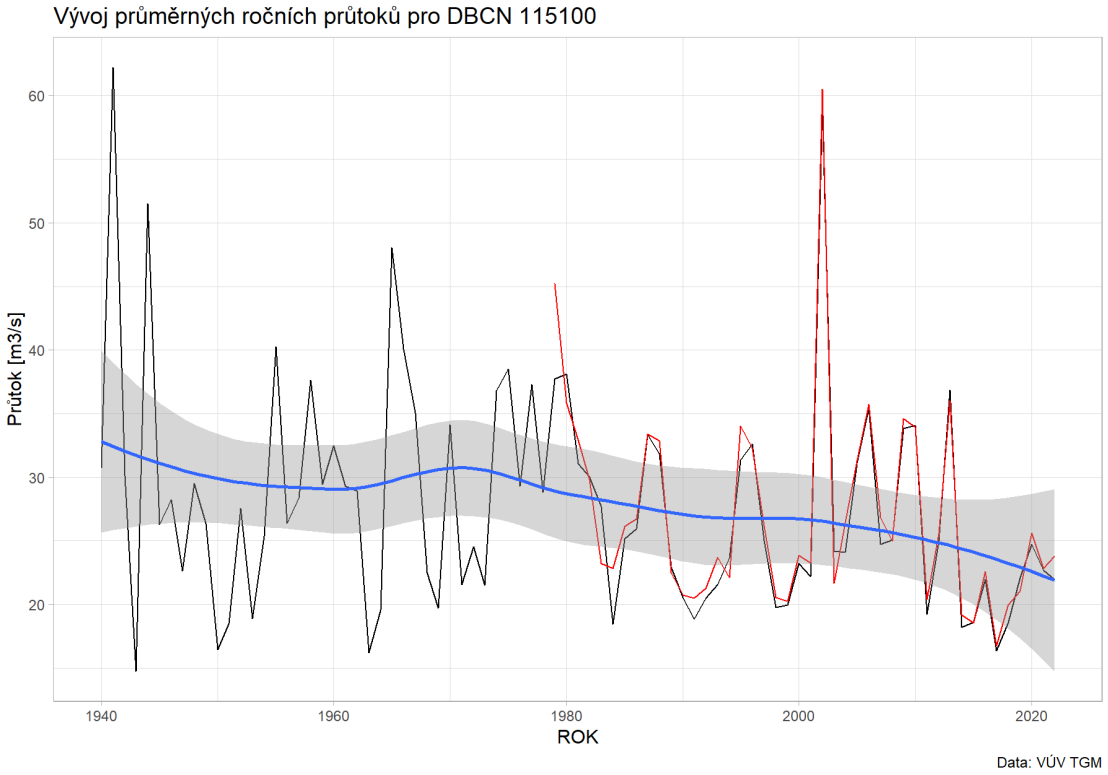
Table 5 Discharge profiles used to assess the hydrological regime. Adapted from [3].

DBCN	Station	Watercourse	Area [km^2]
106000	Lenora	Teplá Vltava	175.80
107000	Chlum-Volary	Teplá Vltava	347.01
108000	Černý Kříž-Volary	Studená Vltava	103.17
109000	Vyšší Brod	Vltava	997.38
109500	Zátoň	Vltava	1303.76
110210	Český Krumlov, old gauge	Vltava	1545.44
112000	Kaplice	Malše	257.67
112500	Ličov	Černá	126.57
112600	Pořešín	Malše	436.83
113000	Římov	Malše	493.89
113200	Horní Stropnice	Stropnice	25.34
114000	Pašinovice-Komařice	Stropnice	400.66
115000	Roudné	Malše	962.69
115100	České Budějovice	Vltava	2849.82
116500	Lékařova Lhota	Bezdrevský Stream	
131000	Klenovice	Lužnice	3152.01
132500	Rataje	Smutná	217.62
133000	Bechyně	Lužnice	4055.13

Table 6 Basic discharge characteristics at the principal profiles. Adapted from [3].

DBCN	Station	Watercourse	p-value	Mean [m^3/s]	Minimum [m^3/s]	Maximum [m^3/s]
106000	Lenora	Teplá Vltava	0.13	2.90	1.77	5.23
107000	Chlum-Volary	Teplá Vltava	0.01	5.52	3.48	9.60
108000	Černý Kříž-Volary	Studená Vltava	0.04	2.09	1.41	3.40
109000	Vyšší Brod	Vltava	0.27	13.31	7.72	25.54
109500	Zátoň	Vltava	0.83	15.42	9.50	31.91
112000	Kaplice	Malše	0.49	1.97	1.15	4.42
112500	Ličov	Černá	0.19	1.27	0.62	2.94
112600	Pořešín	Malše	0.73	3.82	2.18	8.32
113000	Římov	Malše	0.24	3.01	0.89	8.40
113200	Horní Stropnice	Stropnice	0.68	0.22	0.10	0.49
114000	Pašinovice-Komařice	Stropnice	0.74	2.06	0.90	6.36
115000	Roudné	Malše	0.80	5.97	2.94	16.78
115100	České Budějovice	Vltava	0.73	25.27	16.38	59.21
116500	Lékařova Lhota	Bezdrevský Stream	0.19	0.47	0.22	1.27
131000	Klenovice	Lužnice	0.75	16.86	7.45	43.80
132500	Rataje	Smutná	0.36	0.94	0.42	2.69
133000	Bechyně	Lužnice	0.76	20.83	9.31	54.47

It is apparent from Table 6 that, in terms of long-term means, the Vltava River itself is the principal water source, with the Lužnice River also making a substantial contribution. The mean flow in the České Budějovice basin is 25.27 m^3/s, compared with 20.83 m^3/s for the Lužnice River at Bechyně. The relationship between the two series is significant for the Kořensko profile, which lies downstream of the confluence of the Vltava and Lužnice Rivers and also serves as the control profile for the water-management solution. The development of mean annual discharges for DBCN 115100 České Budějovice is shown in Fig. 4.



Vývoj průměrných ročních průtoků pro DBCN 115100	Development of mean annual discharges for DBCN 115100
Průtuok [m 3/s]	Discharge [m 3/s]
ROK	YEAR
Data: VÚV TGM	Data: TGM WRI

Fig. 4 Development of mean annual discharges for DBCN 115100 České Budějovice. Source: [3].

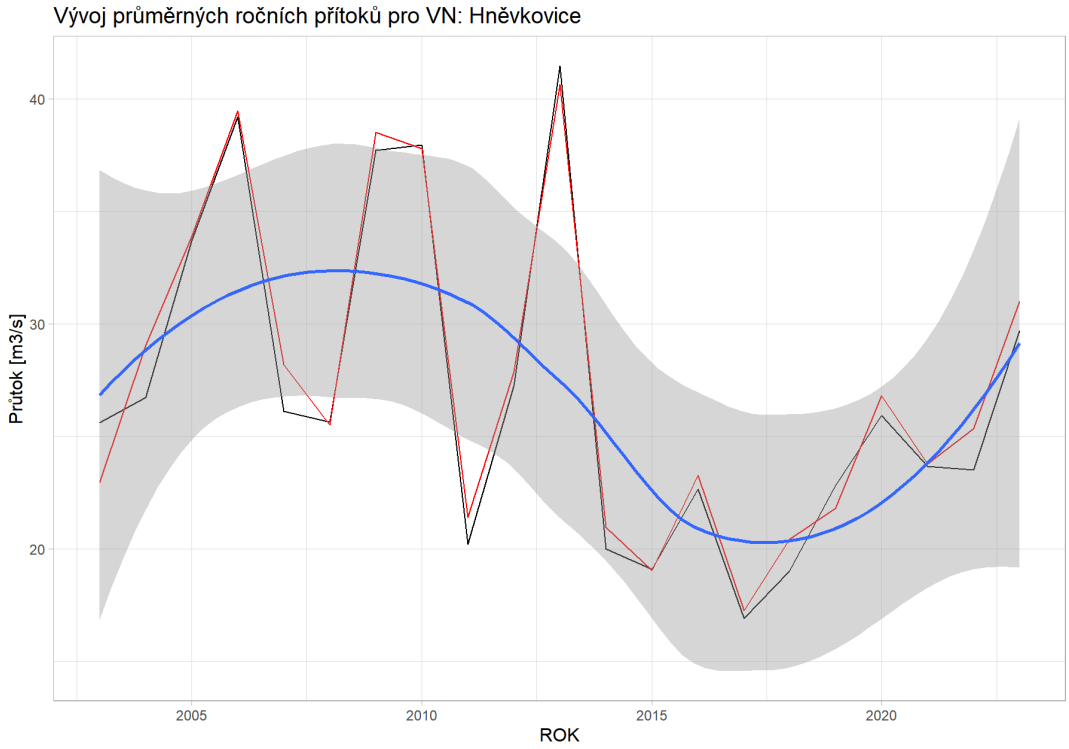
Hněvkovice water reservoir and inflow reconstruction

The Hněvkovice water reservoir is essential for supplying the Temelín site with surface water. The inflow to the reservoir is not measured directly and was therefore reconstructed in DP07 [4] using the water-balance method. The reconstruction inputs comprised reservoir outflow, evaporation from the water surface, water withdrawals, and the change in reservoir water volume. The background study expressed the basic balance relationship such that reservoir inflow equals the sum of outflow, evaporation, withdrawal, and the change in stored water volume. The volume derived in this manner was then converted to a discharge in m^3/s.

The inflow reconstruction was verified against the observed discharge at the České Budějovice-Vltava gauging station (DBCN 115100) and the modeled contribution from the incremental catchment between that station and the inflow to the Hněvkovice water reservoir. The incremental catchment was not monitored continuously, so its contribution was derived by means of a hydrological balance based on precipitation and air temperature. This procedure is important to the assessment of the current situation for two reasons. First, it makes it possible to use a consistent series of reservoir inflows for 2003–2023. Second, it takes into account local contributions from the incremental catchment, which can be significant during low and medium flows.

The Hněvkovice profile is also important to the current situation because a required minimum flow is specified there. According to DP20A and DP20, the minimum-flow requirement at the Hněvkovice profile is 6.5 m^3/s, compared with 9.5 m^3/s at the Kořensko profile; a minimum of 6.0 m^3/s is required at the profile downstream of Lipno II [2], [3].

The annual inflow series for the Hněvkovice water reservoir (Fig. 5) shows substantial interannual variability. In 2003–2023, wetter years with mean annual inflows exceeding 35–40 m^3/s alternated with dry periods in which mean annual inflows fell below 20 m^3/s. The dry period after 2014 is clearly apparent in the series and corresponds to the multi-year drought that affected the entire Central European region. Discharges increase partially toward the end of the period, but the overall water-availability conditions in 2010–2023 remain less favorable than in 2003–2009 [4].



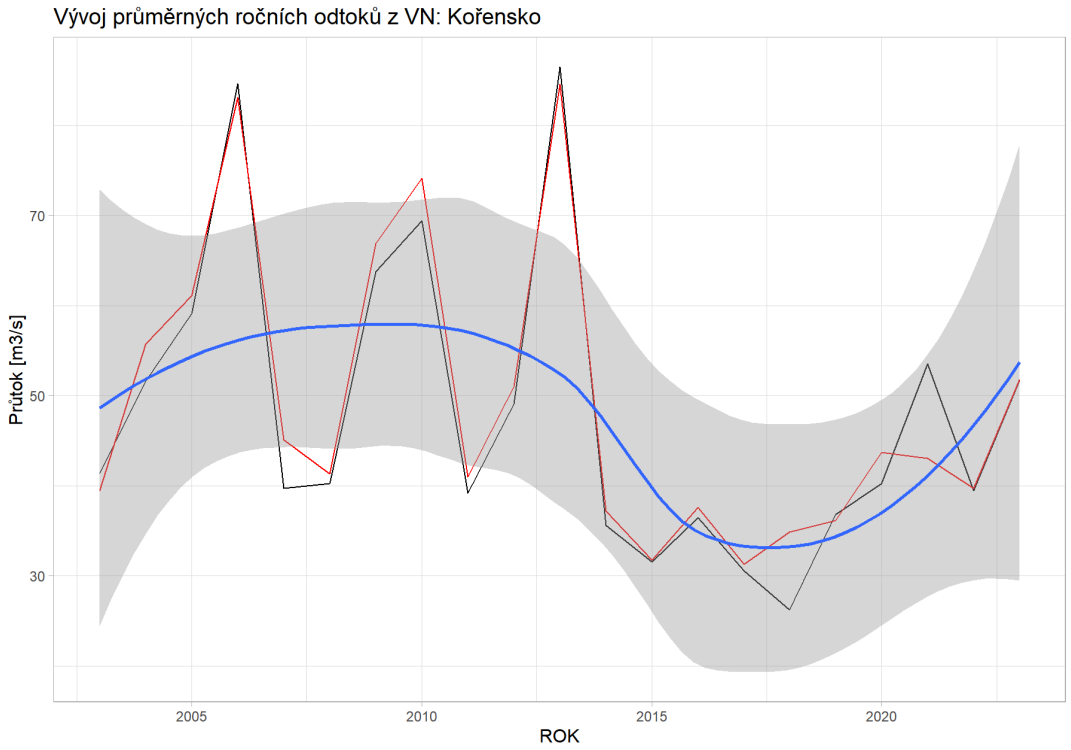
Vývoj průměrných ročních průtoků pro VN: Hněvkovice	Development of mean annual discharges for the following water reservoir: Hněvkovice
Průtuok [m 3/s]	Discharge [m 3/s]
ROK	YEAR

Fig. 5 Mean annual inflows to the Hněvkovice water reservoir in 2003–2023. Source: [4].

Discharges downstream of Hněvkovice, Lužnice inflow, and the Kořensko profile

In DP07 [4], the Vltava discharge at the profile downstream of the Hněvkovice reservoir was determined from corrected reservoir outflows and the modeled contribution from the incremental catchment between Hněvkovice and the confluence of the Vltava and Lužnice Rivers. In addition to the Vltava discharge, the Lužnice inflow, represented by the Bechyně gauging station, is also important to the Kořensko profile. The outflow from Kořensko was therefore derived by combining observed discharges, contributions from incremental catchments, and the Lužnice discharge. This procedure reflects the fact that Kořensko represents a synthetic profile in the lower part of the area of interest, incorporating both the Vltava regime and the Lužnice regime.

In terms of the long-term mean, discharge at the Kořensko profile is higher than at the Hněvkovice profile, but it is also significantly affected by the hydrological situation in the Lužnice basin. The importance of the Lužnice River increases particularly during periods of low flow, when local differences among the individual parts of the river basin can significantly affect the resulting water balance. To assess the current situation, it is therefore necessary to consider not only the withdrawal at Hněvkovice, but also the subsequent balance situation downstream of the confluence with the Lužnice River and at the Kořensko profile. Mean annual outflows from the Kořensko water reservoir are shown in Fig. 6.



Vývoj průměrných ročních průtoků pro VN: Kořensko	Development of mean annual discharges for the following water reservoir: Kořensko
Průtuok [m 3/s]	Discharge [m 3/s]
ROK	YEAR

Fig. 6 Mean annual outflows from the Kořensko water reservoir in 2003–2023. Source: [4].

A summary of annual discharges at the Hněvkovice and Kořensko profiles is provided in Fig. 6 and Table 7. The values shown indicate that lower water availability is apparent in both natural and affected discharges. The differences between the mean and affected regimes are relatively small, supporting the conclusion that the change between the periods is attributable

primarily to climatic and hydrological conditions rather than solely to operational measures. However, the water-management infrastructure mitigates the differences and stabilizes the course of discharges, particularly during periods of low flow [4]. The discharge-characteristic values confirm that the current period is hydrologically less favorable than the reference periods used in some older background documents. The current situation must therefore be described using updated series through 2023, rather than being limited to the earlier periods.

Table 7 Summary of annual discharges at the Hněvkovice and Kořensko profiles. Calculated from the annual values provided in [4].

Profile	Period	Mean affected Q [m^3/s]	Mean natural Q [m^3/s]	Minimum year	Minimum Q [m^3/s]	Maximum year	Maximum Q [m^3/s]
Inflow to the Hněvkovice water reservoir	2003–2009	30.68	31.08	2003	25.62	2006	39.22
Inflow to the Hněvkovice water reservoir	2010–2023	25.03	25.54	2017	16.93	2013	41.46
Inflow to the Hněvkovice water reservoir	2003–2023	26.91	27.39	2017	16.93	2013	41.46
Outflow from the Kořensko water reservoir	2003–2009	54.37	56.13	2007	39.73	2006	84.66
Outflow from the Kořensko water reservoir	2010–2023	44.74	45.56	2018	26.23	2013	86.46
Outflow from the Kořensko water reservoir	2003–2023	47.95	49.08	2018	26.23	2013	86.46

Function of the water-management system and importance of the water reservoirs

The current flow regime of the Vltava River in the area of interest is significantly modified by waterworks (Table 8). The storage function is provided primarily by the Lipno I and Hněvkovice water reservoirs in conjunction with the other elements of the Vltava Cascade. According to the DP20 and DP20A background documents, the water-management model represents a system comprising elements that perform a control function, elements representing withdrawals and discharges, and control profiles with minimum-flow requirements (Table 9).

The water-management modeling method uses a simulation model of the storage function of the water-management system. At each time step, the requirement at a profile is compared with the affected inflow to that profile. If the profile is within the augmentation range of a reservoir's storage volume, the flow deficit can be made up in accordance with the operating rules. This

principle is important to the current situation because the observed discharge is the result not only of the current inflow, but also of decisions concerning the management of stored water [2], [3].

Table 8 Storage volumes of the principal water reservoirs considered in the water-management model [3].

Water reservoir	Watercourse	Storage volume [million m^3]	Storage-volume elevation [m a.s.l.]
Lipno I	Vltava	252.991	724.90
Římov	Malše	30.0162	470.65
Hněvkovice	Vltava	12.155	370.10

Table 9 Minimum-flow requirements at the principal control profiles [3].

Profile ID	Profile name	MQ [m^3/s]	Specification
NAD112002	Lipno II	6.000	Waterworks Operating Rules
NAD111003	Hněvkovice	6.500	Waterworks Operating Rules
NAD1193900	Kořensko	9.500	Waterworks Operating Rules

Lipno I is the principal storage element in the system and can augment flows farther downstream. The operating rules include maintaining the minimum flow downstream of Lipno II, supplementing flows toward Hněvkovice and Kořensko, and supporting withdrawals for the ETE site in cooperation with the Hněvkovice water reservoir. During the summer, the Lipno I recreational target water level is also taken into account in the operating rules where hydrological and operating conditions permit [2], [3].

The Hněvkovice water reservoir has a smaller storage volume than Lipno I, but it is of immediate and decisive importance to the Temelín site. The background documents define its storage volume as lying between elevations 363.60 and 370.10 m a.s.l. and having a volume of 12.155 million m^3. During exceptional low-flow situations and hydrological failures, the reservoir is assumed to be managed in conjunction with supplementation from Lipno I and the need to maintain water withdrawals for the ETE site and the minimum flow downstream of the reservoir [2], [3].

The water-management system therefore does not currently function as a passive reflection of natural discharge, but as a controlled system that uses storage to moderate differences between wet and dry periods. This fact is important when interpreting the data: observed discharges downstream of the reservoirs are stabilized, but this stabilization results from the operational management of water storage. As natural discharges decrease over the long term or dry periods occur more frequently, the importance of storage volumes and the rules governing their use increases.

Assessment of reliability and current hydrological conditions

Although the assessment of the project effects is presented in Chapter 2.1.2, it is relevant to the description of the current situation that the water-management modeling in DP20A [3] also verified the functioning of the system under current hydrological conditions. For the 5 600 MWe capacity option plus the SMR ETE project (the SMR ETE project is not assessed in isolation solely as a separate withdrawal, but in terms of its cumulative effects with the existing Units 1 and 2 and the proposed New NPP ETE), DP20A [3] reported current reliability by supplied volume of 100.0% and reliability by duration of 99.9%. The same reliability by duration of 99.9% was also reported under current conditions for the minimum flows downstream of Lipno II, Hněvkovice, and Kořensko.

These values confirm that, under current hydrological conditions, the system is capable of meeting the water-withdrawal and minimum-flow requirements with a high degree of reliability. However, these results must be interpreted in relation to the assumed operating conditions, particularly the use of the Lipno I storage volume for water storage and flow augmentation. Current reliability is therefore not solely a property of the natural flow regime, but a result of the management of the water-management system.

Seasonal changes in the flow regime

The current state of surface-water quantity is also characterized by changes in seasonality (Table 10). A comparison of 2003–2009 and 2010–2023 shows that the greatest differences occur primarily in spring, particularly in March and April. The decrease in discharge is associated with lower precipitation in 2010–2023, as well as with increases in temperature and evapotranspiration. In other words, even similar precipitation totals can result in lower runoff if evaporation is higher and the growing season begins earlier.

Table 10 Selected monthly changes in affected discharges between 2003–2009 and 2010–2023 [4].

Profile	Month	Q 2003–2009 [m³/s]	Q 2010–2023 [m³/s]	Change [m³/s]
Inflow to the Hněvkovice water reservoir	March	50.50	32.16	-18.34
Inflow to the Hněvkovice water reservoir	April	44.95	28.27	-16.68
Inflow to the Hněvkovice water reservoir	May	30.77	24.13	-6.64
Inflow to the Hněvkovice water reservoir	July	32.80	23.87	-8.93
Inflow to the Hněvkovice water reservoir	August	28.21	22.79	-5.42
Inflow to the Hněvkovice water reservoir	September	20.81	19.20	-1.61

Outflow from the Kořensko water reservoir	March	104.14	64.07	-40.07
Outflow from the Kořensko water reservoir	April	95.28	47.98	-47.30
Outflow from the Kořensko water reservoir	May	48.38	39.01	-9.37
Outflow from the Kořensko water reservoir	July	56.77	35.86	-20.91
Outflow from the Kořensko water reservoir	August	41.50	36.57	-4.93
Outflow from the Kořensko water reservoir	September	34.33	33.58	-0.75

These values show that lower water availability is apparent both in inflows to Hněvkovice and in affected discharges. The differences between the natural and affected regimes are relatively small, supporting the conclusion that the change between the periods is attributable primarily to climatic and hydrological conditions rather than solely to operational measures. However, the water-management infrastructure mitigates the differences and stabilizes the course of discharges, particularly during periods of low flow [4].

2.1.2 Effect of the SMR ETE Project on Surface-Water Quantity

This chapter assesses the effect of the SMR ETE project on surface-water quantity in the Vltava River and the associated water-management system. It builds on the description of the current situation provided in Chapter 2.1.1 and primarily uses the updated DP20A background report, SMR ETE Water-Management Study: Quantity, Background Report for the SMR ETE EIA Documentation [3]. The original DP20 study, Water-Management Study: Quantity, Initial Assessment of the SMR ETE Project [2], is used primarily to explain the broader methodology and compare the options because DP20A [3] refines and supersedes it with respect to some of the options assessed.

The effect of the project is assessed as part of the cumulative water-management configuration of the Temelín site. This means that the SMR ETE project is not assessed in isolation solely as a separate withdrawal, but in terms of its cumulative effects with the existing Units 1 and 2 and the proposed New NPP ETE. For further work, the updated DP20A study [3] considers the 5 600 MWe capacity option, comprising Units 1 and 2 (2 × 1 100 MWe) and two 1 700 MWe New NPP ETE units, supplemented by the 500 MWe SMR ETE project. This approach satisfies the requirement for the EIA Documentation to assess the project in relation to other activities of water-management significance at the site.

Nature of the effect assessed

The direct effect of the project on surface-water quantity is primarily associated with raw-water withdrawal from the Hněvkovice waterworks and subsequent wastewater discharge at the Kořensko weir-pool profile. Withdrawal at Hněvkovice reduces the available discharge in the part of the Vltava River under consideration, whereas discharge at the Kořensko profile returns part of the water withdrawn to the watercourse. The decisive factors in terms of quantity are therefore not only the absolute withdrawal, but also the difference between withdrawal and discharge, its seasonal distribution, and the ability of the water-management system to augment flows from stored water reserves.

The indirect effect of the project is associated with the operation of water reservoirs, particularly Lipno I and Hněvkovice. In the model, these reservoirs provide withdrawals for the ETE site while also meeting the minimum-flow requirements at the control profiles. If the combination of increased withdrawal requirements and unfavorable hydrological conditions were to lower the water levels in the reservoir storage volumes, this would initially result in reduced reliability of the Lipno I recreational target water level and potentially in failures to meet withdrawal or minimum-flow requirements. The assessment therefore considers the reliability of meeting the requirements, not merely a single mean flow.

When interpreting the results, it is important to note that the assessed values are not obtained simply by subtracting the withdrawal from the discharge in the Vltava River. The water-management system is controlled, with withdrawals, discharges, minimum flows, and reservoir water levels interlinked. The project is therefore assessed using a simulation model of the storage function of the water-management system that takes into account the chronological sequence of hydrological situations, reservoir storage volumes, operating rules, and water-use requirements.

Water-withdrawal and discharge requirements

For the 5 600 MWe capacity option plus the SMR ETE project, the updated DP20A study assumes a total annual raw-water withdrawal of 134 922.91 thousand m^3 and total annual wastewater discharge of 30 039.56 thousand m^3 (Table 11) [3]. Expressed as mean year-round discharges, this corresponds to approximately 4.28 m^3/s for withdrawal, 0.95 m^3/s for discharge, and 3.33 m^3/s for the difference between withdrawal and discharge. The contribution of the SMR ETE project itself is 12 000 thousand m^3 withdrawn per year and 3 564 thousand m^3 discharged per year, giving a net difference of approximately 8 436 thousand m^3 per year, equivalent to approximately 0.27 m^3/s.

The SMR ETE project's share of the total cumulative withdrawal under the 5 600 MWe plus SMR option is approximately 8.9%. For discharge, the SMR share is approximately 11.9%. In terms of the overall balance, the SMR ETE project therefore represents a smaller proportion of the water requirements than the principal capacity option for the Temelín site. Nevertheless, its

inclusion is important to the EIA Documentation because it increases the existing and planned raw-water withdrawal requirements.

Table 11 Monthly water-withdrawal and discharge balance for the 5 600 MWe plus SMR ETE project option. Adapted from [3].

Month	Withdrawal, 5 600 MWe + SMR [thousand m^3]	Discharge, 5 600 MWe + SMR [thousand m^3]	Withdrawal minus discharge [thousand m^3]
January	10287.7	2288.4	7999.3
February	9436.3	2097.1	7339.3
March	10858.0	2416.5	8441.5
April	11011.9	2451.1	8560.8
May	12008.8	2675.1	9333.7
June	11961.1	2664.4	9296.7
July	12588.0	2805.3	9782.7
August	12530.1	2805.3	9724.8
September	11688.1	2603.1	9085.1
October	11521.6	2565.6	8955.9
November	10523.3	2341.3	8182.0
December	10508.0	2337.9	8170.1
Year	134922.9	30039.6	104883.4

The monthly distribution of requirements shows that the highest withdrawal values occur during the summer, particularly in July and August. This is significant from a water-management perspective because summer is also a period of increased evaporation, higher water temperatures, and more frequent low flows. The project-effect assessment must therefore verify whether the system can maintain the withdrawal when high seasonal water demand coincides with unfavorable hydrological conditions.

The difference between withdrawal and discharge represents water that does not return to the assessed profile as discharged wastewater. This is not automatically a permanent loss of water from the river basin in hydrological terms because some of the water is part of operating and technological processes; however, this value is key to the flow balance between the withdrawal and discharge profiles. For this reason, the model considers the spatial separation between withdrawal at the Hněvkovice waterworks and discharge at the Kořensko profile.

Water-management system model

The water-management model includes the Vltava River basin as far as the Kořensko weir-pool profile. The solution includes the Lipno I, Lipno II, Římov, Hněvkovice, and Kořensko waterworks, together with selected gauging profiles serving as hydrological inputs and control points (Fig. 7). Hydrological conditions are represented by time series of natural monthly

discharges. The effects of other withdrawals and discharges in the river basin are included in the model on the basis of water-balance records maintained under the applicable regulations [3].

At each monthly step, the simulation model compares the water available at the individual profiles with withdrawal and minimum-flow requirements. If the natural or currently affected inflow does not meet a requirement, the model simulates augmentation from the storage volume of the water reservoirs in accordance with the operating rules. The output comprises not only the course of discharges, but also the course of reservoir water levels and storage, together with an assessment of failures to meet the individual requirements.

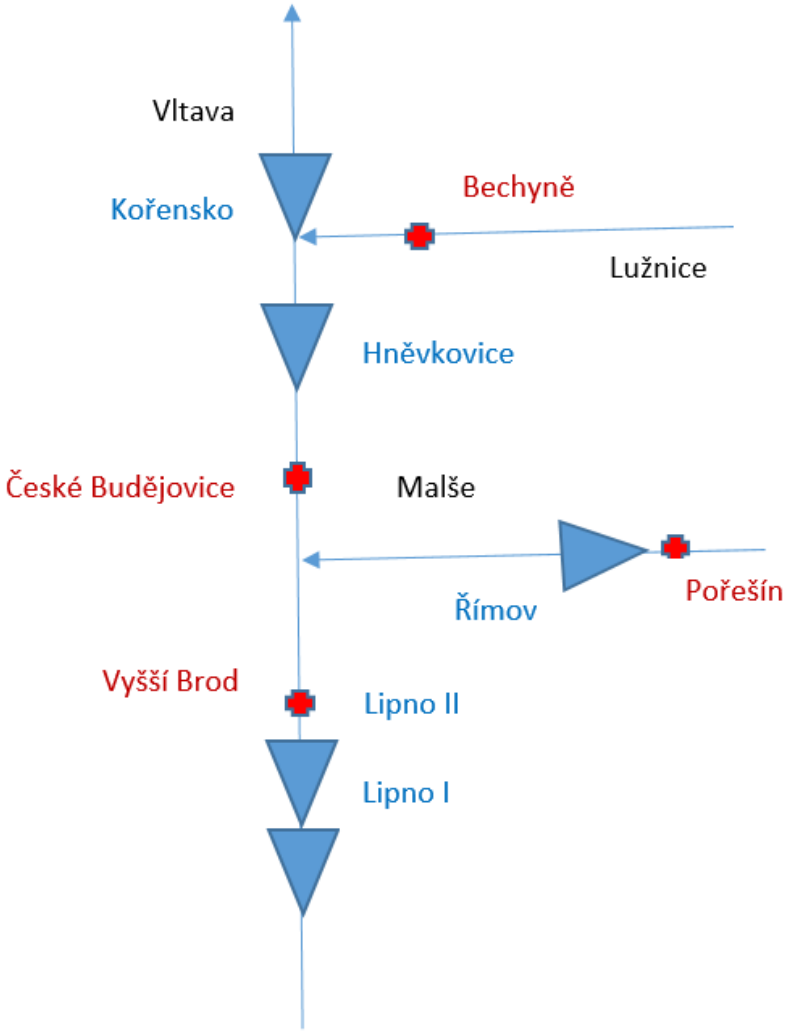


Fig. 7 Diagram of the water-management system used to assess the effect of the SMR ETE project on surface-water quantity. Source: [3].

The figure shows that the project is assessed within a broader system of interconnected waterworks and flow relationships. The storage and control functions of Lipno I are essential to maintaining the withdrawal at Hněvkovice, whereas the Kořensko profile is decisive for evaluating the river flow after wastewater discharge and Lužnice inflow are taken into account. The effect of the SMR ETE project therefore cannot be assessed solely at the withdrawal point, but must be related to the entire system from the upper Vltava to Kořensko.

Hydrological-condition options assessed

The updated DP20A assessment [3] is based on the decision to continue detailed work with emissions scenario SSP2-4.5[1] and the 5 600 MWe capacity option plus the SMR ETE project. The assessment used four climate models, comprising three CMIP6 global climate models (GCMs), EC-Earth3, MPI-ESM1-2-HR, and TaiESM1, and one regional climate model (RCM), ALADIN-CLIMATE/CZ. EC-Earth3 is a European global climate model used within CMIP6, MPI-ESM1-2-HR is a high-resolution global model developed by the Max Planck Institute, and TaiESM1 is a global Earth-system model developed in Taiwan. ALADIN-CLIMATE/CZ is a regional climate model adapted to the conditions of Czechia and Central Europe. Using multiple models captures uncertainty in future climate development.

The assessment was conducted for the reference years 2060 and 2080. Current hydrological conditions and a simple sensitivity option involving warming of 2 °C relative to the present were also evaluated [3].

The original DP20 study [2] considered a broader set of options, including a 4 600 MWe capacity option plus SMR and multiple emissions scenarios. For the SMR ETE EIA Documentation, however, the updated DP20A set [3] is decisive because it includes the additional ALADIN-CLIMATE/CZ simulation and narrows the further assessment to scenario SSP2-4.5 and the 5 600 MWe plus SMR option. The original DP20 results [2] are therefore used in this chapter primarily to explain the methodology and provide context for the sensitivity of the results to the selected capacity option and climate scenario. An overview of the options assessed is provided in Table 12.

Table 12 Overview of water-management modeling options assessed in the updated DP20A study [3].

Withdrawal option	Reference period	Scenario	Model/conditions	Note
5 600 MWe + SMR	2060	SSP2-4.5	EC-Earth3	Climate projection

[1] SSP2-4.5 is an intermediate emissions scenario that assumes a continuation of current socioeconomic trends and only gradual implementation of climate measures. It is neither a distinctly low-emissions nor a high-emissions option, but a so-called “middle-of-the-road” development pathway. The scenario assumes moderate technological progress, gradual reductions in greenhouse-gas emissions, and an intermediate level of warming during the 21st century.

5 600 MWe + SMR	2060	SSP2-4.5	MPI-ESM1-2-HR	Climate projection
5 600 MWe + SMR	2060	SSP2-4.5	TaiESM1	Climate projection
5 600 MWe + SMR	2060	SSP2-4.5	ALADIN-CLIMATE/CZ	Climate projection
5 600 MWe + SMR	2080	SSP2-4.5	EC-Earth3	Climate projection
5 600 MWe + SMR	2080	SSP2-4.5	MPI-ESM1-2-HR	Climate projection
5 600 MWe + SMR	2080	SSP2-4.5	TaiESM1	Climate projection
5 600 MWe + SMR	2080	SSP2-4.5	ALADIN-CLIMATE/CZ	Climate projection
5 600 MWe + SMR	Present	Hist	HIST	Current hydrological conditions
5 600 MWe + SMR	-	Hist+2	Warming of 2 °C	Warming of 2 °C

All options assume that the entire storage volume of the Lipno I water reservoir is used for water storage and flow augmentation. This is a significant assessment assumption. The results therefore characterize the functioning of the system on the assumptions that the operating options corresponding to the selected model configuration are available and that the requirements are prioritized as assumed in the water-management model.

Reliability criteria and their significance to the effect assessment

The assessment of the effect on surface-water quantity is expressed primarily as reliability by duration p_t and reliability by supplied volume p_d. Reliability by duration is the proportion of time steps in which the requirement is met, whereas reliability by supplied volume is the proportion of the total required water volume that is actually supplied. The maximum failure depth and maximum continuous failure duration are also assessed as supplementary criteria.

For indicative interpretation, the results were compared with the values specified in ČSN 75 2405 [6]. Significance class A, with recommended reliability by duration p_t = 99.5%, is relevant to withdrawals for a nuclear power plant. For minimum residual flows and minimum outflows from water reservoirs, the relevant value is p_t = 98.5%. The recreational water level in the Lipno I water reservoir is monitored separately in the assessment as a supplementary indicator, with an indicative value of p_t = 95% for recreational use [3].

In terms of the effect of the SMR ETE project, the key issue is whether including SMR withdrawal and discharge in the cumulative 5 600 MWe plus SMR option results in failures to maintain water withdrawals or minimum flows. The results for current hydrological conditions must also be distinguished from those for climate projections because unfavorable climate-

change options can reduce the river basin's available water yield substantially more than the incremental requirements associated with the SMR ETE project itself.

Results for current hydrological conditions and warming of 2 °C

Under current hydrological conditions, water-withdrawal reliability for the ETE site under the 5 600 MWe plus SMR option was assessed as failure-free. The same result was obtained for the option with hydrological conditions involving warming of 2 °C (Table 13). In both cases, reliability by duration is p_t = 99.9% and reliability by supplied volume is p_d = 100.0%. Both the maximum failure depth and maximum continuous failure duration are zero [3].

Table 13 Water-withdrawal reliability for the 5 600 MWe plus SMR ETE project option under current hydrological conditions and with warming of 2 °C. Adapted from [3].

Hydrological conditions	Pt [%]	Pd [%]	Maximum failure depth [%]	Maximum failure duration [months]	Assessment
Present	99.9	100.0	0	0	Failure-free supply
Warming of 2 °C	99.9	100.0	0	0	Failure-free supply

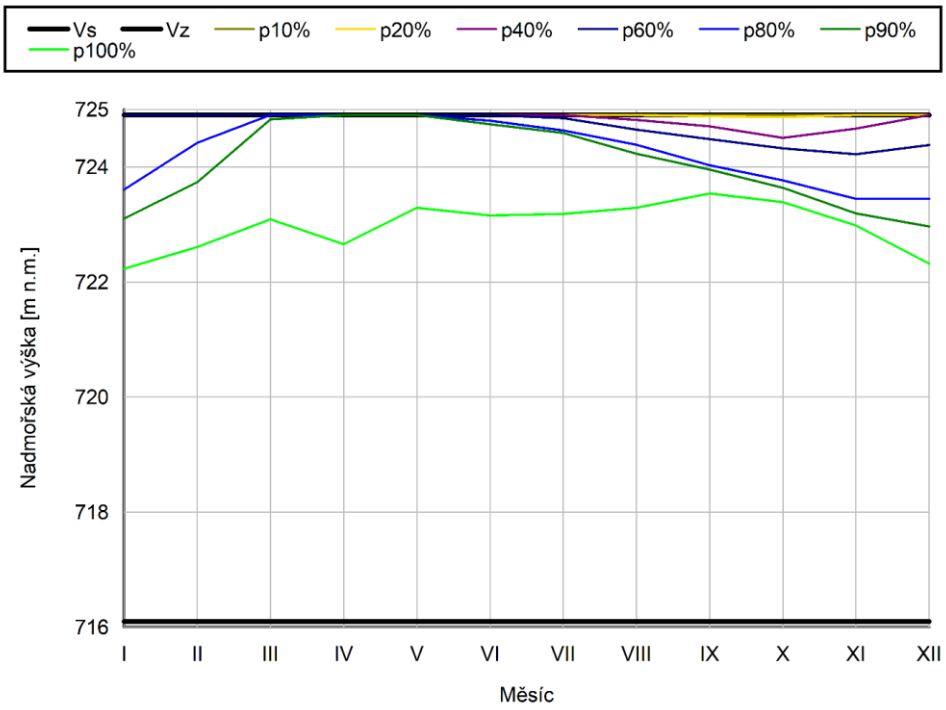
The result means that, under the assumed current hydrological conditions and model assumptions, the cumulative requirement of Units 1 and 2 plus two 1 700 MWe New NPP ETE units plus the 500 MWe SMR ETE project can be met in terms of raw-water withdrawal. Including the SMR ETE project therefore does not in itself result in a failure of the system's storage function or in failure to supply the required water volume under current hydrological conditions.

A similar conclusion applies to minimum flows downstream of the Lipno II, Hněvkovice, and Kořensko waterworks. Both under current conditions and with warming of 2 °C, minimum-flow reliability is assessed as p_t = 99.9%. However, the effect of warming is more pronounced for the Lipno I recreational water level, whose reliability decreases from 97.1% to 75.5% (Table 14). This result indicates that climate warming and increased evaporation may affect the operating water levels and recreational function of Lipno I more than the reliability of withdrawals and minimum flows themselves. The probability fields of water levels are provided in Fig. 8 and Fig. 9.

Table 14 Reliability of the Lipno I minimum flows and recreational water level under current hydrological conditions and with warming of 2 °C [3].

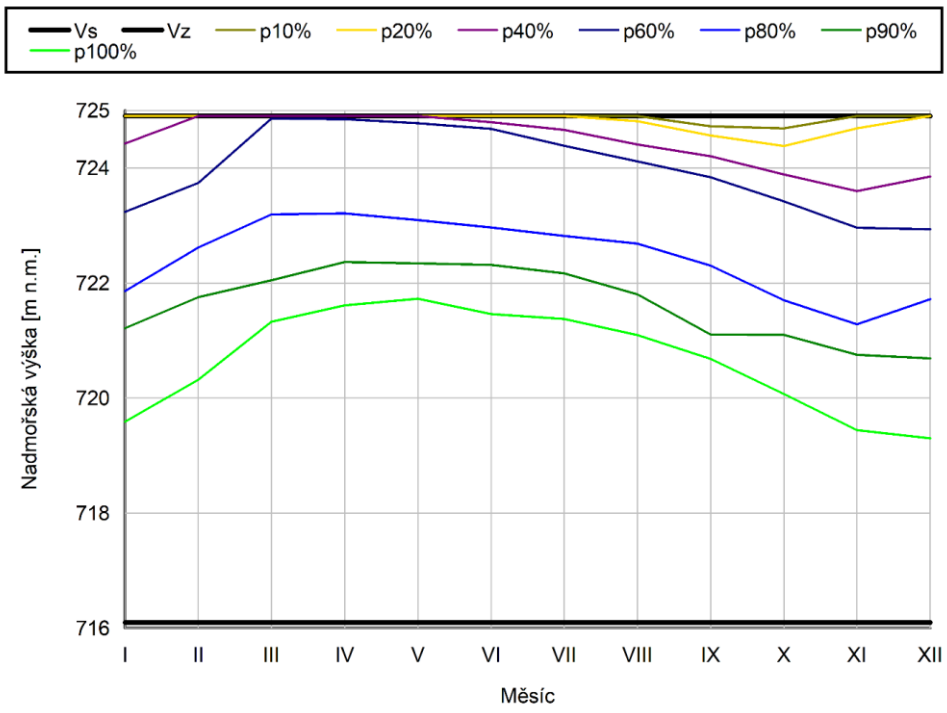
Hydrological conditions	MQ Lipno II Pt [%]	MQ Hněvkovice Pt [%]	MQ Kořensko Pt [%]	Lipno I recreational water level Pt [%]	Interpretation
Present	99.9	99.9	99.9	97.1	Minimum flows met

Warming of 2 °C	99.9	99.9	99.9	75.5	Minimum flows met; reduced reliability of the recreational water level



Nadmořská výška [m n.m.]	Elevation [m a.s.l.]
Měsíc	Month

Fig. 8 Probability field of water levels attained in the Lipno I water reservoir for the 5 600 MWe plus SMR ETE project option under current hydrological conditions. Source: [3].



Nadmořská výška [m n.m.]	Elevation [m a.s.l.]
Měsíc	Month

Fig. 9 Probability field of water levels attained in the Lipno I water reservoir for the 5 600 MWe plus SMR ETE project option with warming of 2 °C [3].

Comparison of the water-level probability fields confirms that the 2 °C warming option results in greater use of the Lipno I storage volume. For the assessment of the effect on surface-water quantity, it is important that even this sensitivity option does not result in a failure to maintain withdrawals for the ETE site or minimum flows at the assessed profiles. However, it also shows that the system's reserve decreases under warmer conditions and that the importance of the Lipno I storage function increases.

Results under climate-change conditions: water withdrawals

Assessment (Table 15) of climate projections for scenario SSP2-4.5 shows that the results have different sensitivities depending on the climate model used. For EC-Earth3, MPI-ESM1-2-HR, and ALADIN-CLIMATE/CZ, withdrawals for the ETE site are maintained without failure in both the 2060 and 2080 reference periods. The TaiESM1 model produces different results and represents the most conservative option in terms of water availability in the assessed area [3]. For interpretation purposes, TaiESM1 must therefore be understood as a boundary climate option on the conservative side, rather than as a representative result for the entire set of

projections. For the other models used, including the regional ALADIN-CLIMATE/CZ model, withdrawal supply was assessed as failure-free.

For the 2060 reference year, TaiESM1 gives withdrawal reliability of p_t = 98.5% and p_d = 99.3%, with a maximum failure depth of 79% and a maximum continuous failure duration of two months. This does not reach the indicatively recommended p_t reliability of 99.5% for nuclear-power-plant withdrawals. For the 2080 reference year, TaiESM1 indicates a more substantial failure: p_t = 87.9%, p_d = 91.8%, a maximum failure depth of 95%, and a maximum failure duration of 11 months. These results represent a limiting climate option, not a result typical of all the models assessed. The presentation of TaiESM1 values in the following text focuses primarily on defining the boundary conditions for the functioning of the water-management system. However, the conclusion on the acceptability of the project must relate to the full set of models, in which three of the four projections for both the 2060 and 2080 reference years show no failures in maintaining withdrawals.

Table 15 Water-withdrawal reliability for the 5 600 MWe plus SMR ETE project option under SSP2-4.5 for the 2060 and 2080 reference years [3].

Reference period	Model	Pt [%]	Pd [%]	Maximum failure depth [%]	Maximum failure duration [months]	Assessment
2060	EC-Earth3	99.9	100.0	0	0	Failure-free supply
2060	MPI-ESM1-2-HR	99.9	100.0	0	0	Failure-free supply
2060	TaiESM1	98.5	99.3	79	2	Recommended value for class A withdrawals not attained
2060	ALADIN-CLIMATE/CZ	99.9	100.0	0	0	Failure-free supply
2080	EC-Earth3	99.9	100.0	0	0	Failure-free supply
2080	MPI-ESM1-2-HR	99.9	100.0	0	0	Failure-free supply
2080	TaiESM1	87.9	91.8	95	11	Significant reliability failures under the unfavorable scenario
2080	ALADIN-CLIMATE/CZ	99.9	100.0	0	0	Failure-free supply

These results show that the effect of the SMR ETE project on surface-water quantity is acceptable in terms of maintaining withdrawals under most of the hydrological options assessed; however, the system is sensitive to the combination of high cumulative water demand and substantially unfavorable climate development. TaiESM1 for 2080 is particularly important because it represents the scenario with the greatest reduction in reliability in DP20A.

It must be emphasized that the failure assessed under unfavorable climate projections does not indicate the effect of the SMR ETE project in isolation from the other requirements at the site. The calculation includes the cumulative effects of Units 1 and 2, the New NPP ETE, and the SMR ETE project. The SMR ETE project itself adds approximately 12 million m^3 per year to the cumulative withdrawal, whereas the 5 600 MWe capacity option accounts for the principal part of the requirement. The result must therefore be interpreted as an assessment of the acceptability of the entire cumulative water-management configuration, in which the SMR ETE project increases the water requirement but is not the sole determining factor.

Results under climate-change conditions: minimum flows

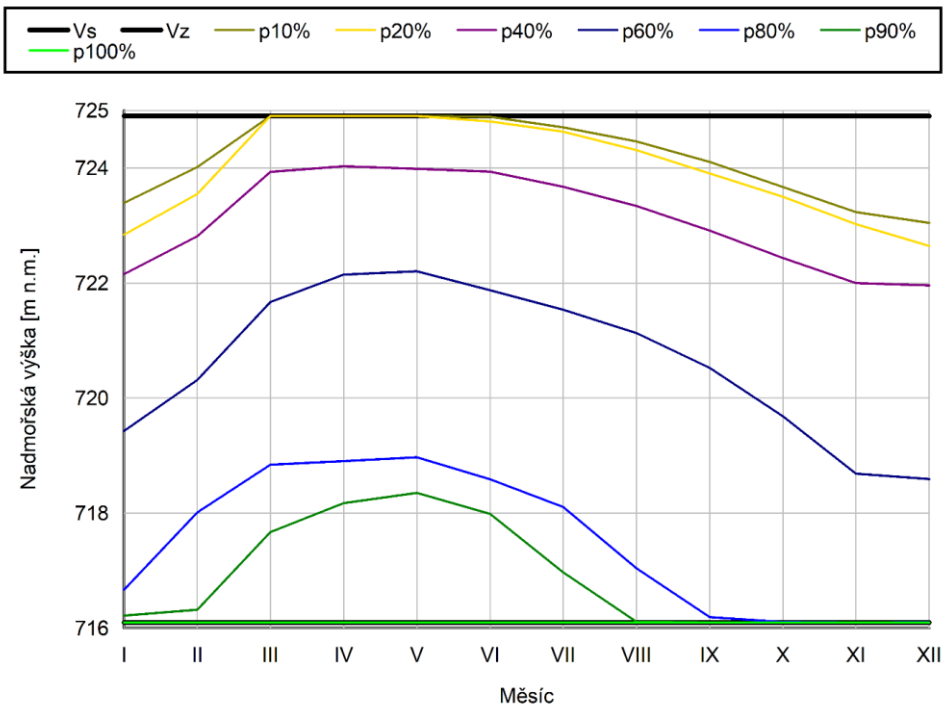
The same set of climate options was used to assess the reliability of minimum flows downstream of the Lipno II, Hněvkovice, and Kořensko waterworks. The required minimum-flow reliability is met under most options (Table 16). More significant failures again occur primarily for TaiESM1 for the 2080 reference year, in which minimum-flow reliability falls below the value recommended for class B. Here too, this is the most conservative projection in the set of climate models used. The results of the other models, particularly ALADIN-CLIMATE/CZ and EC-Earth3, indicate that high minimum-flow reliability will be maintained.

Table 16 Reliability of minimum flows and the Lipno I recreational water level for the 5 600 MWe plus SMR ETE project option under SSP2-4.5 [3].

Reference period	Model	MQ Lipno II Pt [%]	MQ Hněvkovice Pt [%]	MQ Kořensko Pt [%]	Lipno I recreational water level Pt [%]
2060	EC-Earth3	99.9	99.9	99.9	93.3
2060	MPI-ESM1-2-HR	99.9	99.9	99.9	97.1
2060	TaiESM1	99.1	98.9	98.9	68.5
2060	ALADIN-CLIMATE/CZ	99.9	99.9	99.9	97.1
2080	EC-Earth3	99.9	99.9	99.9	96.4
2080	MPI-ESM1-2-HR	99.9	99.7	99.7	84.8
2080	TaiESM1	88.8	88.2	89.4	40.7
2080	ALADIN-CLIMATE/CZ	99.9	99.9	99.9	84.0

For the 2060 reference period, even under the less favorable TaiESM1 model, minimum flows are maintained with p_t = 99.1% for Lipno II and p_t = 98.9% for Hněvkovice and Kořensko. These values exceed the indicative minimum-flow threshold of 98.5%. However, a substantial decrease occurs for the Lipno I recreational water level, where p_t falls to 68.5% under TaiESM1.

For the 2080 reference period, TaiESM1 already shows a decrease in minimum-flow reliability to 88.8% downstream of Lipno II, 88.2% at Hněvkovice, and 89.4% at Kořensko. In this limiting case, the model results do not indicate that minimum-flow reliability is sufficient. However, the other models produce more favorable results even for 2080, with minimum flows maintained at high reliability (the water-level probability field is provided in Fig. 10).



Nadmořská výška [m n.m.]	Elevation [m a.s.l.]
Měsíc	Month

Fig. 10 Probability field of water levels attained in the Lipno I water reservoir for the most conservative option, SSP2-4.5, TaiESM1, reference year 2080. Source: [3].

The most conservative option shows substantial drawdown of the Lipno I storage volume. For the assessment of the effect on surface-water quantity, this is important as an indication of the limits of the entire water-management system under long-term dry and warm conditions. The effect of the SMR ETE project increases the cumulative withdrawal requirement under this option, but failures are caused primarily by the concurrence of this requirement with unfavorable climate development and the overall composition of withdrawals at the Temelín site.

Effect on the flow regime between Hněvkovice and Kořensko

The spatial separation of withdrawal and discharge is essential to interpreting the effect on the Vltava River. Raw-water withdrawal is assumed at the Hněvkovice waterworks, whereas wastewater discharge is included at the Kořensko profile. The reach between these profiles is therefore affected primarily by the withdrawal, which is only partially offset by discharge farther downstream. During periods of low flow, this difference may be more significant than during normal or high flows.

Under the 5 600 MWe plus SMR option, the annual difference between withdrawal and discharge is approximately 104.9 million m^3, equivalent to a mean of 3.33 m^3/s. Of this, the SMR ETE project itself represents a net difference of approximately 8.44 million m^3 per year, or approximately 0.27 m^3/s. In terms of the long-term mean, this value is relatively small compared with the total water availability of the Vltava River, but it becomes more significant during dry periods because the available discharge is low and the system relies more heavily on reservoir storage volumes.

At the Kořensko profile, part of the water withdrawn is returned to the watercourse as wastewater discharge. In terms of water quantity, the project therefore does not act merely as a withdrawal, but as a combination of withdrawal and return of part of the water farther downstream. However, this return cannot fully offset the effect of the withdrawal in the reach between the withdrawal and discharge points and does not take into account the qualitative aspects of discharge, which are addressed in the subsequent chapters on surface-water quality.

The minimum-flow reliability results indicate that, under current hydrological conditions and with warming of 2 °C, the effect of the project on the flow regime at the Hněvkovice and Kořensko profiles is not assessed as limiting. Under unfavorable climate projections, however, the system's reserve decreases, resulting in greater sensitivity to prolonged dry episodes. Under such conditions, the effect of the project can no longer be separated from the broader issue of water availability for the cumulative operation of the entire site.

Comparison with the initial DP20 assessment

The initial DP20 assessment [2] included Units 1 and 2 (assumed as 2 × 1 100 MWe) in combination with two New NPP ETE capacity options (2 × 1 200 MWe and 2 × 1 700 MWe), giving totals of 4 600 MWe or 5 600 MWe, plus the effect of SMR ETE with a bounding capacity of 500 MWe, and was evaluated for a broader set of emissions scenarios. For the purposes of the SMR ETE EIA Documentation, the updated DP20A report [3] retains only the 5 600 MWe plus SMR option and emissions scenario SSP2-4.5, while adding the ALADIN-CLIMATE/CZ model. DP20A is consequently a more precise and up-to-date basis for the EIA Documentation itself, whereas DP20 documents how the results vary over a broader range of capacity and climate options.

DP20 shows that increasing the capacity option from 4 600 MWe plus SMR to 5 600 MWe plus SMR increases the annual withdrawal requirement from approximately 113.0 million m^3 to 134.9 million m^3. The difference of approximately 22.0 million m^3 per year is greater than the contribution of the SMR ETE project itself. This supports the conclusion that the resulting reliability is determined by the cumulative capacity configuration of the entire site and the hydrological scenario, not solely by the inclusion of the SMR ETE project.

The main conclusions of the two studies are consistent. Under current hydrological conditions, withdrawals and minimum flows are maintained without failure. Under the less favorable

effects of climate change, the water-management system's reserve decreases, particularly for combinations involving TaiESM1 and the later reference period of 2080. The updated DP20A study refines this conclusion by also presenting the ALADIN-CLIMATE/CZ results, which are more favorable for the assessed options than the limiting TaiESM1 model.

Assessment of effect significance

Based on the water-management modeling results, the effect of the SMR ETE project on surface-water quantity can be assessed differently according to the hydrological conditions. Under current hydrological conditions and with sensitivity warming of 2 °C, the effect of the project on the reliability of withdrawals and minimum flows is negligible to minor because the model identifies no withdrawal or minimum-flow failures. However, the project increases total water demand and thereby reduces the system's operating reserve.

Under climate-change conditions, the effect must be assessed with regard to the uncertainty of the hydrological projections. Most of the assessed models under SSP2-4.5 confirm failure-free withdrawal supply even in the 2060 and 2080 reference periods. However, one of the climate models used, specifically TaiESM1, indicates that, under unfavorable development, the cumulative 5 600 MWe plus SMR configuration may fail to attain the recommended withdrawal reliability and may result in minimum-flow failures. This result should be understood as an indication of the system's climate sensitivity and of the need to update the water-management data continually.

A summary interpretation of the effect of the SMR ETE project on surface-water quantity is provided in Table 17.

Table 17 Summary interpretation of the effect of the SMR ETE project on surface-water quantity.

Aspect assessed	Conclusion for Chapter 2.1.2
Raw-water withdrawal	The SMR ETE project increases cumulative annual withdrawal by 12.0 million m^3; under the 5 600 MWe plus SMR option, total withdrawal is 134.9 million m^3 per year.
Wastewater discharge	Part of the water withdrawn is returned at the Kořensko profile; total discharge under the 5 600 MWe plus SMR option is 30.0 million m^3 per year.
Current hydrological conditions	Both withdrawals and minimum flows are maintained without failure; p_t = 99.9%, p_d = 100.0%.
Warming of 2 °C	Withdrawals and minimum flows remain failure-free, but the reliability of the Lipno I recreational water level decreases.
SSP2-4.5 scenario, 2060/2080	Most models confirm failure-free supply; the limiting TaiESM1 model shows significant failures, particularly for 2080.
Overall assessment	The effect of the SMR ETE project is acceptable under current conditions, but cumulatively with the New NPP ETE and under unfavorable climate options, it reduces the water-management system's reserve.

Uncertainties and interpretation conditions

The model assessment results depend on the input assumptions. The most important include the assumed extent of use of the Lipno I storage volume, the validity of the operating rules, the accuracy of estimated future withdrawals and discharges, and uncertainty in climate projections. A change in any of these assumptions may affect the resulting reliability of withdrawals and minimum flows.

Particular attention must be paid to the fact that the climate projections differ among models. The favorable results of EC-Earth3, MPI-ESM1-2-HR, and ALADIN-CLIMATE/CZ cannot be transferred mechanically to all possible future hydrological situations. Conversely, the unfavorable TaiESM1 model cannot be interpreted as the only probable development pathway, but as an important limiting option for verifying the resilience of the water-management system.

For subsequent stages of project preparation, the hydrological data, technical information on the actual water demand of the SMR ETE project, and the operating conditions for withdrawals and discharges should therefore be updated continually. At the same time, coordination with the operating management of the Vltava Cascade and the rules for managing storage volumes should be maintained because these rules determine the system's resilience during dry periods.

2.1.3 Effect of the SMR ETE Project on the Vltava Cascade

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This chapter is based on background study [7], which follows study [3].

This chapter summarizes the results of report DP29, Water-Management Study: Quantity, EIA Screening Conclusion Requirement Concerning the Project's Effect on the Vltava Cascade [7]. Report DP29 [7] follows the underlying water-management assessment DP20A [3], which addressed the reliability of withdrawals for the ETE site and minimum flows as far as the Kořensko profile. Compared with DP20A [3], it extends the assessed area farther downstream along the Vltava River to the Prague-Velká Chuchle gauging-station profile and focuses on possible effects on the storage function of the Orlík and Slapy water reservoirs and the associated maintenance of the minimum flow downstream of the Vrané waterworks and the minimum residual flow at the Prague-Chuchle profile.

The assessment covers cumulative operation of the Temelín site, meaning the combined effects of the existing Units 1 and 2, the proposed New NPP ETE, and the SMR ETE project. The effect of the SMR ETE project is therefore not assessed in isolation solely as a separate withdrawal, but as part of the overall 5 600 MWe capacity option plus the SMR ETE project. This approach satisfies the requirement for the EIA Documentation to assess the project in relation to other activities of water-management significance in the Vltava River basin.

Scope of the assessment and relationship to preceding chapters

Chapters 2.1.1 and 2.1.2 describe the current state of surface-water quantity and the direct effect of the SMR ETE project on surface-water quantity in the withdrawal and discharge area, primarily in relation to the Hněvkovice waterworks and the Kořensko profile. Chapter 2.1.3 extends this assessment farther downstream along the Vltava River and evaluates whether the increased water requirements for the ETE site, including the SMR ETE project, may affect the functioning of the principal storage elements in the lower part of the Vltava Cascade.

From the perspective of the water-management system, the Vltava Cascade is not merely a sequence of individual reservoirs, but a set of interconnected elements involved in regulating outflow, augmenting flows, maintaining withdrawals, providing flood protection, and meeting the requirements specified in operating rules. During unfavorable hydrological periods, an increase in water withdrawal in the upper part of the reach under consideration may therefore also affect water management in the storage reservoirs farther downstream.

DP29 [7] primarily addresses the part of the river basin downstream of the Kořensko profile as far as the Prague-Velká Chuchle profile; the chapter focuses on the Orlík, Slapy, and Vrané water reservoirs and the Prague-Chuchle profile. For the Orlík and Slapy water reservoirs, complete depletion of the reservoir storage volume was regarded as a failure to perform the storage function.

Methodological approach

A simulation model of the storage function of the water-management system with a monthly time step was applied for the assessment. Compared with the previous studies, the area of interest was extended to include the Vltava River basin as far as the Prague-Velká Chuchle profile. The modeled system comprised the Lipno I, Lipno II, Římov, Hněvkovice, Kořensko, Orlík, Slapy, Švihov, and Vrané waterworks. The model uses time series of natural mean monthly discharges and requirements for withdrawals, discharges, and minimum flows. The profiles relevant to assessing the storage function in the area of interest downstream of the Kořensko profile are provided in Table 18.

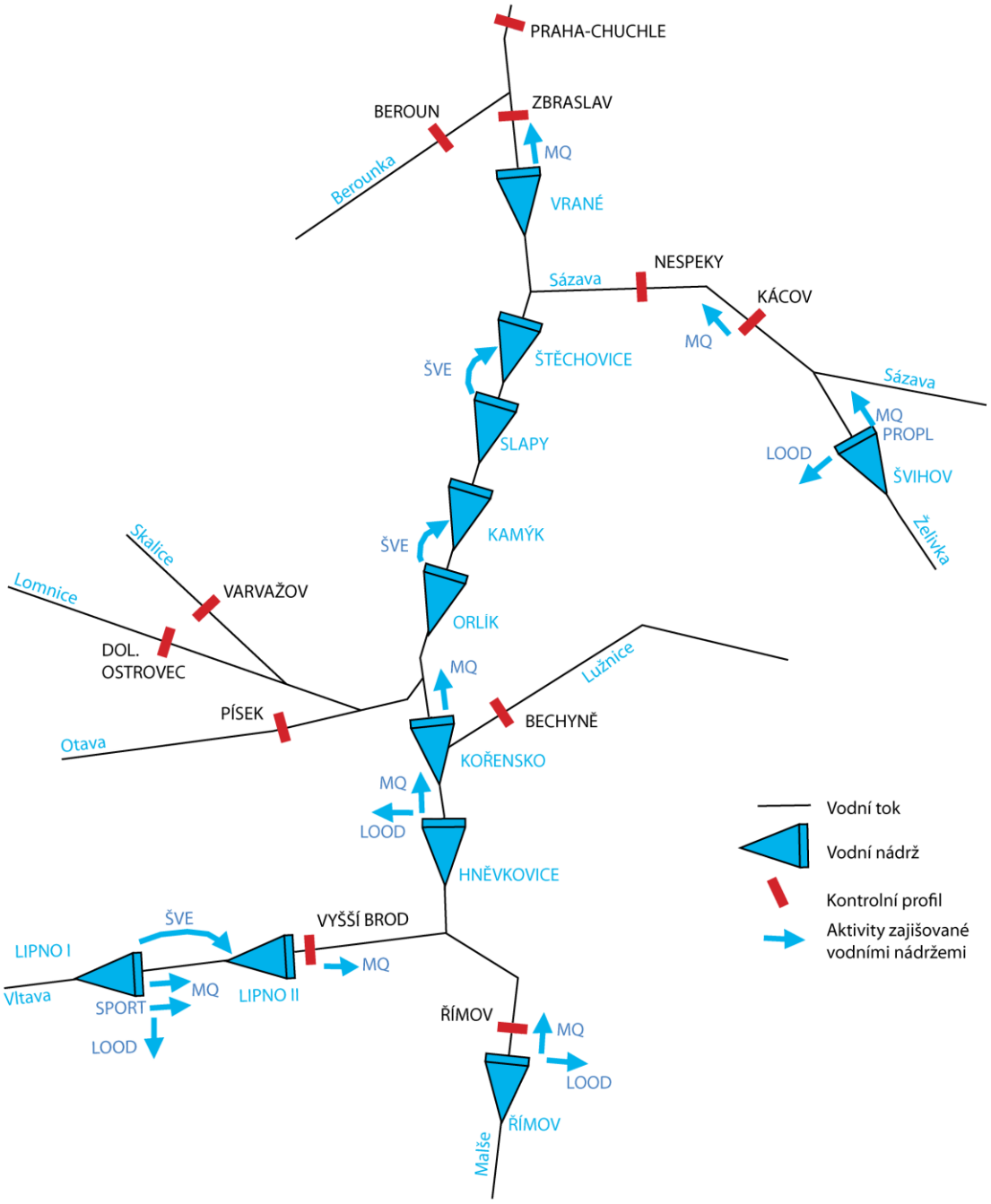
Hydrological conditions were represented by 44-year time series. For the climate-change scenarios, EC-Earth3, MPI-ESM1-2-HR, TaiESM1, and ALADIN-CLIMATE/CZ were used under SSP2-4.5 for the 2060 and 2080 reference periods. The current hydrological option was also evaluated. The modeling output is reliability by duration p_t, compared indicatively with the values recommended in ČSN 75 2405 [6].

The color coding in the DP29 tables [7] distinguishes three interpretation categories. Green indicates failure-free reliability, yellow indicates reliability in accordance with the recommended value in the standard, and red indicates reliability that does not attain the

recommended value. For withdrawals for the ETE site, DP29 [7] gives p_t >= 99.5% as the recommended value; for minimum flows, pt >= 98.5%.

Table 18 Selected water-management system profiles relevant to assessing the effect of the project on the Vltava Cascade [3].

Profile ID	Profile type	Profile	Watercourse	Role in the assessment
NAD1193900	Weir pool	Kořensko	Vltava	End profile of the preceding DP20A assessment
NAD120702	Water reservoir	Orlík	Vltava	Storage function for the Kořensko-Vrané reach
NAD120501	Water reservoir	Slapy	Vltava	Cooperation with Orlík for the Slapy-Vrané reach
NAD120503	Water reservoir	Vrané	Vltava	Minimum-flow control profile
BPS169000	Gauging station	Zbraslav	Vltava	Input for the lower part of the system
BPS200100	Gauging station	Prague-Chuchle	Vltava	Minimum-residual-flow control profile



Vodní tok	Watercourse
Vodní nádrž	Water reservoir
Kontrolní profil	Control profile
Aktivity zajišťované vodními nádržemi	Functions provided by water reservoirs

Fig. 11 **Diagram of the water-management system extended to the Prague-Chuchle profile [3].**

The water-management system diagram (Fig. 11) shows that the reach as far as Kořensko is only one part of the interconnected system. The Orlík and Slapy water reservoirs, which help meet minimum-outflow requirements downstream of the Vrané waterworks and stabilize flow conditions in the lower Vltava, are particularly important to the assessment of effects on the Vltava Cascade. The Prague-Chuchle profile was used as the downstream control profile for the assessment.

Water reservoirs and operational relationships

In DP29 [7], the Orlík and Slapy water reservoirs are assessed as the principal storage elements in the lower part of the Vltava Cascade. In the model, Orlík is used preferentially to meet the requirements in the Kořensko-Vrané reach. Once the specified elevation is reached, the Slapy water reservoir is brought into operation to meet the requirements, after which the remaining storage volume of Orlík is used again. This procedure corresponds to the model representation of the operating rules described in report DP29 [7].

The Kamýk reservoir has no separate storage volume and is not a decisive element in the simulation assessment of the storage function. The Štěchovice reservoir primarily serves to partially balance discharges downstream of Slapy, but it too is not a principal storage element for assessing long-term maintenance of minimum flows. The Vrané waterworks represents a control profile at which maintenance of the minimum flow of 40 m^3/s is assessed.

The water reservoirs of significance to assessing the storage function of the Vltava Cascade are provided in Table 19.

Table 19 **Storage volumes of selected water reservoirs and their role in the assessment [3].**

Water reservoir	Watercourse	Storage volume [million m^3]	Permanent-storage elevation [m a.s.l.]	Storage-volume elevation [m a.s.l.]	Role
Lipno I	Vltava	252.991	716.10	724.90	Flow augmentation for the upper part of the system
Hněvkovice	Vltava	12.155	364.60	370.10	Raw-water withdrawal for the ETE site
Kořensko	Vltava	-	-	-	Weir pool; wastewater-discharge profile
Orlík	Vltava	343.078	329.60	349.90	Principal storage element for the lower Vltava
Slapy	Vltava	200.500	246.60	270.60	Cooperation with Orlík to maintain MQ at Vrané

Vrané	Vltava	-	-	-	Outflow balancing and minimum-flow maintenance

The table shows that Orlík and Lipno I have the largest storage volumes in the modeled part of the system. For the assessment of the lower Vltava, however, Orlík and Slapy are of primary importance. In DP29 [7], Orlík functions as the principal storage element for meeting the requirements in the Kořensko-Vrané reach, while Slapy cooperates in meeting the requirements in the Slapy-Vrané reach. This cooperation is particularly important during dry periods and under scenarios with higher evapotranspiration and lower discharges.

Minimum-flow requirements

The model considered the minimum flows specified in the operating rules for the relevant waterworks and the minimum residual flow at the Prague-Chuchle profile (Table 20). Two downstream control requirements are particularly important to Chapter 2.1.3: the minimum flow of 40 m^3/s downstream of the Vrané waterworks and the minimum residual flow of 45.55 m^3/s at the Prague-Chuchle profile. The requirements upstream of the Kořensko profile are provided to establish continuity with the preceding chapter.

Table 20 Minimum-flow requirements used in the water-management modeling [3].

Profile	MQ/MRF requirement [m^3/s]	Note
Lipno II	6.000	Waterworks operating rules
Hněvkovice	6.500	Waterworks operating rules
Kořensko	9.500	Waterworks operating rules
Vrané	40.000	Waterworks operating rules
Prague-Chuchle	45.550	Minimum residual flow

In the model, minimum flows serve as requirements that must be met even during periods of hydrological drought. If the natural inflow in a given monthly step is insufficient, the model simulates flow augmentation from reservoir storage volumes in accordance with the operating rules. Minimum-flow reliability is therefore one of the principal indicators of whether cumulative withdrawals for the ETE site, including the SMR ETE project, may have a significant effect on the lower part of the Vltava Cascade.

Water-management solution options

The basic option assessed is the 5 600 MWe capacity configuration plus the SMR ETE project, comprising Units 1 and 2 (2 × 1 100 MWe), two 1 700 MWe New NPP ETE units, and the 500 MWe SMR ETE project. This option represents the cumulative water-management load of the Temelín site. To distinguish the effect of climate change from the effect of increased

withdrawals, DP29 [7] also added a comparison option comprising the current Units 1 and 2 without the New NPP ETE and the SMR ETE project. An overview of the solution options is provided in Table 21.

Table 21 Overview of water-management modeling options relevant to Chapter 2.1.3 [3].

Withdrawal option	Reference period	Scenario	Model/conditions
5 600 MWe + SMR	2060	SSP2-4.5	EC-Earth3
5 600 MWe + SMR	2060	SSP2-4.5	MPI-ESM1-2-HR
5 600 MWe + SMR	2060	SSP2-4.5	TaiESM1
5 600 MWe + SMR	2060	SSP2-4.5	ALADIN-CLIMATE/CZ
5 600 MWe + SMR	2080	SSP2-4.5	EC-Earth3
5 600 MWe + SMR	2080	SSP2-4.5	MPI-ESM1-2-HR
5 600 MWe + SMR	2080	SSP2-4.5	TaiESM1
5 600 MWe + SMR	2080	SSP2-4.5	ALADIN-CLIMATE/CZ
5 600 MWe + SMR	Present	Hist	Current hydrological conditions
Units 1 and 2	2060/2080	SSP2-4.5	Comparison option without New NPP + SMR

The specific effect of the SMR ETE project is reflected in the cumulative 5 600 MWe plus SMR option in DP29 [7]. However, the results cannot be interpreted as meaning that all changes in reliability are caused solely by the SMR ETE project. The decisive factor is the concurrence of the future capacity configuration of the Temelín site, hydrological conditions, and the operational capabilities of the Vltava Cascade. Comparison with the Units 1 and 2 option shows the extent to which the resulting sensitivity is attributable to climate change itself and to the increase in withdrawal requirements.

Results for current hydrological conditions

For current hydrological conditions, DP29 [7] assessed the reliability of requirements at the Vrané and Prague-Chuchle profiles and the storage function of the Orlík and Slapy water reservoirs (Table 22). The results show that, under the assumed cumulative 5 600 MWe plus SMR capacity option, the downstream minimum flows are maintained at a very high level of reliability. The reliability of the minimum flow downstream of the Vrané waterworks and the minimum residual flow at the Prague-Chuchle profile is 99.9%. The same value was assessed for the storage function of the Orlík and Slapy water reservoirs.

Table 22 Reliability of minimum flows and the storage function of Orlík and Slapy for the 5 600 MWe plus SMR option under current hydrological conditions [3].

Hydrological conditions	MQ Vrané 40 m^3/s Pt [%]	MRF Prague-Chuchle 45.55 m^3/s Pt [%]	Orlík water reservoir storage function Pt [%]	Slapy water reservoir storage function Pt [%]

Present	99.9	99.9	99.9	99.9

The current results confirm that, under existing hydrological conditions, the cumulative effect of the SMR ETE project and the New NPP ETE does not limit the maintenance of minimum flows in the lower part of the Vltava Cascade. Under these conditions, the system has sufficient control capacity, and the requirements at the Vrané and Prague-Chuchle profiles are met without any significant failure being identified.

Results for climate scenarios under the 5 600 MWe plus SMR option

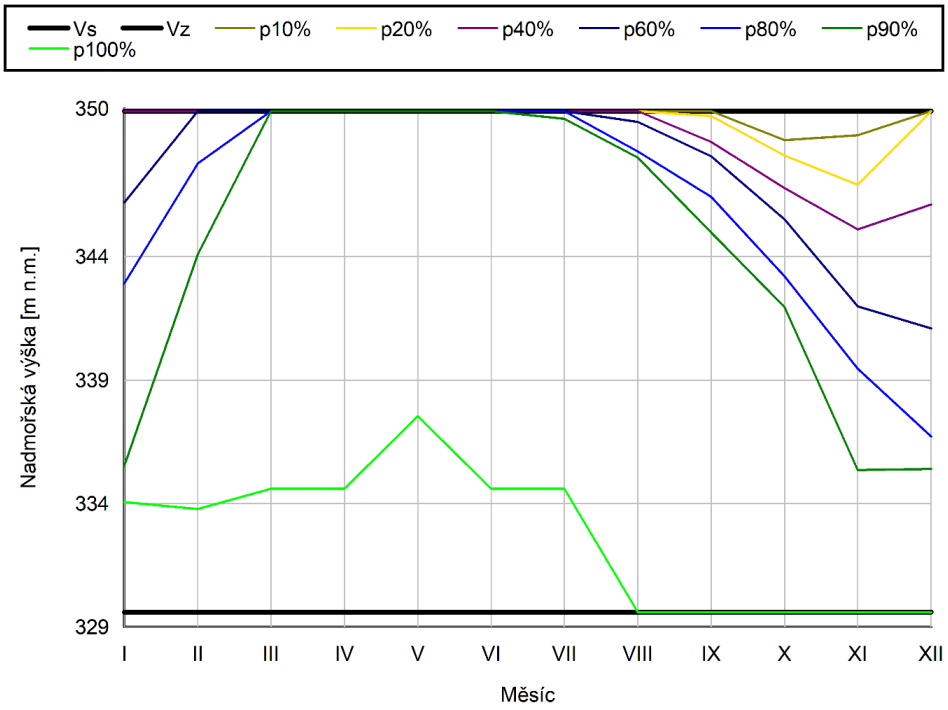
Under climate-change conditions, the results are more varied (Table 23). For the 2060 reference year, two of the four options assessed are failure-free, with p_t of 99.9%. Under EC-Earth3, the reliability of the requirements is 99.5% to 99.1%, which is above the values recommended in the standard. Under TaiESM1, values of 98.7%, 98.5%, and 98.5% are attained for Vrané, Prague-Chuchle, and Orlík, respectively, compared with 97.8% for Slapy. This option therefore shows a reduction in the system's reserve.

For the 2080 reference year, EC-Earth3 is the most favorable option, with all assessed indicators at 99.9%. ALADIN-CLIMATE/CZ also remains favorable, with values ranging from 99.3% to 99.7%. MPI-ESM1-2-HR already exhibits a decrease in reliability to between 98.9% and 99.1%. TaiESM1 is the most conservative option, with reliability of 97.6% for the Vrané minimum flow, 97.2% for the Prague-Chuchle MRF, 97.2% for the Orlík storage function, and 95.7% for the Slapy storage function.

Table 23 Reliability of minimum flows at the Vrané and Prague-Chuchle profiles and the storage function of the Orlík and Slapy water reservoirs for the 5 600 MWe plus SMR option under climate-change conditions. Adapted from [3].

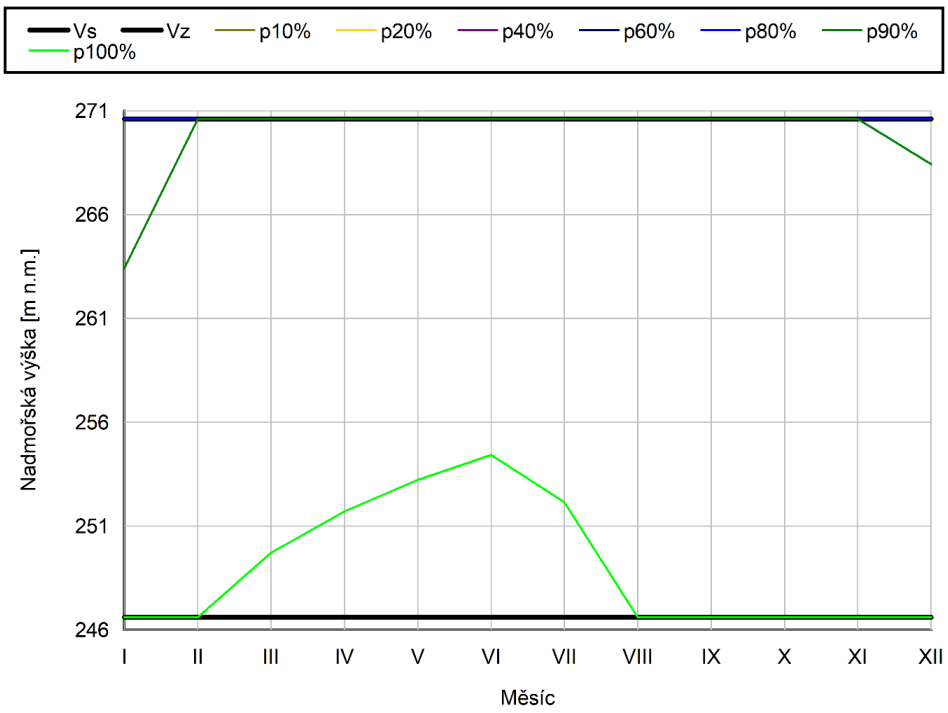
Reference period	Scenario	Model	MQ Vrané Pt [%]	MRF Prague-Chuchle Pt [%]	Orlík storage function Pt [%]	Slapy storage function Pt [%]
2060	SSP2-4.5	EC-Earth3	99.5	99.5	99.5	99.1
2060	SSP2-4.5	MPI-ESM1-2-HR	99.9	99.9	99.9	99.9
2060	SSP2-4.5	TaiESM1	98.7	98.5	98.5	97.8
2060	SSP2-4.5	ALADIN-CLIMATE/CZ	99.9	99.9	99.9	99.9
2080	SSP2-4.5	EC-Earth3	99.9	99.9	99.9	99.9
2080	SSP2-4.5	MPI-ESM1-2-HR	99.1	99.1	98.9	98.9
2080	SSP2-4.5	TaiESM1	97.6	97.2	97.2	95.7
2080	SSP2-4.5	ALADIN-CLIMATE/CZ	99.7	99.5	99.5	99.3

The results show that the decisive factor for the Vltava Cascade is an unfavorable combination of climate model and reference period. For 2060, the system is still assessed as having adequate reliability under most options. For 2080, the differences among the models increase. The limiting option is TaiESM1, representing a scenario with a more pronounced reduction in runoff and a greater need to augment flows from storage volumes.



Nadmořská výška [m n.m.]	Elevation [m a.s.l.]
Měsíc	Month

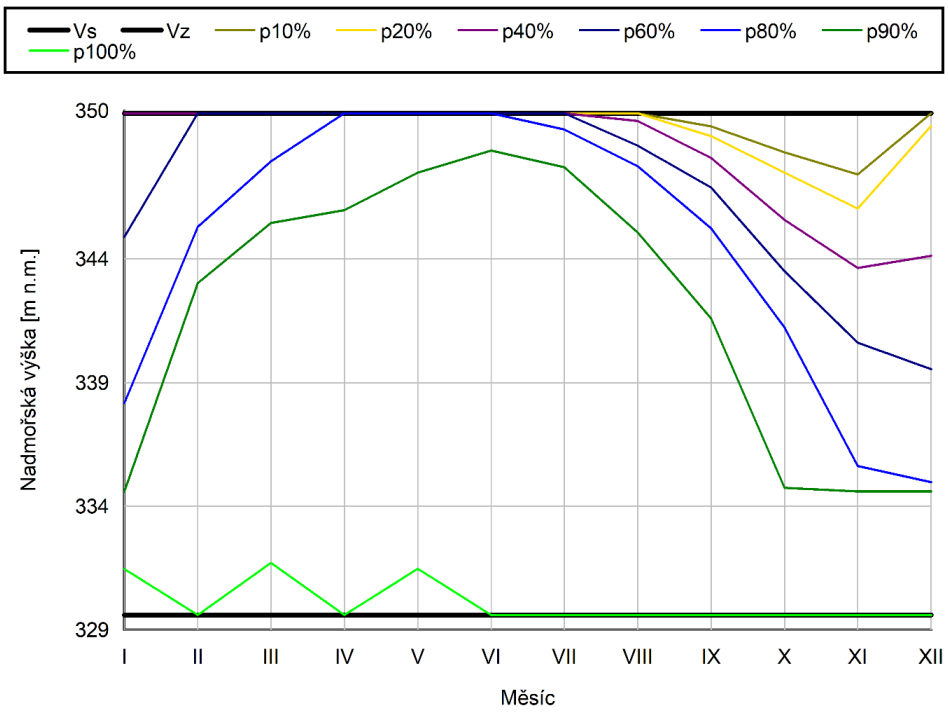
Fig. 12 Probability field of water levels attained in the Orlík water reservoir for the 5 600 MWe plus SMR option, SSP2-4.5 scenario, TaiESM1, reference year 2060 [3].



Nadmořská výška [m n.m.]	Elevation [m a.s.l.]
Měsíc	Month

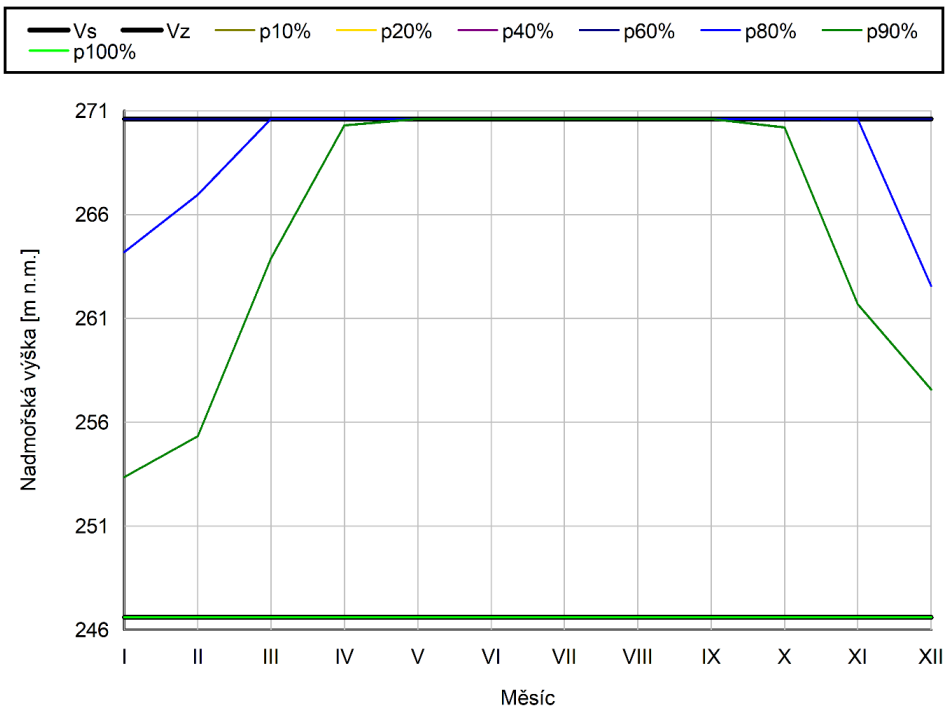
Fig. 13 Probability field of water levels attained in the Slapy water reservoir for the 5 600 MWe plus SMR option, SSP2-4.5 scenario, TaiESM1, reference year 2060 [3].

The probability-field graphs for water levels attained in the Orlík and Slapy water reservoirs for 2060 (Fig. 12 and Fig. 13) show that, even under the less favorable TaiESM1 option, the storage volumes of both Orlík and Slapy are drawn down, but to an extent that still allows the recommended reliability values to be attained or exceeded for most indicators. Slapy exhibits greater sensitivity to the course of the dry period, corresponding to its role in cooperation with Orlík in the lower part of the cascade.



Nadmořská výška [m n.m.]	Elevation [m a.s.l.]
Měsíc	Month

Fig. 14 Probability field of water levels attained in the Orlík water reservoir for the 5 600 MWe plus SMR option, SSP2-4.5 scenario, TaiESM1, reference year 2080 [3].



Nadmořská výška [m n.m.]	Elevation [m a.s.l.]
Měsíc	Month

Fig. 15 Probability field of water levels attained in the Slapy water reservoir for the 5 600 MWe plus SMR option, SSP2-4.5 scenario, TaiESM1, reference year 2080 [3].

The probability-field graphs for water levels attained in the Orlík and Slapy water reservoirs for the 2080 reference year (Fig. 14 and Fig. 15) show a more pronounced decrease in water levels and more frequent use of storage volumes, particularly during unfavorable months of the year. For Orlík, the probability curves show a decrease in the second half of the year; for Slapy, seasonal depletion of the storage volume is more pronounced. These results demonstrate that, under unfavorable climate development, the lower part of the Vltava Cascade is sensitive to the concurrence of low inflows, increased evaporation, and cumulative water requirements.

Comparison with the Units 1 and 2 option

To distinguish the effect of increased withdrawals for the future Temelín site configuration from the effect of climate change itself, DP29 [7] also presents results for the Units 1 and 2 capacity option (Table 24). This option represents the situation without the New NPP ETE and the SMR ETE project. The comparison shows that climate change itself reduces the reliability of some requirements, particularly under TaiESM1. However, under these unfavorable

conditions, the cumulative 5 600 MWe plus SMR option results in a further reduction of the operating reserve.

Table 24 Reliability of minimum flows and the storage function for the Units 1 and 2 comparison option under climate-change conditions. Adapted from [3].

Reference period	Scenario	Model	MQ Vrané Pt [%]	MRF Prague-Chuchle Pt [%]	Orlík storage function Pt [%]	Slapy storage function Pt [%]
2060	SSP2-4.5	EC-Earth3	99.7	99.5	99.5	99.3
2060	SSP2-4.5	TaiESM1	99.1	98.7	98.7	98.0
2080	SSP2-4.5	MPI-ESM1-2-HR	99.1	99.3	99.1	98.9
2080	SSP2-4.5	TaiESM1	98.0	97.4	97.4	96.3
2080	SSP2-4.5	ALADIN-CLIMATE/CZ	99.7	99.7	99.7	99.3

Comparison with the Units 1 and 2 option shows that the classification according to the recommended values in ČSN 75 2405 [6] is similar to that of the 5 600 MWe plus SMR option for many options, but the absolute reliability values are generally slightly higher for Units 1 and 2. The difference is most apparent under the unfavorable TaiESM1 option for 2080, in which the 5 600 MWe plus SMR option attains values of 97.6%, 97.2%, 97.2%, and 95.7%, compared with 98.0%, 97.4%, 97.4%, and 96.3% for the Units 1 and 2 option. This means that the increased withdrawals alone are not the sole cause of reduced reliability, but under limiting climate conditions they increase pressure on the cascade's storage function.

Interpretation of the effect on the Vltava Cascade

The results of DP29 [7] indicate that, under current hydrological conditions, the cumulative effect of the SMR ETE project, Units 1 and 2, and the New NPP ETE on the Vltava Cascade is not assessed as significantly adverse. The minimum flow downstream of the Vrané waterworks and the minimum residual flow at the Prague-Chuchle profile are maintained with very high reliability. The model does not indicate any situation in which the assessed capacity option would limit the meeting of these requirements under current conditions.

Under climate-change conditions, the assessment depends on the specific climate model. The results of EC-Earth3, MPI-ESM1-2-HR, and ALADIN-CLIMATE/CZ confirm that, for most options, the requirements continue to be met at the recommended reliability levels even for the 2060 and 2080 reference years. TaiESM1 is the most conservative option, particularly for 2080. Under this option, the reliability of minimum flows and of the storage function of Orlík and Slapy falls below the recommended values.

The results therefore do not indicate a universal and unequivocal collapse of the functioning of the Vltava Cascade as a result of the SMR ETE project. However, they show that the system's reserve decreases under unfavorable climate conditions and that the cumulative requirements of the Temelín site may become one of the factors increasing demand on the Orlík and Slapy storage volumes. Under such options, the resulting failure is caused by the concurrence of climate development, river-basin water availability, and increased withdrawals, not solely by the SMR ETE project itself.

For EIA purposes, it is therefore essential to distinguish current conditions from future conditions. Under current conditions, the effect of Units 1 and 2 plus the New NPP ETE plus the SMR ETE project on the Vltava Cascade would be acceptable. With respect to future development, the hydrological and climate data must be updated continually and the actual technological requirements for water withdrawal and discharge monitored during subsequent stages of preparation and long-term project operation; the preparation period will be short compared with the operating period.

A summary interpretation of the effect of the SMR ETE project on the Vltava Cascade is provided in Table 25.

Table 25 Summary interpretation of the effect of the SMR ETE project on the Vltava Cascade.

Aspect assessed	Conclusion for Chapter 2.1.3
Scope of assessment	DP29 [7] extends the assessment from the Kořensko profile to the Prague-Chuchle profile and assesses Orlík, Slapy, Vrané, and the minimum residual flow at Prague-Chuchle.
Current conditions	The Vrané minimum flow, the Prague-Chuchle MRF, and the Orlík storage function are maintained with pt = 99.9%. Under current conditions, the system is not limited by the assessed project.
Year 2060	Most options are failure-free or attain the recommended values. TaiESM1 is limiting, particularly for the storage function of the Slapy water reservoir.
Year 2080	The differences among the climate models increase. TaiESM1 represents an unfavorable limiting option with values below the recommended reliability levels.
Comparison with Units 1 and 2	Climate change itself reduces reliability, but under the limiting scenarios, the cumulative 5 600 MWe plus SMR option further reduces the operating reserve.
Overall assessment	The effect of the SMR ETE project on the Vltava Cascade is acceptable under current conditions. In the long term, uncertainty in climate development and the need to update the underlying data continually are significant. In view of possible climate-change development, the operating rules for the waterworks may also be reassessed in the future, for example by reducing the required flow, which would produce different reliability results; this would be essentially independent of the project because the effect of climate change will be dominant.

2.2 Surface-Water Quality: Vltava River

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This chapter is based on background study [8].

2.2.1 Current state of surface-water quality

Area of interest

The SMR ETE project is located near the existing Temelín Nuclear Power Plant site in South Bohemia, near Týn nad Vltavou. Wastewater from the SMR ETE project is planned to be discharged to the Vltava River at Kořensko, at the profile shared with Units 1 and 2 and the New NPP ETE.

The Vltava Cascade, extending from the Orlík water reservoir to the Vrané water reservoir, begins immediately downstream of the Kořensko waterworks structure at the discharge point. The Vltava then flows through Prague and enters the Elbe approximately 200 km downstream of the Kořensko waterworks. The major tributaries of the Vltava in this reach are: The Lužnice, which enters the Vltava in the Kořensko water reservoir just upstream of the SMR ETE wastewater outfall; the Otava, which enters the Orlík water reservoir; and the Sázava and Berounka, which enter the Vltava upstream of Prague.

The area of interest is defined on the basis of an assessment of surface-water quality requirements downstream of the SMR ETE wastewater outfall and the selection of critical profiles, as described in greater detail below.

In addition, the area of interest includes reference watercourse reaches that are unaffected by wastewater discharge from the project, namely the reach of the Vltava upstream of the outfall and the Lužnice and Otava tributaries of the Vltava.

The area of interest is described below in terms of assessing surface-water status/potential, water uses (drinking-water sources and bathing waters), the designation of waters suitable for fish life (fish waters), and nature conservation (water-dependent sites of Community importance designated within the Natura 2000 network).

According to the Upper Vltava Sub-basin Plan [9] and the Lower Vltava Sub-basin Plan [10], six surface water bodies affected by wastewater discharge are designated in this study's area of interest for the assessment of the ecological status/potential and chemical status of surface water bodies: four standing surface water bodies (lake category), including the Otava arm of the Orlík water reservoir, and two running surface water bodies (river category). To evaluate surface-water quality and, in particular, the potential future effect of wastewater discharge from the SMR ETE project, future monitoring must also include reference reaches upstream of the outfall or unaffected tributaries, representing a further six surface water bodies. A list of the bodies included in the assessment area of interest, both those affected by wastewater discharge and the reference bodies, together with their characteristics, is provided in Table 26.

Table 26 List of surface water bodies (SWBs) in the watercourse reach of interest and their basic characteristics

SWB ID	SWB name	Watercourse	SWB category	SWB hydromorphological character	SWB type	SWB location relative to the SMR ETE project
HVL_0460	Vltava from the Malše to the backwater of the Hněvkovice reservoir, including the Bezdrevský Stream from the Bezdrev fishpond dam to its confluence with the Vltava	Vltava	River	Heavily modified	1223	Reference
HVL_0475_J	Hněvkovice reservoir on the Vltava	Vltava	Lake	Heavily modified	2BC21F21	Reference
HVL_3030	Vltava from the Hněvkovice reservoir dam to the backwater of the Kořensko reservoir	Vltava	River	Heavily modified	1213	Reference
HVL_1035_J	Kořensko reservoir on the Vltava	Vltava	Lake	Heavily modified	2BC11F11	Reference
HVL_1010	Lužnice from the Košínský Stream to the backwater of the Kořensko reservoir	Lužnice	River	Natural	1213	Reference
HVL_2410	Otava from the Blanice to the backwater of the Orlík II reservoir	Otava	River	Natural	1213	Reference
HVL_1055_J	Orlík I reservoir on the Vltava	Vltava	Lake	Heavily modified	2BC21F21	Modified
HVL_1525_J	Orlík II reservoir on the Otava	Otava	Lake	Heavily modified	2BC21F21	Modified
DVL_0015_J	Orlík III reservoir on the watercourse	Vltava	Lake	Heavily modified	2BC21F22	Modified
DVL_0030	Vltava from the Orlík reservoir dam to the backwater of the Slapy reservoir	Vltava	River	Heavily modified	1213	Modified
DVL_0095_J	Slapy reservoir on the Vltava	Vltava	Lake	Heavily modified	2BC21F22	Modified
DVL_0110	Vltava from the Slapy reservoir dam to the Sázava	Vltava	River	Heavily modified	1113	Modified

There are eight surface-water abstractions for human consumption (public water-supply use) in the Vltava reach within the area of interest [9, 10]; all are recorded as current sources in the 2024 records [11]. In the past, abstraction point 120714 for human consumption (Municipality of Milešov nad Vltavou, Trhovky campsite) also existed in the Orlík water reservoir area, but no water has been abstracted there for this purpose since 2016 [11], and it is not listed as an abstraction for public water-supply purposes in the most recent Lower Vltava Sub-basin Plan [10]. Protection zones that also include the Vltava watercourse have been established for four of these surface-water sources for human consumption [11]. A list of surface-water abstractions for human consumption is provided in Table 27.

Table 27 Surface-water abstractions for human consumption and their protection zones in the Vltava reach of interest [10, 11]

Structure name	Abstraction ID	Water use	Abstraction volume in the reference year (thousand m^3)	Reference year (most recent year in records)	Protection zone		SWB ID
					ID	Name	
1.ScV Příbram Solenice Vltava	120706	M	171.614	2024	178202 178302	Solenice surface-water abstraction	DVL_0030
1.ScV Příbram Dublovice Zvírotice	120715	M	5.71	2023	227102 227202	Dublovice surface-water abstraction from the Vltava	DVL_0095_J
VHS Benešov Živohošť WTP	120120	M	2.336	2024			DVL_0095_J
Měřín Military Recreation Facility	120517	O	41.4	2024			DVL_0095_J
VHS Benešov Nová Rabyně	120502	M	8.833	2024			DVL_0095_J
Municipality of Slapy, Slapy WTP	120522	O	24.784	2024	165002 165102 165202	Slapy Přestavlky surface-water abstraction	DVL_0095_J
VHS Benešov Třebenice-Štěchovice, Slapy reservoir	120501	M	11.409	2024	232402	Třebenice surface-water abstraction, Slapy Lake	DVL_0110
VHS Benešov Štěchovice	120519	M	65.632	2024			DVL_0110

Notes: M: municipal; O: other

With respect to recreational water use, 12 bathing-water areas were identified in the Vltava reach of interest [11], in the Orlík and Slapy water reservoir areas. A list is provided in Table 28.

Government Decree No. 71/2003 Coll. [12] designates surface waters suitable for the life and reproduction of native fish species and other aquatic animals and defines so-called salmonid and cyprinid waters. The Decree establishes water-quality requirements for these waters.

Salmonid waters are designated in the Vltava reach of interest from Štěchovice, at the confluence with the Kocába River, to the confluence with the Sázava River. Cyprinid waters are designated in the Otava arm of the Orlík water reservoir.

With respect to the Natura 2000 network of protected sites, no water-dependent sites of Community importance were identified in the Vltava watercourse reach of interest.

Table 28 Bathing-water areas in the Vltava watercourse reach of interest [11]

Area ID	Area name	SWB ID
KO310801	Orlík water reservoir: Podolsko public campsite	HVL_1055_J
KO310701	Orlík water reservoir: Radava campsite	DVL_0015_J
KO212301	Orlík water reservoir: Podskalí	DVL_0015_J
KO212303	Orlík water reservoir: Trhovky	DVL_0015_J
KO212001	Orlík water reservoir: Lavičky	DVL_0015_J
KO212302	Orlík water reservoir: Popelíky	DVL_0015_J
KO210702	Slapy water reservoir: Županovice	DVL_0095_J
KO210103	Slapy water reservoir: Nová Živohošť	DVL_0095_J
KO210701	Slapy water reservoir: Živohošť	DVL_0095_J
KO210101	Slapy water reservoir: Měřín	DVL_0095_J
KO210501	Slapy water reservoir: Ždáň	DVL_0095_J
KO210102	Slapy water reservoir: Nová Rabyně	DVL_0095_J

Non-radiological parameters

The legislative requirements for surface-water quality in relation to non-radiological parameters, including temperature, arise primarily from Act No. 254/2001 Coll., on Water and on Amendments to Certain Acts (the Water Act), as amended [13], and its implementing regulation, Government Decree No. 401/2015 Coll. [14]. In addition to permissible surface-water pollution in general, the latter specifies permissible pollution of surface waters used for particular purposes; these values reflect the requirements of other regulations: Decree No. 428/2001 Coll. [15] for waters used as a source for drinking-water treatment, Decree No. 238/2011 Coll. [16] for waters used for bathing, and Government Decree No. 71/2003 Coll. [12] for water-quality requirements for the life and reproduction of native fish species and other aquatic animals.

Furthermore, Annex 3, Table 1b, to Government Decree No. 401/2015 Coll. [14] contains environmental quality standards for priority substances and certain other pollutants in accordance with Directive 2013/39/EU of the European Parliament and of the Council [17], while Table 1c contains environmental quality standards for river-basin-specific pollutants in surface water bodies and permissible pollution values for surface waters used for public water-supply purposes in accordance with Decree No. 428/2001 Coll. on waters used as a source for drinking-water treatment [15]. These tables list dozens of parameters, comprising individual substances or groups: Table 1b contains 64 parameters and Table 1c a further 92. The values for chemical-status parameters and river-basin-specific pollutants used to assess ecological status/potential are established independently of the water-body type.

In addition to the regulations listed above, the analysis includes methodologies approved by the Ministry of the Environment for assessing the ecological status/potential of surface waters [18–25], the chemical status of waters [26], and the status of protected areas designated to protect water-dependent habitats and species [27]. The parameters specified in the methodology for assessing ecological status in terms of river-basin-specific pollutants [23] and in the methodology for assessing chemical status [26] correspond to those established in Annex 3, Tables 1b and 1c, to Government Decree No. 401/2015 Coll. [14]. The methodologies for assessing the ecological status/potential of running waters (river category) [24, 25] or standing waters (lake category) [18] assess ecological status/potential using general physicochemical or chemical parameters describing thermal conditions, oxygenation conditions, salinity, acidification status, and nutrient conditions. These methodologies establish values specific to the water-body type for the individual parameters.

The assessment of the ecological status/potential of surface waters also includes assessment of the biological quality elements: phytoplankton, macrophytes, and fish fauna for standing waters [18]; and benthic invertebrates, phytobenthos, phytoplankton, macrophytes, and fish fauna for running waters [19–22, 28]. The documents listed may specify different values for individual parameters in surface waters because they consider water quality from different perspectives; they may also differ among individual sites because of different local requirements.

The general permissible-pollution parameters under Government Decree No. 401/2015 Coll. [14] are among the basic parameters relevant to assessing the effect of the SMR ETE project. Other relevant parameters are the general physicochemical parameters used to assess the ecological status/potential of surface water bodies under the methodologies [18, 24, 25]. Most parameters used to assess the ecological status/potential of surface water bodies are also listed as permissible-pollution parameters in Government Decree No. 401/2015 Coll. [14]; the methodologies [18, 24, 25] additionally include only orthophosphate phosphorus ($P\text{-}PO_4^{3-}$) for running water bodies and transparency for standing water bodies. Water oxygen saturation must be assessed both as dissolved-oxygen concentration and as percent saturation.

In addition to the general physicochemical and chemical water-quality parameters, the following additional parameters must not be omitted: chemical-status parameters under the methodology [26] and Annex 3, Table 1b, to Government Decree No. 401/2015 Coll. [14]; and river-basin-specific pollutants under the methodology [23] and Annex 3, Table 1c, to Government Decree No. 401/2015 Coll. [14]. Because this represents a large number of substances or groups of substances, the relevant ones were selected. The selection is based on the condition that wastewater discharge should neither jeopardize good water status nor impede its attainment. The assessment includes parameters that cause failure to attain good water status or for which such failure could occur. For preliminary identification of the parameters, the results of the assessment of ecological status/potential in terms of river-basin-specific pollutants and the results of the assessment of the chemical status of surface water bodies in the Upper Vltava Sub-basin Plan [9] and Lower Vltava Sub-basin Plan [10] were analyzed. This analysis identified additional significant parameters, as described below.

The assessment in connection with wastewater discharge from the SMR ETE project therefore also included parameters for which emission standards are established for industrial wastewater from the corresponding industrial sector, namely electricity and heat generation, under Annex 1, Table 2, to Government Decree No. 401/2015 Coll. [14]. These are water reaction (pH), suspended solids (SS), dissolved inorganic salts (DIS), and C_{10}-C_{40} hydrocarbons. DIS is measured in wastewater; in surface water it corresponds approximately to DS_{550}.

Parameters corresponding to the anticipated wastewater composition and selected by the preliminary analysis as relevant to assessing the effect of the SMR ETE project on water quality:

General physicochemical and chemical parameters: transparency; water temperature; water reaction (pH); oxygen (O_2) as dissolved-oxygen concentration and water oxygen saturation; biochemical oxygen demand (BOD_5); chemical oxygen demand (COD_{Cr}); total organic carbon (TOC); total phosphorus (P_{total}); orthophosphate phosphorus ($P\text{-}PO_4^{3-}$); total nitrogen (N_{total}); nitrate nitrogen ($N\text{-}NO_3^-$); nitrite nitrogen ($N\text{-}NO_2^-$); ammoniacal nitrogen ($N\text{-}NH_4^+$); dried dissolved solids (DS_{105}); ignited dissolved solids (DS_{550}); suspended solids (SS_{105}); chlorides (Cl^-); sulfates (SO_4^{2-}); magnesium (Mg); and calcium (Ca).

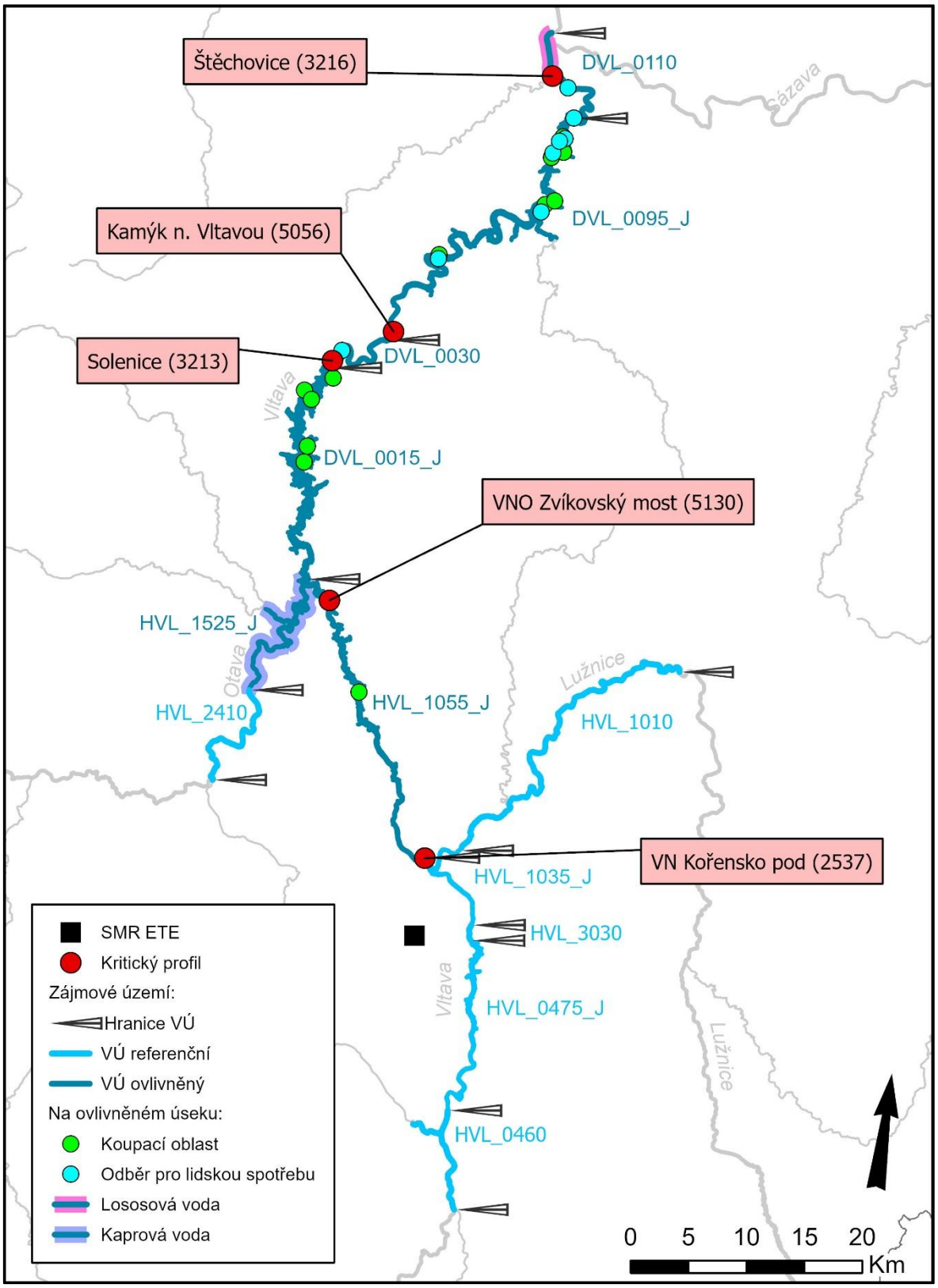
River-basin-specific pollutants and chemical-status parameters: C_{10}-C_{40} hydrocarbons.

Additional parameters resulting from the detailed data analysis. Chemical-status parameters: fluoranthene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[g,h,i]perylene, nickel and its compounds (Ni). Non-radiological river-basin-specific pollutants: AOX, alachlor metabolites, metolachlor and its metabolites, terbuthylazine and its metabolites, phenanthrene, pyrene, aluminum (Al), and EDTA.

Biological and microbiological parameters were not included in the studies of the SMR ETE project's effect on surface-water quality because insufficient data are available. It is recommended that these parameters be included in future monitoring and assessment of the effects of SMR ETE operation because biological quality elements are part of water-status assessment under the methodologies [18–22, 28], while microbiological parameters form part of the assessment of the suitability of water for bathing and for drinking-water treatment.

The analysis of legislative requirements showed that the legislative requirements for surface-water quality, meaning both the range of parameters assessed and their values, may differ among watercourse reaches depending on the purpose of the assessment. Critical profiles for assessing the effect of the SMR ETE project were selected taking into account the changing requirements along the reach of the Vltava affected by SMR ETE discharge.

The selected critical profiles, together with the other profiles at which surface-water quality was assessed, are provided in Table 29. An overview of the area of interest, including the critical profiles, is provided in Fig. 16. For these critical profiles, the parameters used to assess the effect of the SMR ETE project on surface-water quality were specified so as to correspond to the surface-water quality requirements relevant to each critical profile.


Štěchovice (3216)
DVL_0110
Sázava
DVL_0095_J
Kamýk n. Vltavou (5056)
Solenice (3213)
DVL_0030
Vltava
DVL_0015_J
VNO Zvíkovský most (5130)
HVL_1525_J
Otava
HVL_2410
HVL_1055_J
Lužnice
HVL_1010
VN Kořensko pod (2537)
HVL_1035_J
HVL_3030
Vltava
HVL_0475_J
Lužnice
HVL_0460
SMR ETE
Kritický profil
Zájmové území:
Hranice VÚ
VÚ referenční
VÚ ovlivněný
Na ovlivněném úseku:
Koupací oblast
Odběr pro lidskou spotřebu
Lososová voda
Kaprová voda
0 5 10 15 20
Km

SMR ETE	SMR ETE
Kritický profil	Critical profile
Zájmové území:	Area of interest:
Hranice VÚ	SWB boundary
VÚ referenční	Reference SWB
VÚ ovlivněný	Affected SWB
Na ovlivněném úseku:	In the affected reach:
Koupací oblast	Bathing-water area
Odběr pro lidskou spotřebu	Abstraction for human consumption
Lososová voda	Salmonid waters
Kaprová voda	Cyprinid waters

Fig. 16 Area of interest and critical profiles for assessing the effect of the SMR ETE project on surface-water quality

Table 29 Profiles included in the processing of selected non-radiological parameters, including temperature; critical profiles are shown in bold, together with the purpose of assessment

Profile ID	Watercourse	Profile name	Purpose of critical-profile assessment
1042	Vltava	Hluboká nad Vltavou	---
2095/6992	Vltava	Hněvkovice water reservoir, composite sample at dam	---
2535	Vltava	Downstream of Hněvkovice water reservoir	---
3960	Vltava	Týn nad Vltavou downstream	---
2537	**Vltava**	**Downstream of Kořensko water reservoir**	**Direct effect of SMR ETE discharge, permissible surface-water pollution, bathing-water area**
5130/6957	**Vltava**	**Orlík WR, Zvíkov Bridge**	**Permissible surface-water pollution, ecological potential of the SWB (standing waters), bathing-water area**
5150/6955	Vltava	Orlík water reservoir, composite sample at dam	---
3213	**Vltava**	**Solenice**	**Public water-supply use**
5400/6963	Vltava	Slapy water reservoir, composite sample at center of dam	---
5056	**Vltava**	**Kamýk nad Vltavou**	**Ecological potential of the SWB (running waters)**
3216	**Vltava**	**Štěchovice**	**Salmonid waters**
4004	Lužnice	Bechyně	---
4005	Otava	Topělec	---
2334/6956	Otava	Orlík WR, Plazy Bridge, composite sample	---

The available surface-water quality data for the area of interest, at the profiles listed in Table 29, were compiled for 2015–2024. The area is monitored under the Program for Monitoring and Assessing the Environmental Effects of the Temelín Nuclear Power Plant [29–38], specifically Surface-Water and Groundwater Quality Monitoring at the Temelín Nuclear Power Plant, prepared by VÚV TGM, v. v. i. [39–48]; and by the surface-water quality monitoring program of Povodí Vltavy (PVL), from which data were requested for this study [49]. Because the quality monitoring under the Program for Monitoring and Assessing the Environmental Effects of the Temelín Nuclear Power Plant covers fewer profiles and a narrower range of monitored substances than the background study, and does not include the Lužnice and Otava tributaries entering the Orlík water reservoir, data from Povodí Vltavy, státní podnik, were used for the work. At critical profiles, data were processed for the parameters significant to each profile; at profiles upstream of the outfall and on unaffected tributaries, they were processed to the maximum extent available, based on the requirements for the profile downstream of the Kořensko water reservoir. Temporal trends, meaning trends in the values of monitored parameters over time, were assessed at the individual profiles. The analysis showed that the range of monitored parameters differs among profiles and that data are missing for some profiles. A brief assessment of each parameter and a comparison of the assessed values with the applicable permissible-pollution values under Government Decree No. 401/2015 Coll. [14] are provided below.

For temperature, the permissible-pollution value (maximum 29 °C) under Government Decree No. 401/2015 Coll. [14] was not attained or exceeded anywhere along the longitudinal profile of the Vltava or in its tributaries. No statistically significant decreasing or increasing trend in values was identified for the parameter at any profile during the monitored period.

For water reaction (pH), the values identified were outside the permissible-pollution range (maximum 9, minimum 5) under Government Decree No. 401/2015 Coll. [14] at the Hněvkovice water reservoir composite dam profile, Týn nad Vltavou, the Kořensko water reservoir composite dam profile, the profile downstream of the Kořensko water reservoir, the Slapy water reservoir composite central dam profile, and Bechyně; at these profiles, the identified maximum value was higher than that given in [14]. A statistically significant increasing trend in the parameter was identified during the monitored period at the Hluboká nad Vltavou profile, while decreasing trends were identified downstream of the Hněvkovice water reservoir, at Solenice, and at Kamýk nad Vltavou.

For dissolved oxygen, an annual mean below the permissible-pollution requirement (>9 mg/l) under Government Decree No. 401/2015 Coll. [14] was assessed at the Vltava-Solenice, Kamýk nad Vltavou, and Štěchovice profiles. A statistically significant change in the parameter was assessed only at the Kamýk profile, where values decreased during the monitored period, representing deterioration.

For BOD_5, the permissible-pollution value (annual mean 3.8 mg/l) under Government Decree No. 401/2015 Coll. [14] was attained or exceeded at the Kořensko water reservoir composite dam profile, downstream of the Kořensko water reservoir, and at Bechyně. The value for public

water-supply use (annual mean 2.7 mg/l) was attained or exceeded at Týn nad Vltavou, the Kořensko water reservoir composite dam profile, downstream of the Kořensko water reservoir, Bechyně, and Topělec. The value for salmonid waters (annual mean 1.8 mg/l) was exceeded along almost the entire longitudinal profile and in the tributaries, except at the Kamýk and Štěchovice profiles. The value for cyprinid waters (annual mean 3.2 mg/l) was exceeded at Bechyně, the Kořensko water reservoir composite dam profile, and the profile downstream of the Kořensko water reservoir. No statistically significant decreasing or increasing trend in the parameter was identified at any profile during the monitored period.

For COD_{Cr}, the permissible-pollution value (annual mean 26 mg/l) under Government Decree No. 401/2015 Coll. [14] was attained or exceeded at the profile downstream of Kořensko and at Bechyně. The value for public water-supply use (annual mean 5.9 mg/l) was attained or exceeded at every profile for which data were available. A statistically significant increasing trend in the parameter, meaning deterioration over time, was identified during the monitored period at Hluboká nad Vltavou, downstream of the Hněvkovice water reservoir, Solenice, Bechyně, and Topělec.

For TOC, the permissible-pollution value (annual mean 10 mg/l) under Government Decree No. 401/2015 Coll. [14] was attained or exceeded at the Hněvkovice water reservoir composite dam profile, the Kořensko water reservoir composite dam profile, downstream of the Kořensko water reservoir, the Orlík water reservoir Zvíkov Bridge composite profile, Bechyně, and the Orlík water reservoir Plazy Bridge composite profile. The value for public water-supply use (annual mean 4.5 mg/l) was attained or exceeded at every profile for which data were available. A statistically significant increasing trend in the parameter was identified during the monitored period at the Hněvkovice water reservoir composite dam profile, downstream of the Hněvkovice water reservoir, the Kořensko composite dam profile, and Solenice.

For P_{total}, the permissible-pollution value (annual mean 0.15 mg/l) under Government Decree No. 401/2015 Coll. [14] was attained or exceeded at the Bechyně profile. The value for salmonid waters (annual mean 0.05 mg/l) was attained or exceeded at every profile except the Orlík water reservoir composite dam profile. A statistically significant increasing trend in the parameter was identified at the Solenice profile during the monitored period.

For N_{total} and $N\text{-}NO_3^-$, the permissible-pollution values (annual means 6 mg/l and 5.4 mg/l, respectively) under Government Decree No. 401/2015 Coll. [14] were not attained or exceeded. For N_{total}, a statistically significant increasing trend was identified during the monitored period downstream of the Hněvkovice water reservoir, at the Zvíkov Bridge composite profile, and at the Orlík water reservoir Plazy Bridge composite profile. For $N\text{-}NO_3^-$, no statistically significant decreasing or increasing trend was identified at any profile during the monitored period.

For $N\text{-}NO_2^-$, the permissible-pollution values (annual means 0.08 mg/l and 0.12 mg/l, respectively) under Government Decree No. 401/2015 Coll. [14] were not attained or exceeded

for salmonid and cyprinid waters. A statistically significant increasing trend in the parameter was identified during the monitored period at Kamýk nad Vltavou.

For $N\text{-}NH_4^+$, the permissible-pollution value (annual mean 0.23 mg/l) under Government Decree No. 401/2015 Coll. [14] was not attained or exceeded. The value for salmonid waters (0.03 mg/l) was attained or exceeded along the entire longitudinal profile and in the tributaries. The value for cyprinid waters (0.16 mg/l) was attained or exceeded downstream of the Hněvkovice water reservoir and at Týn nad Vltavou. A statistically significant decreasing trend in the parameter was identified during the monitored period at Hluboká nad Vltavou, Týn nad Vltavou, downstream of the Kořensko water reservoir, and at Bechyně; an increasing trend was identified at the Orlík water reservoir Zvíkov Bridge composite profile.

DS_{105} was monitored only at the Hluboká, Týn nad Vltavou downstream, Bechyně, and Topělec profiles. At all profiles, the assessed mean was substantially below the permissible-pollution value (annual mean 750 mg/l) under Government Decree No. 401/2015 Coll. [14]. A statistically significant increasing trend in the parameter was identified during the monitored period at the Topělec profile.

DS_{550} was not monitored at any profile.

For SS_{105}, the permissible-pollution value (annual mean 20 mg/l) under Government Decree No. 401/2015 Coll. [14] was attained or exceeded at the Bechyně profile. No statistically significant decreasing or increasing trend in the parameter was identified at any profile during the monitored period.

Cl^- was monitored only at the Hluboká nad Vltavou, Hněvkovice water reservoir composite dam, downstream Kořensko water reservoir, Bechyně, and Topělec profiles. At all profiles, the assessed mean was substantially below both the permissible-pollution value (annual mean 150 mg/l) under Government Decree No. 401/2015 Coll. [14] and the stricter value for public water-supply use (annual mean 65 mg/l). A statistically significant increasing trend in the parameter was identified during the monitored period at the Hněvkovice water reservoir composite dam and Topělec profiles.

SO_4^{2-} was monitored only at the Hluboká nad Vltavou, Hněvkovice water reservoir composite dam, downstream Kořensko water reservoir, Solenice, Bechyně, and Topělec profiles. At all profiles, the assessed mean was substantially below both the permissible-pollution value (annual mean 200 mg/l) under Government Decree No. 401/2015 Coll. [14] and the stricter value for public water-supply use (annual mean 180 mg/l). A statistically significant decreasing trend in the parameter was identified during the monitored period downstream of the Kořensko water reservoir and at Solenice and Bechyně.

For Mg and Ca, the assessed mean at all profiles was substantially below the permissible-pollution values (annual means 120 mg/l and 190 mg/l, respectively) under Government Decree No. 401/2015 Coll. [14]. For Ca, a statistically significant decreasing trend was identified during the monitored period at the Orlík water reservoir composite dam, Solenice, and Bechyně profiles, while an increasing trend was identified at the Orlík water reservoir Plazy Bridge

composite profile. For Mg, a statistically significant increasing trend was identified during the monitored period at the Orlík water reservoir Plazy Bridge composite profile.

C_{10}-C_{40} hydrocarbons were monitored only at the Hluboká nad Vltavou and Týn nad Vltavou downstream. At both profiles, most values were <LOQ, with the LOQ at the permissible-pollution value (annual mean 0.1 mg/l) under Government Decree No. 401/2015 Coll. [14]; an assessment therefore cannot be made. It was not possible to assess the development of values over time for the parameter.

Fluoranthene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[g,h,i]perylene, dissolved Ni, AOX, aluminum, phenanthrene, pyrene, and EDTA were monitored only at the Hluboká nad Vltavou, Bechyně, and Topělec profiles.

For fluoranthene, the annual-average environmental quality standard (EQS-AA) of 0.0063 µg/l under Government Decree No. 401/2015 Coll. [14] was attained or exceeded at all profiles; the maximum allowable concentration environmental quality standard (EQS-MAC) of 0.12 µg/l was not attained at any profile. A statistically significant decreasing trend in the parameter was identified during the monitored period at the Bechyně and Topělec profiles.

For benzo[a]pyrene, the EQS-AA of 1.7×10^{-4} µg/l under Government Decree No. 401/2015 Coll. [14] was attained or exceeded at all profiles; the EQS-MAC of 0.27 µg/l was not attained at any profile. No statistically significant decreasing or increasing trend in the parameter was identified at any profile during the monitored period.

For benzo[b]fluoranthene, the EQS-MAC of 0.017 µg/l under Government Decree No. 401/2015 Coll. [14] was attained or exceeded at the Hluboká nad Vltavou.

For benzo[k]fluoranthene, the EQS-MAC of 0.017 µg/l under Government Decree No. 401/2015 Coll. [14] was not attained or exceeded.

For benzo[g,h,i]perylene, the EQS-MAC of 8.2×10^{-3} µg/l under Government Decree No. 401/2015 Coll. [14] was attained or exceeded at the Hluboká nad Vltavou and Bechyně profiles. For benzo[b]fluoranthene, benzo[k]fluoranthene, and benzo[g,h,i]perylene, statistically significant decreasing trends were identified during the monitored period at the Bechyně profile.

For dissolved Ni, neither the EQS-AA of 4 µg/l nor the EQS-MAC of 34 µg/l under Government Decree No. 401/2015 Coll. [14] was attained or exceeded at any profile. A statistically significant increasing trend in the parameter was identified during the monitored period at the Topělec profile.

For AOX, the EQS-AA of 25 µg/l was attained or exceeded; the stricter permissible-pollution values for public water-supply use of 12 µg/l under Government Decree No. 401/2015 Coll. [14] were exceeded at all profiles.

For phenanthrene, pyrene, and EDTA, the respective EQS-AA values of 0.03 µg/l, 0.024 µg/l, and 5 µg/l were not attained or exceeded at any profile. For AOX and phenanthrene, statistically

significant decreasing trends were identified during the monitored period at Hluboká nad Vltavou, Bechyně, and Topělec, meaning at every profile for which data are available. For pyrene, a statistically significant decreasing trend was identified during the monitored period at the Bechyně and Topělec profiles. For EDTA, a statistically significant decreasing trend was identified during the monitored period at Hluboká nad Vltavou, and an increasing trend was identified at the Orlík water reservoir Plazy Bridge composite profile.

For Al, neither the EQS-AA of 1 000 µg/l nor the stricter permissible-pollution value for public water-supply use of 380 µg/l under Government Decree No. 401/2015 Coll. [14] was attained or exceeded at any profile. No statistically significant decreasing or increasing trend in the parameter was identified at any profile during the monitored period.

Alachlor metabolites, metolachlor and its metabolites, and terbuthylazine and its metabolites were monitored only at the Hluboká nad Vltavou, downstream Hněvkovice water reservoir, Bechyně, and Topělec profiles. The EQS-AA of 0.1 µg/l for alachlor metabolites was attained or exceeded only at the Bechyně profile. For alachlor metabolites, a statistically significant decreasing trend was identified during the monitored period at Hluboká nad Vltavou, Bechyně, and the Orlík water reservoir Plazy Bridge composite profile. For metolachlor and its metabolites, a statistically significant increasing trend was identified during the monitored period at Hluboká nad Vltavou and Topělec. For terbuthylazine and its metabolites, no statistically significant decreasing or increasing trend was identified at any profile during the monitored period.

For the Orlík water reservoir Zvíkov Bridge composite, Orlík water reservoir composite dam, Kamýk nad Vltavou, Slapy water reservoir composite, and Štěchovice profiles, the assessed parameters were also compared with values of the general physicochemical and chemical parameters used to assess the ecological potential of running or standing surface water bodies, meaning the good/moderate potential boundary, for the given water-body type [18, 23, 25]. A higher value for total phosphorus (P_{total}) was assessed at the Zvíkov Bridge composite, Orlík water reservoir composite dam, Kamýk nad Vltavou, and Slapy water reservoir composite profiles. At the Kamýk nad Vltavou and Štěchovice profiles, lower minimum temperatures for April, May, and June and lower oxygen saturation were identified. Values below the minimum were assessed for oxygen saturation at the Kamýk nad Vltavou, Slapy water reservoir composite, and Štěchovice profiles. Details of the assessment of SWB status/potential are provided in Chapter 4.1.1.

For the critical Štěchovice profile, the assessed parameters were also compared with the surface-water quality values suitable for the life and reproduction of native fish species and other aquatic animals under Government Decree No. 71/2003 Coll. [12]. In this comparison, the target value for ammoniacal nitrogen, or ammonium ions, of 0.030 mg/l was not met. For dissolved oxygen, neither the target value nor the permissible value was met (9 mg/l and 7 mg/l, respectively).

Radioactivity parameters

The legislative requirements for surface-water quality in relation to radioactivity parameters arise primarily from Act No. 254/2001 Coll. (the Water Act) [13] and its implementing regulation, Government Decree No. 401/2015 Coll. [14], Annex 3, Table 1a, which defines the parameters and permissible-pollution values for radioactive substances, alongside general and microbiological parameters. In addition to permissible surface-water pollution in general, the table in the Government Decree specifies permissible pollution of surface waters used for particular purposes. In relation to radioactivity parameters, this concerns the use of waters as a source for drinking-water treatment; the values reflect the requirements of other regulations: Act No. 263/2016 Coll., the Atomic Act, as amended [50], which is implemented by Radiation Protection Decree No. 422/2016 Coll. [51]. The parameters are tritium (^{3}H), strontium-90 (^{90}Sr), cesium-137 (^{137}Cs), radium-226 (^{226}Ra), gross alpha activity concentration (cα), gross beta activity concentration (cβ), and gross beta activity concentration after subtraction of the ^{40}K contribution (cβ-^{40}K).

These radioactive substances are also listed among the river-basin-specific pollutants in Annex 3, Table 1c, to Government Decree No. 401/2015 Coll. [14], which gives their environmental quality standards and permissible-pollution values for surface waters used for public water-supply purposes in accordance with [51]. These radioactive substances are also listed in methodology [23], although its values do not correspond to those in Government Decree No. 401/2015 Coll. [14] because the methodology has not yet been updated following the amendment to the Government Decree that modified the environmental quality standards for radioactive substances.

Different values may be specified for some radioactivity parameters at different locations in surface waters, particularly in view of the use of surface waters as a source for public water-supply purposes.

At the time background study [8] was prepared, the Atomic Act and its implementing regulations were being amended; the assessment was therefore based primarily on the requirements of Government Decree No. 401/2015 Coll. [14]. The amendment to Act No. 263/2016 Coll. (the Atomic Act) [50] introduced a provision prohibiting the supply of drinking water if the tritium activity concentration exceeds the maximum permissible value. This maximum permissible value is established by an implementing regulation, in this case Radiation Protection Decree No. 422/2016 Coll. [51]. The Decree establishes a maximum permissible value of 3 500 Bq/l for tritium in drinking water and a reference level of 1 000 Bq/l for tritium in drinking water; it also requires the activity concentration of gamma-emitting radionuclides to be measured where tritium in drinking water exceeds 100 Bq/l. The investigation level for ^{137}Cs is 0.5 Bq/l; if exceeded, the indicative dose must be determined. Similar provisions are established for surface waters into which radioactive substances are discharged from a workplace with a nuclear power installation: An investigation level of 100 Bq/l for tritium, above which it must be assessed whether the discharge procedures have been breached and whether the investigation level for ^{137}Cs has been exceeded; an investigation

level of 0.5 Bq/l for ^{137}Cs, above which the customer abstracting water for drinking-water treatment must be informed of the results of artificial-radionuclide activity-concentration determination if the exceedance occurs at a drinking-water abstraction point; an action level of 1 000 Bq/l for tritium, above which it must be assessed whether the discharge procedures have been breached and corrective or preventive measures must be established, where appropriate, with the aim of not exceeding an annual mean tritium activity concentration of 1 000 Bq/l; and a maximum permissible value of 3 500 Bq/l for tritium. The values in Government Decree No. 401/2015 Coll. [14] are therefore consistent with the values introduced by the amendment to the atomic legislation and with the study prepared [8], and correspond to the requirements of the legislation currently in force.

Radioactivity parameters are essential to assessing the effect of the SMR ETE project because of the nature of the installation assessed. This applies particularly to artificial radionuclides that may be produced during the operation of nuclear installations. Based on Government Decree No. 401/2015 Coll. [14] and methodology [23], the assessment of the effect of the SMR ETE project on water quality should therefore include the following radioactivity parameters: ^{3}H, ^{90}Sr, ^{137}Cs, cα, cβ, cβ-^{40}K.

The analysis shows that the legislative requirements for surface-water quality, meaning both the range of parameters assessed and their values, may differ among watercourse reaches depending on the purpose of the assessment. No other criteria are relevant from the perspective of radioactive substances. Critical profiles for assessing the effect of the SMR ETE project were selected taking into account the changing requirements along the reach of the Vltava affected by SMR ETE discharge. The selected critical profiles, together with the other profiles at which surface-water quality was assessed, are provided in Table 30. For the critical profiles, the parameters used to assess the effect of the SMR ETE project on surface-water quality were specified so as to correspond to the surface-water quality requirements relevant to each critical profile.

Table 30 Profiles included in the processing of selected radioactivity parameters; critical profiles are shown in bold, together with the purpose of assessment

Profile ID	Watercourse	Profile name	Purpose of assessment
1042	Vltava	Hluboká nad Vltavou	---
-	Vltava	Downstream of Hněvkovice	---
-	Vltava	Upstream of Kořensko	---
2537	**Vltava**	**Downstream of Kořensko water reservoir**	**Direct effect of SMR ETE discharge; permissible surface-water pollution**
5130	**Vltava**	**Orlík WR, Zvíkov Bridge**	**Permissible surface-water pollution; ecological potential of the SWB (standing waters)**
-	Vltava	Hladná	---
3213	**Vltava**	**Solenice**	**Public water-supply use**

-	Lužnice	Koloděje	---
-	Otava	Topělec***)	---

The available surface-water quality data for the area of interest, at the profiles listed in Table 30, were compiled for 2015–2024. Radioactivity parameters are monitored in the area under the ETE Effluent Monitoring Program [52–61] and the Program for Monitoring and Assessing the Environmental Effects of the Temelín Nuclear Power Plant [29–38], specifically Surface-Water and Groundwater Quality Monitoring at the Temelín Nuclear Power Plant, prepared by VÚV TGM, v. v. i. [39–48]; and by the surface-water quality monitoring program of Povodí Vltavy, from which data were requested for this study [49]. At critical profiles, data were processed for the parameters significant to each profile; at reference profiles, they were processed to the maximum extent available, based on the requirements for the profile downstream of the Kořensko water reservoir. The range of monitored parameters differs among profiles, data are missing at some profiles, and the character of the data also differs among the individual suppliers. A brief assessment of each parameter and a comparison of the assessed values with the applicable permissible-pollution values under Government Decree No. 401/2015 Coll. [14] are provided below.

For cα, no values exceeding the permissible-pollution values (annual mean 0.2 Bq/l, maximum 0.3 Bq/l) under Government Decree No. 401/2015 Coll. [14] were recorded at any monitored profile. A statistically significant decrease in activity concentrations during the monitored period was assessed for the parameter at the Hladná profile. At the other profiles for which data were available, the trend was not significant or could not be assessed.

For cβ, no values exceeding the permissible-pollution values (annual mean 0.5 Bq/l, maximum 1 Bq/l) under Government Decree No. 401/2015 Coll. [14] were recorded at any monitored profile. For gross beta activity concentration (cβ), a statistically significant increase in activity concentrations during the monitored period was assessed downstream of the Hněvkovice water reservoir. At the other profiles for which data were available, the trend was not significant.

For cβ-^{40}K, no values exceeding the permissible-pollution values (annual mean and maximum 0.5 Bq/l) under Government Decree No. 401/2015 Coll. [14] were recorded at any monitored profile. No statistically significant increase or decrease in activity concentrations during the monitored period was assessed for the parameter at any profile.

For ^{137}Cs and ^{90}Sr, no values exceeding the permissible-pollution values (maximum 2 Bq/l and 1 Bq/l, respectively) or the EQS-AA values (0.5 Bq/l and 0.2 Bq/l, respectively) under Government Decree No. 401/2015 Coll. [14] were recorded. For ^{137}Cs, a statistically significant decrease in activity concentrations during the monitored period was assessed at the Hladná and Topělec profiles. At the other profiles for which data were available, the trend was not significant. For ^{90}Sr, a statistically significant decrease in activity concentrations during the monitored period was assessed downstream of the Hněvkovice water reservoir, upstream of the

Kořensko water reservoir, and at Koloděje and Topělec. At the other profiles for which data were available, the trend was not significant.

For ^{3}H, no values exceeding the permissible-pollution value (maximum 3 500 Bq/l) or the EQS-AA value (1 000 Bq/l) under Government Decree No. 401/2015 Coll. [14] were recorded at any monitored profile. A statistically significant decrease in activity concentrations during the monitored period was assessed for the parameter at Hluboká nad Vltavou and Solenice. At the other profiles for which data were available, the trend was not significant.

2.2.2 Effect of the SMR ETE Project on Surface-Water Quality

The effect of the SMR ETE project on surface-water quality was assessed in study [8], which served as the basis for this chapter.

Estimated effect of project operation on surface water

Concentrations at the critical profiles were modeled for two project capacity alternatives:

1. SMR ETE + Units 1 and 2
2. SMR ETE + Units 1 and 2 + two 1 700 MWe New NPP ETE units

For both alternatives, surface-water quality at the critical profiles was modeled for two hydrological situations:

1. "Normal flow": long-term mean flow (Q_a) was used for the modeling
2. "Drought, effect of climate change": flow Q_{355} was used for the modeling

In addition, the minimum reliable discharge (Q_{rel}) was modeled at the profile downstream of the Kořensko water reservoir to estimate extreme parameter values, meaning maxima, for comparison with values established by legislation as annual maxima, or minima in the case of dissolved oxygen. The discharges used are provided in Table 31.

Table 31 Discharge data at the profiles for assessing the effect of the SMR ETE project; critical profiles are shown in bold

Watercourse	Profile name	Q_a [m³/s]	Q_{rel} [m³/s]	Q_{355} [m³/s]
Lužnice	Bechyně (Koloděje)	21.6		2.63
Otava	Topělec	23.2		5.88
Vltava	Týn nad Vltavou (downstream of the Hněvkovice waterworks dam)	27.3		9.86
Vltava	**Downstream of Kořensko water reservoir**	49.1	9.5 *	13
Vltava	**Orlík WR, Zvíkov Bridge**	49.9		13.7
Vltava	**Solenice**	76.5		21.1
Vltava	**Kamýk nad Vltavou**	75.6		30.9
Vltava	**Štěchovice**	77.9		31.0

Data source: communication with the Czech Hydrometeorological Institute [62–64] (* Hněvkovice-Kořensko operating rules [65])

The modeling was also conducted for two discharge scenarios:

1. Average Discharge: Actual concentrations measured in wastewater from Units 1 and 2, averaged over 2015–2024, were used in the calculation. The same concentrations were also used for the SMR ETE project and the New NPP ETE [66]. For radioactivity parameters, the actual measured discharged-activity values from Units 1 and 2, averaged over 2015–2024, were used. For the other parts of the assessed project capacity alternative, meaning the SMR ETE project and, where applicable, the New NPP ETE, the specified SMR source term [67] or, where applicable, the design radionuclide discharges according to the New NPP ETE EIA Documentation (2010) [68] were used conservatively.
2. Maximum Discharge: For Units 1 and 2, the "maximum" emission limits [t/year and Bq/year], or "m" where applicable, established in the permit for wastewater discharge from Units 1 and 2 [69] were used in the calculation. For the other parts of the assessed capacity alternatives, meaning the SMR ETE project and, where applicable, the New NPP ETE, the same approach as for the Average Discharge scenario was used. It represents an extreme boundary condition that has not been attained in practice by Units 1 and 2.

The data used for Units 1 and 2 are presented below: Data on the quantity and quality of raw water withdrawn and wastewater discharged were taken from the ETE environmental-protection reports [29–38] and the effluent and radiation-monitoring reports [48–57] for 2015–2024. Directly measured concentration data in wastewater from Units 1 and 2 are not available for all parameters identified as significant in this study. For the purposes of estimating the project's effect on surface-water quality, the wastewater concentration of these parameters was calculated as the parameter concentration in raw water multiplied by the concentration factor at which the existing Units 1 and 2 were operated during 2015–2024. This ratio, the concentration factor, is 4.4. Limit values for concentrations discharged in wastewater have been established for Units 1 and 2: emission limits "p", which may be exceeded to the extent defined in [14]; "m", which may not be exceeded; and "maximum" values in [g/s] and [t/year] [69]. Under this permit [69], the maximum wastewater discharge from Units 1 and 2 is 10.8 million m^3/year. Radioactivity parameters in wastewater comprise the contribution from the power plant and that from raw water, which also contains radioactive substances that are concentrated in the cooling circuit and discharged with wastewater. Data on the power plant's contribution in discharged wastewater were taken from the ETE environmental-protection reports [29–38] and effluent and radiation-monitoring reports [52–61] for 2015–2024. The contribution of raw water to the discharge of radioactivity parameters is calculated as its activity concentration in raw water multiplied by a concentration factor of 4.4, except for tritium, for which a concentration factor of 1 is used in view of its properties.

The data used for the New NPP ETE are presented below: Data on the quantity and quality of raw water withdrawn and the quantity of wastewater discharged were taken from reports prepared as background documents for the New NPP ETE EIA Documentation; for the quality of wastewater discharged, the emission limits proposed in a report by VÚV TGM, v. v. i. [66], were used. For the two 1 700 MWe New NPP ETE units, the EIA Documentation [68] assumes raw-water withdrawal of 67 million m^3/year, averaging 2.12 m^3/s. Wastewater discharge, comprising process wastewater and sewage, is assumed to be 15.156 million m^3/year, averaging 0.48 m^3/s. The same raw-water quality as for Units 1 and 2 is assumed for the New NPP ETE, with raw water for the New NPP ETE assumed to be withdrawn at the same location. Because the operation will be fundamentally similar from a water-management perspective, the wastewater composition is assumed to be the same as that of Units 1 and 2 [68]. For wastewater quality in terms of radioactivity parameters, the design annual discharge data for the two 1 700 MWe units provided in the New NPP ETE EIA Documentation [68] were used. Beta emitters are included under cβ and cβ-^{40}K, except ^{3}H, which is not included in those parameters. No alpha emitters are anticipated in the New NPP ETE design discharge. For wastewater discharged from the New NPP ETE, the parameter concentrations were assumed to be values derived from the "maximum" emission limits for wastewater discharge from the New NPP ETE proposed in report [66] for the two 1 750 MWe unit capacity alternative, which is closest to the two 1 700 MWe unit capacity alternative assessed here. Where "maximum" limits in t/year were not established for temperature, dissolved oxygen, and pH, the "m" values were used. For parameters for which no emission limits were proposed, the concentrations used in wastewater were values based on experience with Units 1 and 2, meaning the mean concentration in wastewater from Units 1 and 2 in 2015–2024, or their concentration in raw water multiplied by the concentration factor.

The data used for the SMR ETE project are presented below: In some cases, data relating directly to the SMR ETE project were available [67]. Where these data were unavailable, experience from operation of the existing Units 1 and 2, which should be fundamentally similar in water-management terms, was used. The SMR ETE project is assumed to withdraw a maximum of 12 million m^3 of raw water per year, averaging 0.38 m^3/s, under the conservative SSP5-8.5 climate scenario; wastewater discharge is estimated at 3.6 million m^3/year [67], averaging 0.11 m^3/s. Operating experience from Units 1 and 2 can be used to estimate the behavior of substances in the SMR ETE cooling circuit because its operation, including the anticipated number of cycles of concentration, is assumed to be fundamentally similar to that of Units 1 and 2 [67]. For each parameter, the concentration ratio used to estimate its behavior in the cooling circuit was therefore calculated using operating data from Units 1 and 2. For several other parameters, concentration-ratio values could be taken from an earlier study by VÚV TGM, v. v. i. [70]; these primarily included PAHs, for which the concentration ratio was found to be substantially higher than the cooling-circuit concentration factor in many cases, and Ni. Radioactive substances in wastewater from the SMR ETE project will comprise the sum of the radioactive substances introduced with raw water and those added as a result of operating the SMR ETE reactor. According to information from the client [67], the SMR ETE cooling

circuit is expected to operate at 4.0–4.3 cycles of concentration, which may be considered close to the number of cycles of concentration at which the existing Units 1 and 2 are operated. According to their nature, the radionuclides listed are included under the individual radioactivity parameters assessed. Beta emitters are included under cβ and cβ-^{40}K, except ^{3}H, ^{14}C, and gaseous isotopes (xenon and krypton), which are not covered by those parameters. No alpha emitters are anticipated in the SMR ETE source term. Radioactivity parameters in wastewater comprise the contribution from the power plant and that from raw water, which also contains radioactive substances that are concentrated in the cooling circuit and discharged with wastewater. No data are available for estimating the concentration of radioactive substances originating from the raw water itself; a value of 4.4 is therefore used for the concentration of radioactivity parameters, excluding the power plant's contribution, except for tritium, for which a concentration factor of 1 is used in view of its properties.

The effect of the SMR ETE project on surface-water quality was estimated for the critical profiles using the model described in detail in study [8]:

1. Downstream of Kořensko water reservoir: non-radiological parameters, including temperature; radioactivity parameters;
2. Orlík water reservoir, Zvíkov Bridge: non-radiological parameters, including temperature; radioactivity parameters;
3. Solenice: non-radiological parameters, including temperature; radioactivity parameters;
4. Kamýk nad Vltavou: non-radiological parameters, including temperature;
5. Štěchovice: non-radiological parameters, including temperature; radioactivity parameters.

The effect of tritium on the watercourse was also assessed at the Podolí and Hřensko profiles.

Non-radiological parameters

At the profile downstream of the Kořensko water reservoir, the modeled concentrations were assessed in terms of permissible pollution under Government Decree No. 401/2015 Coll. [14], taking into account that the Orlík water reservoir Podolsko public campsite bathing-water area lies downstream of this profile. Concentrations of significant parameters modeled for the effect of the capacity alternative comprising SMR ETE and Units 1 and 2 on the watercourse under the “Average Discharge” scenario are provided in Table 32, and those under the “Maximum Discharge” scenario in Table 33. Concentrations of significant parameters modeled for the effect of the capacity alternative comprising SMR ETE, Units 1 and 2, and New NPP ETE on the watercourse under the “Average Discharge” scenario are provided in Table 34, and those under the “Maximum Discharge” scenario in Table 35. The tables also provide the applicable permissible-pollution values under Government Decree No. 401/2015 Coll. [14]: permissible-pollution annual average/environmental quality standard annual average (AA); permissible-pollution maximum/environmental quality standard maximum allowable concentration (MAX); permissible-pollution minimum (MIN); permissible-pollution annual average/environmental quality standard annual average for public water-supply use (LIM-B); permissible-pollution annual average/environmental quality standard annual average for a

bathing-water area (LIM-C); permissible-pollution annual average/environmental quality standard annual average for salmonid waters (LIM-D); and permissible-pollution annual average/environmental quality standard annual average for cyprinid waters (LIM-E). Attainment or exceedance of the applicable value is indicated by color formatting.

The modeled concentration values show that the permissible-pollution annual average may be exceeded for BOD_5, COD_{Cr}, TOC, and the PAHs fluoranthene and benzo[a]pyrene; P_{total} does not meet the requirements for bathing waters. It must be noted, however, that the legislative requirements for these parameters are already not being met at present; the principal cause of this situation can be attributed to pollutant input from the Lužnice River. This is also reflected in the apparently paradoxical fact that, for some parameters, the situation under low-flow drought conditions appears better than under normal flows. This is because the influence of the Lužnice is less significant under drought conditions than under normal flows. Comparison of the modeled concentration values with the legislative requirements for annual maxima, or minima where applicable, showed that the maximum values may be exceeded for pH, benzo[b]fluoranthene, and benzo[g,h,i]perylene. Here too, the cause must be sought primarily in the pollution entering the Vltava from the Lužnice.

Table 32 Modeled concentrations of significant parameters at the profile downstream of the Kořensko water reservoir for the capacity alternative comprising SMR ETE and Units 1 and 2 under the "Average Discharge" scenario for Q_a (normal flow), Q_{355} (drought, effect of climate change), and Q_{guar} (assessment of extremes and comparison with requirements specified as maxima or minima, as applicable).

SMR ETE + Units 1 and 2 Profile: Downstream of Kořensko water reservoir Scenario: Average Discharge		Modeled concentration at discharge:			Legislative requirements			
Parameter	**Unit**	**Q_a**	**Q_{355}**	**Q_{rel} (max)**	AA	MAX	MIN	LIM-C
T	°C	**11.5**	**11.7**	**24.5**		29		
pH		**7.8**	**7.7**	**9.2**		9	5	
O_2	mg/l						9	
O_2 saturation	%							
BOD_5	mg/l	**4.1**	**3.4**	-	3.8			
COD_{Cr}	mg/l	**32**	**29**	-	26			
TOC	mg/l	**12**	**11**	-	10			
P_{total}	mg/l	**0.13**	**0.11**	-	0.15			0.05
$P\text{-}PO_4^{3-}$	mg/l	**0.04**	**0.04**	-				
N_{total}	mg/l	**2.6**	**2.3**	-	6			
$N\text{-}NO_3^-$	mg/l	**1.6**	**1.5**	-	5.4			
$N\text{-}NO_2^-$	mg/l	**0.02**	**0.02**	-				
$N\text{-}NH_4^+$	mg/l	**0.13**	**0.15**	-	0.23			
DS_{105}	mg/l	**168**	**158**	-	750			
DS_{550}	mg/l	**-**	**-**	-	470			
SS_{105}	mg/l	**14.6**	**11.8**	-	20			
Cl^-	mg/l	**19**	**16**	-	150			
SO_4^{2-}	mg/l	**20**	**20**	-	200			
Mg	mg/l	**5.2**	**4.8**	-	120			
Ca	mg/l	**18**	**16**	-	190			
$C_{10}\text{-}C_{40}$	mg/l	**0.05**	**0.05**	-	0.1			
Fluoranthene	µg/l	**0.012**	**0.013**	**0.051**	0.0063	0.12		
Benzo[a]pyrene	µg/l	**0.004**	**0.005**	**0.020**	0.000017	0.27		
Benzo[b]fluoranthene	µg/l	**0.004**	**0.004**	**0.018**		0.017		
Benzo[k]fluoranthene	µg/l	**0.002**	**0.002**	**0.009**		0.017		
Benzo[g,h,i]perylene	µg/l	**0.003**	**0.004**	**0.016**		0.0082		
Phenanthrene	µg/l	**0.008**	**0.009**	-	0.03			
Pyrene	µg/l	**0.010**	**0.011**	-	0.024			
Al	µg/l	**227**	**240**	-	1000			
Ni	µg/l	**1.5**	**1.3**	**3.1**	4	34		
AOX	µg/l	**22**	**22**	-	25			
Alachlor	µg/l	**0.063**	**0.048**	-	0.1			
Metolachlor	µg/l	**0.075**	**0.054**	-	0.2			
Terbuthylazine	µg/l	**0.029**	**0.021**	-	0.5			
EDTA	µg/l	**3.0**	**3.0**	-	5			

Notes on legislative requirements:
AA Permissible pollution, annual average/EQS-AA [14]
MAX Permissible pollution, maximum/EQS-MAC [14]
MIN Permissible pollution, minimum [14]
LIM-C Permissible pollution, annual average/EQS-AA (bathing waters) [14]

Table 33 Modeled concentrations of significant parameters at the profile downstream of the Kořensko water reservoir for the capacity alternative comprising SMR ETE and Units 1 and 2 under the "Maximum Discharge" scenario for Q_a (normal flow), Q_{355} (drought, effect of climate change), and Q_{guar} (assessment of extremes and comparison with requirements specified as maxima or minima, as applicable).

SMR ETE + Units 1 and 2 Profile: Downstream of Kořensko water reservoir Scenario: Maximum Discharge		Modeled concentration at discharge:			Legislative requirements			
Parameter	**Unit**	**Q_a**	**Q_{355}**	**Q_{rel} (max)**	AA	MAX	MIN	LIM-C
T	°C	**11.6**	**12.0**	**25**		29		
pH		**7.8**	**7.9**	**9.3**		9	5	
BOD_5	mg/l	**4.2**	**3.8**	-	3.8			
COD_{Cr}	mg/l	**32**	**29**	-	26			
P_{total}	mg/l	**0.14**	**0.13**	-	0.15			0.05
$P\text{-}PO_4^{3-}$	mg/l	**0.04**	**0.04**	-				
$N\text{-}NO_3^-$	mg/l	**1.7**	**1.8**	-	5.4			
DS_{550}	mg/l	**-**	**-**	-	470			
SS_{105}	mg/l	**15**	**12**	-	20			
SO_4^{2-}	mg/l	**21**	**25**	-	200			
$C_{10}\text{-}C_{40}$	mg/l	**0.05**	**0.05**	-	0.1			

Notes on legislative requirements:
AA Permissible pollution, annual average/EQS-AA [14]
MAX Permissible pollution, maximum/EQS-MAC [14]
MIN Permissible pollution, minimum [14]
LIM-C Permissible pollution, annual average/EQS-AA (bathing waters) [14]

Table 34 Modeled concentrations of significant parameters at the profile downstream of the Kořensko water reservoir for the capacity alternative comprising SMR ETE, Units 1 and 2, and New NPP ETE under the "Average Discharge" scenario for Q_a (normal flow), Q_{355} (drought, effect of climate change), and Q_{guar} (assessment of extremes and comparison with requirements specified as maxima or minima, as applicable).

SMR ETE + Units 1 and 2 + New NPP ETE Profile: Downstream of Kořensko water reservoir Scenario: Average Discharge		Modeled concentration at discharge:			Legislative requirements			
Parameter	**Unit**	**Q_a**	**Q_{355}**	**Q_{rel} (max)**	AA	MAX	MIN	LIM-C
T	°C	**11.7**	**12.4**	**25.3**		29		
pH		**7.8**	**7.8**	**9.2**		9	5	
O_2	mg/l						9	
O_2 saturation	%							
BOD_5	mg/l	**4.1**	**3.5**	-	3.8			
COD_{Cr}	mg/l	**32**	**31**	-	26			
TOC	mg/l	**12**	**12**	-	10			
P_{total}	mg/l	**0.13**	**0.13**	-	0.15			0.05
$P\text{-}PO_4^{3-}$	mg/l	**0.04**	**0.04**	-				
N_{total}	mg/l	**2.7**	**2.6**	-	6			
$N\text{-}NO_3^-$	mg/l	**1.7**	**1.8**	-	5.4			
$N\text{-}NO_2^-$	mg/l	**0.02**	**0.03**	-				
$N\text{-}NH_4^+$	mg/l	**0.14**	**0.15**	-	0.23			
DS_{105}	mg/l	**173**	**177**	-	750			
DS_{550}	mg/l	**-**	**-**	-	470			
SS_{105}	mg/l	**15**	**12**	-	20			
Cl^-	mg/l	**19**	**18**	-	150			
SO_4^{2-}	mg/l	**21**	**24**	-	200			
Mg	mg/l	**5.3**	**5.4**	-	120			
Ca	mg/l	**19**	**18**	-	190			
$C_{10}\text{-}C_{40}$	mg/l	**0.05**	**0.06**	-	0.1			
Fluoranthene	µg/l	**0.013**	**0.015**	**0.052**	0.0063	0.12		
Benzo[a]pyrene	µg/l	**0.004**	**0.005**	**0.020**	0.000017	0.27		
Benzo[b]fluoranthene	µg/l	**0.004**	**0.005**	**0.019**		0.017		
Benzo[k]fluoranthene	µg/l	**0.002**	**0.003**	**0.010**		0.017		
Benzo[g,h,i]perylene	µg/l	**0.003**	**0.005**	**0.016**		0.0082		
Phenanthrene	µg/l	**0.009**	**0.010**	-	0.03			
Pyrene	µg/l	**0.010**	**0.013**	-	0.024			
Al	µg/l	**236**	**274**	-	1000			
Ni	µg/l	**1.5**	**1.4**	**17.6**	4	34		
AOX	µg/l	**23**	**25**	-	25			
Alachlor	µg/l	**0.065**	**0.053**	-	0.1			
Metolachlor	µg/l	**0.076**	**0.059**	-	0.2			
Terbuthylazine	µg/l	**0.029**	**0.023**	-	0.5			
EDTA	µg/l	**3.1**	**3.4**	-	5			

Notes on legislative requirements:
AA Permissible pollution, annual average/EQS-AA [14]
MAX Permissible pollution, maximum/EQS-MAC [14]
MIN Permissible pollution, minimum [14]
LIM-C Permissible pollution, annual average/EQS-AA (bathing waters) [14]

Table 35 Modeled concentrations of significant parameters at the profile downstream of the Kořensko water reservoir for the capacity alternative comprising SMR ETE, Units 1 and 2, and New NPP ETE under the "Maximum Discharge" scenario for Q_a (normal flow), Q_{355} (drought, effect of climate change), and Q_{guar} (assessment of extremes and comparison with requirements specified as maxima or minima, as applicable).

SMR ETE + Units 1 and 2 + New NPP ETE Profile: Downstream of Kořensko water reservoir Scenario: Maximum Discharge		Modeled concentration at discharge:			Legislative requirements			
Parameter	**Unit**	**Q_a**	**Q_{355}**	**Q_{rel} (max)**	AA	MAX	MIN	LIM-C
T	°C	**11.9**	**13.2**	**25.8**		29		
pH		**7.9**	**8.0**	**9.3**		9	5	
BOD_5	mg/l	**4.2**	**3.9**	-	3.8			
COD_{Cr}	mg/l	**33**	**32**	-	26			
TOC	mg/l	**12**	**13**	-	10			
P_{total}	mg/l	**0.14**	**0.14**	-	0.15			0.05
$P\text{-}PO_4^{3-}$	mg/l	**0.04**	**0.05**	-				
$N\text{-}NO_3^-$	mg/l	**1.8**	**2.5**	-	5.4			
$N\text{-}NH_4^+$	mg/l	**0.14**	**0.17**	-	0.23			
DS_{550}	mg/l	-	-	-	470			
SS_{105}	mg/l	**15**	**13**	-	20			
SO_4^{2-}	mg/l	**25**	**38**	-	200			
$C_{10}\text{-}C_{40}$	mg/l	**0.05**	**0.06**	-	0.1			

Notes on legislative requirements:
AA Permissible pollution, annual average/EQS-AA [14]
MAX Permissible pollution, maximum/EQS-MAC [14]
MIN Permissible pollution, minimum [14]
LIM-C Permissible pollution, annual average/EQS-AA (bathing waters) [14]

Like the profile downstream of the Kořensko water reservoir, the Orlík water reservoir Zvíkov Bridge profile was assessed in terms of permissible pollution under Government Decree No. 401/2015 Coll. [14], taking into account that additional bathing-water areas in the lower part of the Orlík water reservoir lie downstream of this profile. This profile is also the representative profile for water body HVL_1055_J, Orlík I Reservoir on the Vltava, so compliance with the ecological-potential values established by methodology [18] was also assessed. Concentrations of significant parameters modeled for the effect of the capacity alternative comprising SMR ETE and Units 1 and 2 on the watercourse under the "Average Discharge" scenario are provided in Table 36, and those under the "Maximum Discharge" scenario in Table 37. Concentrations of significant parameters modeled for the effect of the capacity alternative comprising SMR ETE, Units 1 and 2, and New NPP ETE on the watercourse under the "Average Discharge" scenario are provided in Table 38, and those under the "Maximum Discharge" scenario in Table 39.

As at the profile downstream of the Kořensko water reservoir, TOC and P_{total} remain problematic parameters at the Orlík water reservoir Zvíkov Bridge profile. Other parameters for which the requirements were not met at the profile downstream of the Kořensko water reservoir (BOD_5, COD_{Cr}, fluoranthene, and benzo[a]pyrene) could not be assessed because data were unavailable for them. In addition to the criteria listed above, the values for cyprinid waters were also considered at this profile because of the possible effect on the Otava arm of the Orlík

water reservoir. However, the modeled data show that the cyprinid-water requirements are not at risk of exceedance for nitrite nitrogen or ammoniacal nitrogen; for BOD_5, it can be concluded that the contribution of the assessed project capacity alternative to any exceedance of the values is negligible.

Table 36 Modeled concentrations of significant parameters at the Orlík water reservoir Zvíkov Bridge profile for the capacity alternative comprising SMR ETE and Units 1 and 2 under the "Average Discharge" scenario for Q_a (normal flow) and Q_{355} (drought, effect of climate change)

SMR ETE + Units 1 and 2 Profile: Orlík WR, Zvíkov Bridge Scenario: Average Discharge		Modeled concentration at discharge:		Legislative requirements:					
Parameter	**Unit**	**Q_a**	**Q_{355}**	AA	MAX	MIN	LIM-C	LIM-E	LIM-F
T	°C				29			28*	20
pH					9	5		6–9*	5–10
O_2	mg/l					9		≥7*	
O_2 saturation	%							50*	50–200
BOD_5	mg/l			3.8				3.2	
COD_{Cr}	mg/l			26					
TOC	mg/l	**11**	**10**	10					
P_{total}	mg/l	**0.08**	**0.07**	0.15			0.05		0.04
P-PO_4^{3-}	mg/l	**0.02**	**0.02**						
N_{total}	mg/l	**1.8**	**1.6**	6					
N-NO_3^-	mg/l	**1.0**	**0.9**	5.4					
N-NO_2^-	mg/l	**0.02**	**0.02**					0.12	
N-NH_4^+	mg/l	**0.09**	**0.10**	0.23				0.16	
NH_3	mg/l							0.025*	
DS_{105}	mg/l			750					
DS_{550}	mg/l			470					
SS_{105}	mg/l			20					
Cl^-	mg/l			150					
SO_4^{2-}	mg/l			200					
Mg	mg/l	**4.7**	**4.3**	120					
Ca	mg/l	**16**	**15**	190					
C_{10}-C_{40}	mg/l			0.1					
Fluoranthene	µg/l			0.0063	0.12				
Benzo[a]pyrene	µg/l			0.000017	0.27				
Benzo[b]fluoranthene	µg/l				0.017				
Benzo[k]fluoranthene	µg/l				0.017				
Benzo[g,h,i]perylene	µg/l				0.0082				
Phenanthrene	µg/l			0.03					
Pyrene	µg/l			0.024					
Al	µg/l			1000					
Ni	µg/l			4	34				
AOX	µg/l			25					
Alachlor	µg/l			0.1					
Metolachlor	µg/l			0.2					
Terbuthylazine	µg/l			0.5					
EDTA	µg/l			5					
Notes on legislative requirements: AA Permissible pollution, annual average/EQS-AA [14]									

MAX Permissible pollution, maximum/EQS-MAC [14]
MIN Permissible pollution, minimum [14]
LIM-C Permissible pollution, annual average/EQS-AA (bathing waters) [14]
LIM-E Permissible pollution, annual average/EQS-AA (cyprinid waters) [14] (* permissible values from the Government Decree [12])
LIM-F Good ecological-potential requirement [23]

Table 37 Modeled concentrations of significant parameters at the Orlík water reservoir Zvíkov Bridge profile for the capacity alternative comprising SMR ETE and Units 1 and 2 under the "Maximum Discharge" scenario for Q_a (normal flow) and Q_{355} (drought, effect of climate change)

SMR ETE + Units 1 and 2 Profile: Orlík WR, Zvíkov Bridge Scenario: Maximum Discharge		**Modeled concentration at discharge:**		**Legislative requirements:**					
Parameter	**Unit**	**Q_a**	**Q_{355}**	AA	MAX	MIN	LIM-C	LIM-E	LIM-F
T	°C				29			28*	20
pH					9	5		6–9*	5–10
BOD_5	mg/l			3.8				3.2	
COD_{Cr}	mg/l			26					
P_{total}	mg/l	**0.08**	**0.08**	0.15			0.05		0.04
$P\text{-}PO_4^{3-}$	mg/l	**0.02**	**0.03**						
$N\text{-}NO_3^-$	mg/l	**1.0**	**1.1**	5.4					
DS_{550}	mg/l			470					
SS_{105}	mg/l			20					
SO_4^{2-}	mg/l			200					
$C_{10}\text{-}C_{40}$	mg/l			0.1					

Notes on legislative requirements:
AA Permissible pollution, annual average/EQS-AA [14]
MAX Permissible pollution, maximum/EQS-MAC [14]
MIN Permissible pollution, minimum [14]
LIM-C Permissible pollution, annual average/EQS-AA (bathing waters) [14]
LIM-E Permissible pollution, annual average/EQS-AA (cyprinid waters) [14] (* permissible values from the Government Decree [12])
LIM-F Good ecological-potential requirement [23]

Table 38 Modeled concentrations of significant parameters at the Orlík water reservoir Zvíkov Bridge profile for the capacity alternative comprising SMR ETE, Units 1 and 2, and New NPP ETE under the "Average Discharge" scenario for Q_a (normal flow) and Q_{355} (drought, effect of climate change)

SMR ETE + Units 1 and 2 + New NPP ETE Profile: Orlík WR, Zvíkov Bridge Scenario: Average Discharge		**Modeled concentration at discharge:**		**Legislative requirements:**					
Parameter	**Unit**	**Q_a**	**Q_{355}**	AA	MAX	MIN	LIM-C	LIM-E	LIM-F
T	°C				29			28*	20
pH					9	5		6–9*	5–10
O_2	mg/l					9		≥7*	
O_2 saturation	%							50*	50–200
BOD_5	mg/l			3.8				3.2	
COD_{Cr}	mg/l			26					
TOC	mg/l	**11**	**11**	10					
P_{total}	mg/l	**0.08**	**0.08**	0.15			0.05		0.04
$P\text{-}PO_4^{3-}$	mg/l	**0.025**	**0.027**						
N_{total}	mg/l	**1.8**	**1.8**	6					
$N\text{-}NO_3^-$	mg/l	**1.0**	**1.1**	5.4					
$N\text{-}NO_2^-$	mg/l	**0.02**	**0.03**					0.12	
$N\text{-}NH_4^+$	mg/l	**0.09**	**0.10**	0.23				0.16	
NH_3	mg/l							0.025*	
DS_{105}	mg/l			750					
DS_{550}	mg/l			470					
SS_{105}	mg/l			20					
Cl^-	mg/l			150					
SO_4^{2-}	mg/l			200					
Mg	mg/l	**4.8**	**4.9**	120					
Ca	mg/l	**17**	**16**	190					
C_{10}-C_{40}	mg/l			0.1					
Fluoranthene	µg/l			0.0063	0.12				
Benzo[a]pyrene	µg/l			0.000017	0.27				
Benzo[b]fluoranthene	µg/l				0.017				
Benzo[k]fluoranthene	µg/l				0.017				
Benzo[g,h,i]perylene	µg/l				0.0082				
Phenanthrene	µg/l			0.03					
Pyrene	µg/l			0.024					
Al	µg/l			1000					
Ni	µg/l			4	34				
AOX	µg/l			25					
Alachlor	µg/l			0.1					
Metolachlor	µg/l			0.2					
Terbuthylazine	µg/l			0.5					
EDTA	µg/l			5					

Notes on legislative requirements:
AA Permissible pollution, annual average/EQS-AA [14]
MAX Permissible pollution, maximum/EQS-MAC [14]
MIN Permissible pollution, minimum [14]
LIM-C Permissible pollution, annual average/EQS-AA (bathing waters) [14]
LIM-E Permissible pollution, annual average/EQS-AA (cyprinid waters) [14] (* permissible values from the Government Decree [12])
LIM-F Good ecological-potential requirement [23]

Table 39 Modeled concentrations of significant parameters at the Orlík water reservoir Zvíkov Bridge profile for the capacity alternative comprising SMR ETE, Units 1 and 2, and New NPP ETE under the "Maximum Discharge" scenario for Q_a (normal flow) and Q_{355} (drought, effect of climate change)

SMR ETE + Units 1 and 2 + New NPP ETE Profile: Orlík WR, Zvíkov Bridge Scenario: Maximum Discharge		Modeled concentration at discharge:		Legislative requirements:					
Parameter	**Unit**	**Q_a**	**Q_{355}**	AA	MAX	MIN	LIM-C	LIM-E	LIM-F
T	°C				29			28*	20
pH					9	5		6–9*	5–10
BOD_5	mg/l			3.8				3.2	
COD_{Cr}	mg/l			26					
TOC	mg/l	**12**	**12**	10					
P_{total}	mg/l	**0.08**	**0.08**	0.15			0.05		0.04
$P\text{-}PO_4^{3-}$	mg/l	**0.026**	**0.032**						
$N\text{-}NO_3^-$	mg/l	**1.1**	**1.6**	5.4					
$N\text{-}NH_4^+$	mg/l	**0.09**	**0.11**	0.23				0.16	
DS_{550}	mg/l			470					
SS_{105}	mg/l			20					
SO_4^{2-}	mg/l			200					
C_{10}-C_{40}	mg/l			0.1					

Notes on legislative requirements:
AA Permissible pollution, annual average/EQS-AA [14]
MAX Permissible pollution, maximum/EQS-MAC [14]
MIN Permissible pollution, minimum [14]
LIM-C Permissible pollution, annual average/EQS-AA (bathing waters) [14]
LIM-E Permissible pollution, annual average/EQS-AA (cyprinid waters) [14] (* permissible values from the Government Decree [12])
LIM-F Good ecological-potential requirement [23]

At the Solenice profile, surface-water quality is assessed in terms of use for public water-supply purposes because abstraction point 1 is located there. SčV Příbram Solenice Vltava. Concentrations of significant parameters modeled for the effect of the capacity alternative comprising SMR ETE and Units 1 and 2 on the watercourse are provided in Table 40. Concentrations of significant parameters modeled for the effect of the capacity alternative comprising SMR ETE, Units 1 and 2, and New NPP ETE on the watercourse are provided in Table 41. The modeled concentration values show that the values for public water-supply use are not met for TOC. Compliance with the limits cannot be assessed for the other parameters because data are unavailable.

Table 40 Modeled concentrations of significant parameters at the Solenice profile for the capacity alternative comprising SMR ETE and Units 1 and 2 at Q_a (normal flow) and Q_{355} (drought, effect of climate change)

SMR ETE + Units 1 and 2 Profile: Solenice		Discharge scenario:				Legislative requirements:
		Average		Maximum		
		Modeled concentration at discharge:				
Parameter	Unit	Q_a	Q_{355}	Q_a	Q_{355}	LIM-B
T	°C					
pH						
O_2	mg/l					
O_2 saturation	%					
BOD_5	mg/l					2.7
COD_{Cr}	mg/l					5.9
TOC	mg/l	8.7	8.2	8.7	8.2	4.5
P_{total}	mg/l	**0.07**	**0.06**	**0.07**	**0.07**	
$P\text{-}PO_4^{3-}$	mg/l	**0.04**	**0.04**	**0.04**	**0.05**	
$N\text{-}NO_3^-$	mg/l	**2.1**	**2.0**	**2.2**	**2.3**	
$N\text{-}NO_2^-$	mg/l	**0.015**	**0.016**	**0.015**	**0.016**	
$N\text{-}NH_4^+$	mg/l	**0.09**	**0.09**	**0.09**	**0.09**	
SO_4^{2-}	mg/l					180
Mg	mg/l	**5.5**	**5.2**	**5.5**	**5.2**	
Ca	mg/l	**19**	**18**	**19**	**18**	
Notes on legislative requirements: LIM-B Permissible pollution, annual average/EQS-AA (public water-supply use) [14]						

Table 41 Modeled concentrations of significant parameters at the Solenice profile for the capacity alternative comprising SMR ETE, Units 1 and 2, and New NPP ETE at Q_a (normal flow) and Q_{355} (drought, effect of climate change)

SMR ETE + Units 1 and 2 + New NPP ETE Profile: Solenice		Discharge scenario:				Legislative requirements:
		Average		Maximum		
		Modeled concentration at discharge:				
Parameter	Unit	Q_a	Q_{355}	Q_a	Q_{355}	LIM-B
T	°C					
pH						
O_2	mg/l					
O_2 saturation	%					
BOD_5	mg/l					2.7
COD_{Cr}	mg/l					5.9
TOC	mg/l	8.8	8.7	9.0	9.2	4.5
P_{total}	mg/l	**0.07**	**0.07**	**0.07**	**0.07**	
$P\text{-}PO_4^{3-}$	mg/l	**0.043**	**0.045**	**0.044**	**0.050**	
$N\text{-}NO_3^-$	mg/l	**2.2**	**2.3**	**2.3**	**2.8**	
$N\text{-}NO_2^-$	mg/l	**0.02**	**0.02**	**0.02**	**0.02**	
$N\text{-}NH_4^+$	mg/l	**0.09**	**0.09**	**0.09**	**0.10**	
SO_4^{2-}	mg/l					180
Mg	mg/l	**5.6**	**5.6**	**5.6**	**5.6**	
Ca	mg/l	**19**	**19**	**19**	**19**	
Notes on legislative requirements: LIM-B Permissible pollution, annual average/EQS-AA (public water-supply use) [14]						

The Kamýk nad Vltavou profile is the representative profile for water body DVL_0030, Vltava from the Orlík reservoir dam to the backwater of the Slapy reservoir. Concentrations of significant parameters modeled for the effect of the capacity alternative comprising SMR ETE

and Units 1 and 2 on the watercourse are provided in Table 42. Concentrations of significant parameters modeled for the effect of the capacity alternative comprising SMR ETE, Units 1 and 2, and New NPP ETE on the watercourse are provided in Table 43. Comparison of the modeled value with the ecological-potential values established by methodology [25] showed that the good ecological-potential requirements for water-body phosphorus concentrations, both total phosphorus and orthophosphate phosphorus, are not met.

Table 42 Modeled concentrations of significant parameters at the Kamýk nad Vltavou profile for the capacity alternative comprising SMR ETE and Units 1 and 2 at Q_a (normal flow) and Q_{355} (drought, effect of climate change)

SMR ETE + Units 1 and 2 Profile: Kamýk nad Vltavou		Discharge scenario:				Legislative requirements:
		Average		Maximum		
		Modeled concentration at discharge:				
Parameter	Unit	Q_a	Q_{355}	Q_a	Q_{355}	LIM-F
T	°C					14
pH						6–8.5
O_2	mg/l					
O_2 saturation	%					60–150
BOD_5	mg/l					2.2
P_{total}	mg/l	0.061	0.055	0.062	0.060	0.05
$P\text{-}PO_4^{3-}$	mg/l	0.037	0.036	0.038	0.040	0.035
$N\text{-}NO_3^-$	mg/l	**2.1**	**2.0**	**2.2**	**2.3**	3.2
$N\text{-}NH_4^+$	mg/l	**0.06**	**0.07**	**0.06**	**0.07**	0.1
Notes on legislative requirements: LIM-F Good ecological-potential requirement [25]						

Table 43 Modeled concentrations of significant parameters at the Kamýk nad Vltavou profile for the capacity alternative comprising SMR ETE, Units 1 and 2, and New NPP ETE at Q_a (normal flow) and Q_{355} (drought, effect of climate change)

SMR ETE + Units 1 and 2 + New NPP ETE Profile: Kamýk nad Vltavou		Discharge scenario:				Legislative requirements:
		Average		Maximum		
		Modeled concentration at discharge:				
Parameter	Unit	Q_a	Q_{355}	Q_a	Q_{355}	LIM-F
T	°C					14
pH						6–8.5
O_2	mg/l					
O_2 saturation	%					60–150
BOD_5	mg/l					2.2
P_{total}	mg/l	0.06	0.06	0.06	0.06	0.05
$P\text{-}PO_4^{3-}$	mg/l	0.038	0.040	0.039	0.044	0.035
$N\text{-}NO_3^-$	mg/l	**2.2**	**2.3**	**2.3**	**2.8**	3.2
$N\text{-}NH_4^+$	mg/l	**0.06**	**0.07**	**0.07**	**0.07**	0.1
Notes on legislative requirements: LIM-F Good ecological-potential requirement [25]						

The last profile assessed was Štěchovice, where salmonid waters occur. Concentrations of significant parameters modeled for the effect of the capacity alternative comprising SMR ETE and Units 1 and 2 on the watercourse are provided in Table 44. Concentrations of significant parameters modeled for the effect of the capacity alternative comprising SMR ETE, Units 1 and 2, and New NPP ETE on the watercourse are provided in Table 45. The modeled

concentrations at this profile exceed the salmonid-water requirements for $N\text{-}NH_4^+$. The concentration of $N\text{-}NO_2^-$ meets the requirements; data are unavailable for the other parameters.

Table 44 Modeled concentrations of significant parameters at the Štěchovice profile for the SMR ETE plus Units 1 and 2 plus at Q_a (normal flow) and Q_{355} (drought, effect of climate change)

SMR ETE + Units 1 and 2 Profile: Štěchovice		Discharge scenario:				Legislative requirements:
		Average		Maximum		
		Modeled concentration at discharge:				
Parameter	Unit	Q_a	Q_{355}	Q_a	Q_{355}	LIM-D
T	°C					21.5*
pH						6–9*
O_2	mg/l					≥9*
O_2 saturation	%					50*
BOD_5	mg/l					1.8
$N\text{-}NO_2^-$	mg/l	**0.011**	**0.012**	**0.011**	**0.012**	0.08
$N\text{-}NH_4^+$	mg/l	**0.035**	**0.037**	**0.035**	**0.037**	0.03
NH_3	mg/l					0.025*
Notes on legislative requirements: LIM-D Permissible pollution, annual average/EQS-AA (salmonid waters) [14] (* permissible values from the Government Decree [12])						

Table 45 Modeled concentrations of significant parameters at the Štěchovice profile for the capacity alternative comprising SMR ETE, Units 1 and 2, and New NPP ETE at Q_a (normal flow) and Q_{355} (drought, effect of climate change)

SMR ETE + Units 1 and 2 + New NPP ETE Profile: Štěchovice		Discharge scenario:				Legislative requirements:
		Average		Maximum		
		Modeled concentration at discharge:				
Parameter	Unit	Q_a	Q_{355}	Q_a	Q_{355}	LIM-D
T	°C					21.5*
pH						6–9*
O_2	mg/l					≥9*
O_2 percent saturation	%					50*
BOD_5	mg/l					1.8
$N\text{-}NO_2^-$	mg/l	**0.012**	**0.015**	**0.012**	**0.015**	0.08
$N\text{-}NH_4^+$	mg/l	**0.036**	**0.040**	**0.036**	**0.040**	0.03
NH_3	mg/l					0.025*
Notes on legislative requirements: LIM-D Permissible pollution, annual average/EQS-AA (salmonid waters) [14], (* permissible values from the Government Decree [12])						

Radioactivity parameters

At the profile downstream of the Kořensko water reservoir, the modeled concentrations were assessed in terms of permissible pollution under Government Decree No. 401/2015 Coll. [14]. Activity concentrations of significant radioactivity parameters modeled for the effect of the capacity alternative comprising SMR ETE and Units 1 and 2 on the watercourse under the "Average Discharge" scenario are provided in Table 46, and those under the "Maximum Discharge" scenario in Table 47. Activity concentrations of significant radioactivity parameters modeled for the effect of the capacity alternative comprising SMR ETE, Units 1 and 2, and

New NPP ETE on the watercourse under the "Average Discharge" scenario are provided in Table 48, and those under the "Maximum Discharge" scenario in Table 49. All modeled activity-concentration values for the radioactivity parameters meet the permissible-pollution annual average, maximum, and EQS-AA requirements.

Table 46 Modeled activity concentrations of significant parameters at the profile downstream of the Kořensko water reservoir for the capacity alternative comprising SMR ETE and Units 1 and 2 under the "Average Discharge" scenario for Q_a (normal flow), Q_{355} (drought, effect of climate change), and Q_{guar} (assessment of extremes and comparison with values specified as maxima).

SMR ETE + Units 1 and 2 Profile: Downstream of Kořensko water reservoir Scenario: Average Discharge		Modeled concentration at discharge:			Legislative requirements	
Parameter	**Unit**	**Q_a**	**Q_{355}**	**Q_{rel} (max)**	AA	MAX
cα	Bq/l	**0.02**	**0.03**	**0.06**	0.2	0.3
cβ	Bq/l	**0.14**	**0.12**	**0.25**	0.5	1
cβ-^{40}K	Bq/l	**0.05**	**0.04**	**0.08**	0.5	0.5
^{137}Cs	Bq/l	**0.001**	**0.001**	**0.001**	0.5	2
^{90}Sr	Bq/l	**0.003**	**0.003**	**0.006**	0.2	1
^{3}H	Bq/l	**31**	**115**	**158**	1000	3500
Notes on legislative requirements: AA Permissible pollution, annual average/EQS-AA [14] MAX Permissible pollution, maximum/EQS-MAC [14]						

Table 47 Modeled activity concentrations of significant parameters at the profile downstream of the Kořensko water reservoir for the capacity alternative comprising SMR ETE and Units 1 and 2 under the "Maximum Discharge" scenario for Q_a (normal flow), Q_{355} (drought, effect of climate change), and Q_{guar} (assessment of extremes and comparison with values specified as maxima).

SMR ETE + Units 1 and 2 Profile: Downstream of Kořensko water reservoir Scenario: Maximum Discharge		Modeled concentration at discharge:			Legislative requirements	
Parameter	**Unit**	**Q_a**	**Q_{355}**	**Q_{rel} (max)**	AA	MAX
cβ	Bq/l	**0.14**	**0.12**	**0.25**	0.5	1
^{3}H	Bq/l	**61**	**228**	**312**	1000	3500
Notes on legislative requirements: AA Permissible pollution, annual average/EQS-AA [14] MAX Permissible pollution, maximum/EQS-MAC [14]						

Table 48 Modeled activity concentrations of significant parameters at the profile downstream of the Kořensko water reservoir for the capacity alternative comprising SMR ETE, Units 1 and 2, and New NPP ETE under the "Average Discharge" scenario for Q_a (normal flow), Q_{355} (drought, effect of climate change), and Q_{guar} (assessment of extremes and comparison with values specified as maxima).

SMR ETE + Units 1 and 2 + New NPP ETE Profile: Downstream of Kořensko water reservoir Scenario: Average Discharge		Modeled concentration at discharge:			Legislative requirements	
Parameter	**Unit**	**Q_a**	**Q_{355}**	**Q_{rel} (max)**	AA	MAX

cα	Bq/l	**0.02**	**0.03**	**0.06**	0.2	0.3
cβ	Bq/l	**0.15**	**0.17**	**0.31**	0.5	1
cβ-^{40}K	Bq/l	**0.06**	**0.09**	**0.14**	0.5	0.5
^{137}Cs	Bq/l	**0.001**	**0.001**	**0.002**	0.5	2
^{90}Sr	Bq/l	**0.003**	**0.004**	**0.006**	0.2	1
^{3}H	Bq/l	**109**	**408**	**558**	1000	3500
Notes on legislative requirements: AA Permissible pollution, annual average/EQS-AA [14] MAX Permissible pollution, maximum/EQS-MAC [14]						

Table 49 Modeled activity concentrations of significant parameters at the profile downstream of the Kořensko water reservoir for the capacity alternative comprising SMR ETE, Units 1 and 2, and New NPP ETE under the "Maximum Discharge" scenario for Q_a (normal flow), Q_{355} (drought, effect of climate change), and Q_{guar} (assessment of extremes and comparison with values specified as maxima).

SMR ETE + Units 1 and 2 + New NPP ETE Profile: Downstream of Kořensko water reservoir Scenario: Maximum Discharge		**Modeled concentration at discharge:**			**Legislative requirements**	
Parameter	**Unit**	**Q_a**	**Q_{355}**	**Q_{rel} (max)**	AA	MAX
cβ	Bq/l	**0.15**	**0.17**	**0.32**	0.5	1
^{3}H	Bq/l	**139**	**520**	**712**	1000	3500
Notes on legislative requirements: AA Permissible pollution, annual average/EQS-AA [14] MAX Permissible pollution, maximum/EQS-MAC [14]						

Like the profile downstream of the Kořensko water reservoir, the Orlík water reservoir Zvíkov Bridge profile was assessed in terms of permissible pollution under Government Decree No. 401/2015 Coll. [14]. This profile is also the representative profile for water body HVL_1055_J, Orlík I Reservoir on the Vltava, so compliance with the water-body ecological-potential values established by methodology [23] was also assessed. Activity concentrations of significant radioactivity parameters modeled for the effect of the capacity alternative comprising SMR ETE and Units 1 and 2 on the watercourse are provided in Table 50; those for the capacity alternative comprising SMR ETE, Units 1 and 2, and New NPP ETE are provided in Table 51. As at the profile downstream of the Kořensko water reservoir, all modeled activity-concentration values for the radioactivity parameters meet these requirements.

Table 50 Modeled activity concentrations of significant parameters at the Orlík water reservoir Zvíkov Bridge profile for the capacity alternative comprising SMR ETE and Units 1 and 2 at Q_a (normal flow) and Q_{355} (drought, effect of climate change)

SMR ETE + Units 1 and 2 Profile: Orlík WR, Zvíkov Bridge		**Discharge scenario:**				**Legislative requirements:**		
		Average		**Maximum**				
		Modeled concentration at discharge:						
Parameter	**Unit**	**Q_a**	**Q_{355}**	**Q_a**	**Q_{355}**	AA	MAX	LIM-F
cα	Bq/l					0.2	0.3	
cβ	Bq/l					0.5	1	
cβ-^{40}K	Bq/l					0.5	0.5	
^{137}Cs	Bq/l					0.5	2	
^{90}Sr	Bq/l					0.2	1	

^{3}H	Bq/l	**31**	**115**	**61**	**228**	1000	3500	1000

Notes on legislative requirements:
AA Permissible pollution, annual average/EQS-AA [14]
MAX Permissible pollution, maximum/EQS-MAC [14]
LIM-F Good ecological-potential requirement [23]

Table 51 Modeled activity concentrations of significant parameters at the Orlík water reservoir Zvíkov Bridge profile for the capacity alternative comprising SMR ETE, Units 1 and 2, and New NPP ETE at Q_a (normal flow) and Q_{355} (drought, effect of climate change)

SMR ETE + Units 1 and 2 + New NPP ETE Profile: Orlík WR, Zvíkov Bridge		Discharge scenario:				Legislative requirements:		
		Average		Maximum				
		Modeled concentration at discharge:						
Parameter	Unit	Q_a	Q_{355}	Q_a	Q_{355}	AA	MAX	LIM-F
cα	Bq/l					0.2	0.3	
cβ	Bq/l					0.5	1	
cβ-^{40}K	Bq/l					0.5	0.5	
^{137}Cs	Bq/l					0.5	2	
^{90}Sr	Bq/l					0.2	1	
^{3}H	Bq/l	**109**	**409**	**139**	**520**	1000	3500	1000

Notes on legislative requirements:
AA Permissible pollution, annual average/EQS-AA [14]
MAX Permissible pollution, maximum/EQS-MAC [14]
LIM-F Good ecological-potential requirement [23]

At the Solenice profile, surface-water quality is assessed in terms of public water-supply use because abstraction point 1 is located there. SčV Příbram Solenice Vltava. Activity concentrations of significant radioactivity parameters modeled for the effect of the capacity alternative comprising SMR ETE and Units 1 and 2 on the watercourse are provided in Table 52; those for the capacity alternative comprising SMR ETE, Units 1 and 2, and New NPP ETE are provided in Table 53. The modeled concentration values show that the indicative tritium value for public water-supply use is exceeded under the unfavorable concurrence of maximum discharge and low flows for both capacity alternatives assessed. For the capacity alternative comprising SMR ETE, Units 1 and 2, and New NPP ETE, this situation also occurs at low flows under average discharge. The indicative value of 100 Bq/l for tritium in water used for drinking-water purposes is based on Czech and European legislation: Government Decree No. 401/2015 Coll. [14], Council Directive 2013/51/Euratom [71], and the amended atomic legislation [50]. This tritium activity concentration does not in itself represent a significant health risk, but may indicate the presence of other, more serious artificial radionuclides. If this value is exceeded, the source of the radioactive pollution should be identified [14] and, where applicable, the presence of other artificial radionuclides must be analyzed [71].

Table 52 Modeled activity concentrations of significant parameters at the Solenice profile for the capacity alternative comprising SMR ETE and Units 1 and 2 at Q_a (normal flow) and Q_{355} (drought, effect of climate change)

SMR ETE + Units 1 and 2 Profile: Solenice		Discharge scenario:				Legislative requirements:
		Average		Maximum		
		Modeled concentration at discharge:				
Parameter	Unit	Q_a	Q_{355}	Q_a	Q_{355}	LIM-B
cα	Bq/l					0.2
cβ-^{40}K	Bq/l	**0.04**	**0.04**	**0.04**	**0.04**	0.5
^{3}H	Bq/l	**21**	**75**	**40**	**148**	100

Notes on legislative requirements:
LIM-B Permissible pollution, annual average/EQS-AA (public water-supply use) [14]

Table 53 Modeled activity concentrations of significant parameters at the Solenice profile for the capacity alternative comprising SMR ETE, Units 1 and 2, and New NPP ETE at Q_a (normal flow) and Q_{355} (drought, effect of climate change)

SMR ETE + Units 1 and 2 + New NPP ETE Profile: Solenice		Discharge scenario:				Legislative requirements:
		Average		Maximum		
		Modeled concentration at discharge:				
Parameter	Unit	Q_a	Q_{355}	Q_a	Q_{355}	LIM-B
cα	Bq/l					0.2
cβ-^{40}K	Bq/l	**0.08**	**0.21**	**0.08**	**0.21**	0.5
^{3}H	Bq/l	**71**	**265**	**91**	**338**	100
Notes on legislative requirements: LIM-B Permissible pollution, annual average/EQS-AA (public water-supply use) [14]						

The effect of tritium on the watercourse farther downstream, at the Podolí and Hřensko profiles, was also estimated. The discharges published by the Czech Hydrometeorological Institute in the ISVS VODA information system [72] were used as Q_a and Q_{355} to estimate tritium activity concentrations at the Podolí and Hřensko profiles: Prague-Chuchle gauging station (200100) for the Podolí profile and Elbe-Hřensko gauging station (245000) for the Hřensko profile. In view of the activity concentration at Solenice, the tritium activity concentration in Vltava tributaries unaffected by discharges of tritiated water can be disregarded. According to this estimate (Table 54), the tritium activity-concentration values, for both capacity alternatives and both flow scenarios, are in the dozens of Bq/l. A value slightly exceeding 100 Bq/l was estimated at the Podolí profile for the capacity alternative comprising concurrent operation of the SMR ETE project, Units 1 and 2, and the New NPP ETE under the Maximum Discharge scenario during low flows due to climate-change drought. The permissible-pollution maximum for tritium in surface water is 3 500 Bq/l [14]; however, the tritium activity-concentration value must also be considered in view of the fact that a surface-water abstraction for public water-supply purposes is located at Prague-Podolí, for which an indicative value of 100 Bq/l is established [14].

Table 54 Estimated tritium activity concentrations at the Solenice, Podolí, and Hřensko profiles under normal-flow conditions (Q_a) and climate-change drought conditions (Q_{355}) for the SMR ETE plus Units 1 and 2 and the capacity alternative comprising SMR ETE, Units 1 and 2, and New NPP ETE.

Capacity alternative:		SMR ETE + Units 1 and 2		SMR ETE + Units 1 and 2 + New NPP ETE	
Discharge scenario:		Average	Maximum	Average	Maximum
Normal-flow conditions	Q_a [m^3/s]	c(^{3}H) [Bq/l]			
Solenice	76.5	21	40	71	91
Podolí	134	12	23	41	52
Hřensko	291	5	11	19	24
Climate-change drought conditions	Q_{355} [m^3/s]	c(^{3}H) [Bq/l]			
Solenice	21.1	75	148	265	338
Podolí	47.4	33	66	118	151
Hřensko	99.2	16	32	56	72

Modeling the effects of both project alternatives assessed, the SMR ETE plus Units 1 and 2 and the SMR ETE plus Units 1 and 2 plus the New NPP ETE, showed that under low-flow conditions, the indicative tritium value may be exceeded along the longitudinal profile of the Vltava affected by wastewater discharge at profiles subject to a stricter requirement because of abstractions for public water-supply purposes, namely Solenice and potentially Podolí.

In the future, discharges from the individual parts of the assessed project capacity alternatives, namely the SMR ETE project, Units 1 and 2, and the New NPP ETE, may need to be coordinated with one another and with the current flow in the receiving water so that legislative requirements, particularly for tritium, are not exceeded.

2.3 Affected Minor Watercourses

Chapter prepared by: RNDr. Diana Marešová, Ph.D. and Ing. Eva Juranová, Ph.D.
This chapter is based on background study [73].

In addition to the Vltava, which will receive wastewater from the SMR ETE project, the effects on several minor watercourses near the ETE site were also assessed in relation to the drainage of precipitation falling on the SMR ETE site and the pumping of groundwater to lower the groundwater level at the site.

The SMR ETE site and construction-facility Areas I and H are located in hydrological basin No. 1-08-03-0793 (Dvorčický Stream); construction-facility Area J lies partly in the Dvorčický Stream basin and partly in basin No. 1-08-03-0792 (Temelínecký Stream); Area G lies in basin No. 1-06-03-0730 (Strouha Stream); and Area C lies in basin No. 1-06-03-0770 (Palečkův Stream). [74]

After construction of the SMR ETE project is completed, the construction-facility sites (C, H, G, I, and J) are expected to be restored to their original condition. The original runoff conditions are expected to be restored at the construction-facility sites; the Temelínecký and Palečkův Streams are therefore not assessed further. In addition to the change in land use at the SMR ETE site, the hydrogeological conditions will be decisively affected by climate change during SMR ETE operation [74]. The project effects on the Strouha and Dvorčický Streams and Dvorčice Pond are assessed in detail [73].

2.3.1 Current state of the affected minor watercourses

Strouha Stream

On the basis of information from the Czech Hydrometeorological Institute, Valočík [75] summarizes the situation of minor watercourses near the ETE site. The Strouha is a third-order stream draining the southeastern slope below Units 1 and 2; it includes Karlovec Pond, with an

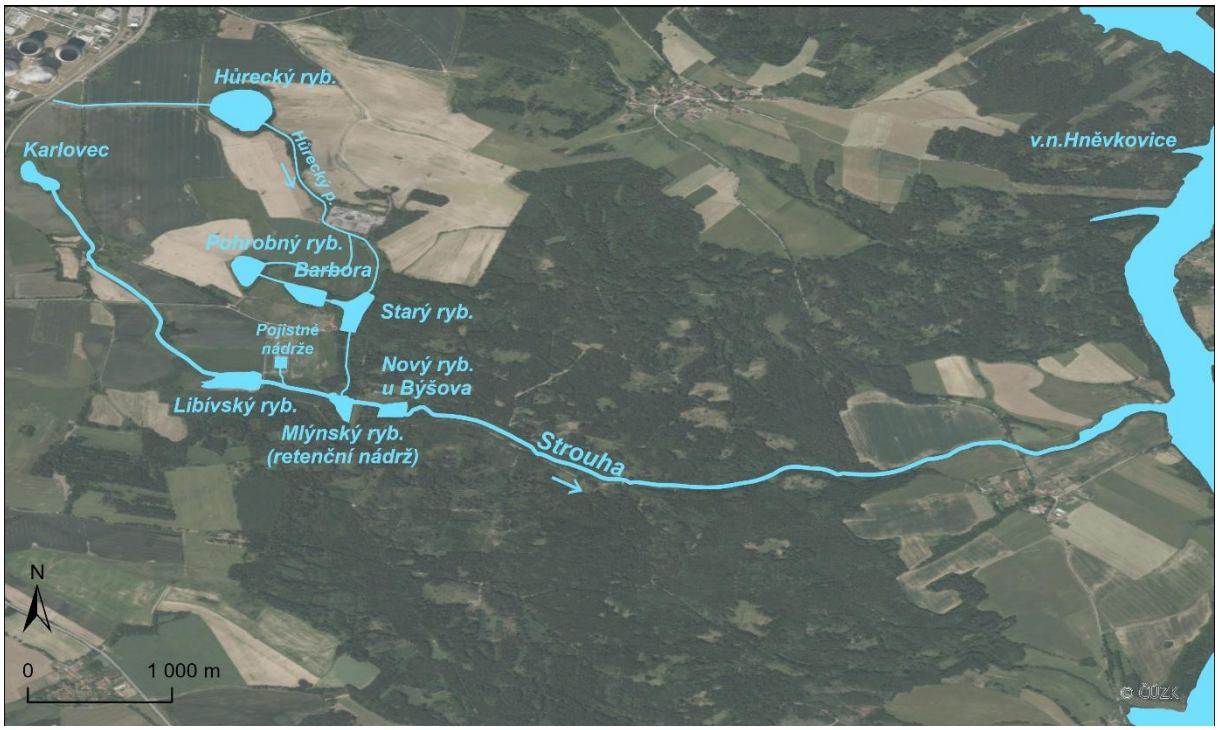
area of approximately 1.8 ha, at which the Strouha begins. Karlovec is located very close to Units 1 and 2. A cascade of three fishponds, with a total area of up to 2.25 ha, was constructed on the Strouha in the past at an elevation of approximately 450 m a.s.l. These are Libívský, Mlýnský, and Nový fishponds near Býšov.

The Strouha watercourse receives treated water discharged from the stormwater sewer system at Units 1 and 2, which enters the stream downstream of the safety basins between Libívský and Mlýnský fishponds. Mlýnský fishpond serves as a retention basin that attenuates the incoming water volume.

A system of fishponds has also been constructed on Hůrecký Stream, a left-bank tributary of the Strouha that rises below the village of Březí nad Vltavou; these fishponds are not affected by stormwater drainage from Units 1 and 2. The largest of these is Hůrecký fishpond, with an area of approximately 4.5 ha. The other three fishponds, Pohrobný, Barbora, and Starý, have a total area of up to 2.25 ha [75].

The Strouha is a left-bank tributary of the Vltava and enters the Hněvkovice waterworks at river kilometer 214.118 near Buzkov. Its catchment area is 13.19 km^2 [75]. Over its approximately 6.5 km course, it descends by approximately 114 m. The smaller settlements along it are Hůrka, Knín, Býšov, Strouha, Jeznice, and Buzkov.

The watercourses and fishponds listed are shown on the map in Fig. 17.



Pojistné nádrže	Safety basins
(retenční nádrž)	(retention basin)

Fig. 17 Overview of minor watercourses and fishponds in the Strouha catchment

The basic hydrological characteristics of the Strouha are provided in Table 55 to Table 57 [75].

Table 55 Characteristics of the Strouha watercourse profile (class IV) [75]

Watercourse:	**Strouha**	**A [km²]**	**P_a [mm]**	**Q_a* [m³/s]**
Hydrological basin number:	1-06-03-0730-0-00			
At profile:	1.4 km downstream of the Karlovec Pond dam	1.04	610	0.003

* Long-term mean (reference period 1991–2020)

Table 56 M-day discharges of the Strouha watercourse (class IV) [75]

M	30	60	90	120	150	180	210	240	270	300	330	355	364
Q_M [l/s]	6.4	4.2	3.2	2.4	1.8	1.3	0.9	0.6	0.3	0.2	0.1	0.0	0.0

Table 57 N-year discharges of the Strouha watercourse (class IV) [75]

N	1	2	5	10	20	50	100	1000
Q_N [m³/s]	0.30	0.60	1.20	1.80	2.60	3.85	5.00	9.30

Note: Q_{1000} was determined by extrapolation from the parameters of the theoretical probability distribution.

At this location, the ETE Laboratories take measurements twice monthly at the Býšov Retention Basin profile (0UL068). Regular monitoring data are also available on the Strouha from PVL at profiles 112243 Temelín NPP Strouha safety basins, at the outflow from the safety basins; 112243 Temelín NPP Strouha retention basins, at the outflow from the retention basin; and Strouha-Jeznice (2544), at frequencies of twice yearly and 12 times yearly, respectively.

The ETE Laboratories monitor pH, electrical conductivity, COD_{Cr}, non-polar extractable substances, C_{10}-C_{40} hydrocarbons, and tritium twice monthly. Of these parameters, the permissible-pollution value (annual mean 26 mg/l) under Government Decree No. 401/2015 Coll. [14] was attained or exceeded for COD_{Cr}. For C_{10}-C_{40} hydrocarbons, most values were below the limit of quantification, which is at the permissible-pollution value (annual mean 0.1 mg/l) under Government Decree No. 401/2015 Coll. [14]; an assessment therefore cannot be made. For the other parameters, the permissible-pollution values under Government Decree No. 401/2015 Coll. [14] were attained or exceeded for total organic carbon (annual mean 10 mg/l). As stated above, these results must be regarded as indicative only because of the very limited sampling frequency.

At the Strouha-Jeznice profile, where PVL conducts regular monitoring, the permissible-pollution annual-average values under Government Decree No. 401/2015 Coll. [14] were attained or exceeded for COD_{Cr}, suspended solids, and total organic carbon.

For the purposes of this study, the measurements were supplemented by VÚV TGM, v. v. i., monitoring conducted monthly from January through March 2026 at the Strouha upstream and downstream profiles. The results indicate that the quality of water in the Strouha is affected by water discharged from the safety basins, comprising a mixture of stormwater or runoff from the Units 1 and 2 site and pumped groundwater. The effect is particularly apparent for SS_{105}, for which there is a substantial improvement, although this may merely be a transient current situation. Conversely, increases were identified in pH and chloride concentrations, although all measured chloride values remained below the permissible-pollution annual-average value; the increase may also have been influenced by the monitoring period and winter treatment of the site surfaces. The situation was similar for the PAHs fluoranthene and benzo[a]pyrene, whose measured values exceeded the EQS-AA on average under Government Decree No. 401/2015 Coll. [14]. However, it must again be emphasized that the supplementary monitoring comprised only three campaigns, or sampling dates, during a limited part of the year, from January through March, which is generally a period of increased PAH occurrence in the environment. PAHs enter water primarily through atmospheric deposition from air polluted by fuel combustion during the heating season. For O_2, both concentration and saturation, the values at the Strouha upstream profile were probably reduced by the frozen water surface and were influenced by the monitoring period, so they cannot be considered representative. Measurements by the ETE Laboratories downstream of the retention basin show that electrical conductivity and pH improve in the retention basin, Mlýnský fishpond; an assessment of other parameters is not possible because of the range of parameters determined by the individual laboratories.

Dvorčický Stream and Dvorčice Pond

Dvorčický Stream (hydrological basin No. 1-08-03-0793-0-00-00), with Dvorčice Pond covering approximately 1.8 ha, drains the southern slope below Units 1 and 2, and the SMR ETE site extends into its catchment [75]. Water from Dvorčický Stream flows successively into Malešický Stream, Temelínecký Stream, and then Bílý Stream, whose name subsequently changes to Radomilický Stream, before flowing into the Blanice, Otava, and Vltava Rivers. Within the same basin, Dvorčický Stream is a left-bank tributary of Malešický Stream, a seventh-order watercourse, and descends by approximately 82 m over its 5 km course. A diversion channel at an elevation of approximately 457 m a.s.l. supplies a system of fishponds on Dříteňský Stream (hydrological basin No. 1-08-03-079/6) [75]. According to findings from November 2025 [74], this millrace was not functional. During the field survey conducted as part of the supplementary monitoring for this study, from January through March 2026, Dvorčický Stream was dammed and the water redirected into the diversion channel, although the sluice gate also allowed some water to continue into Dvorčický Stream.

Neither pumped groundwater nor stormwater from the Units 1 and 2 site is currently discharged to Dvorčický Stream.

The watercourses listed near the SMR ETE project are shown clearly on the map in Fig. 18.



náhon	Millrace

Fig. 18 Watercourses and fishponds near the SMR ETE project in the Dvorčický Stream area

The Czech Hydrometeorological Institute does not perform measurements on Dvorčický Stream, so discharge data determined according to its methodology are unavailable. Hydrological monitoring was conducted at this location in 2015–2017 [76] and used to calculate the discharge characteristics provided in Table 58. According to that study [76], Dvorčický Stream has the lowest total-runoff and baseflow values among the minor watercourses near the ETE site. The water regime is not optimal; during the summer, the stream dries up for an average of one to two months.

No existing water-quality data were identified for Dvorčický Stream, Dvorčice Pond, or the other associated minor watercourses, including the millrace serving as a water-diversion channel between the Dvorčický and Dříteňský Streams through the village of Kočín. Supplementary monitoring was therefore conducted as part of this study.

Table 58 Measured M-day discharges on Dvorčický Stream at profile P4 (Fig. 19) for 8/2015–7/2017

Catchment area [km^2]		1.536
Mean flow [l/s]		1.847
Mean specific discharge [l/s/km^2]		1.2
M-day discharges:	M	Q [l/s]
	30	4.578
	60	3.229
	90	2.569
	120	2.045
	150	1.599
	180	1.255
	210	1.039
	240	0.815
	270	0.605
	300	0.310
	330	0.007
	355	0
	364	0

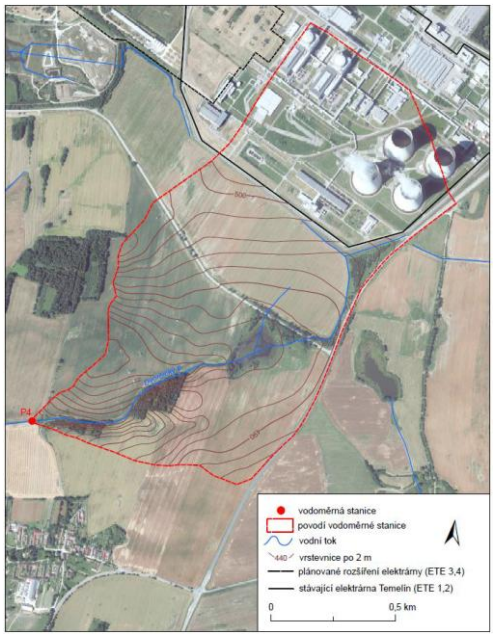


Fig. 19 Catchment of Dvorčický Stream profile P4, measured in 8/2015–7/2017 [76]

vodoměrná stanice	Gauging station
povodní vodoměrné stanice	Gauging-station catchment
vodní tok	Watercourse
vrstevnice po 2 m	Contours at 2 m intervals
plánované rozšíření elektrárny (ETE 3,4)	Planned power plant expansion (New NPP ETE)
stávající elektrárna Temelín (ETE 1,2)	Existing Temelín Nuclear Power Plant (Units 1 and 2)

For the purposes of this study, the measurements were supplemented by VÚV TGM, v. v. i., monitoring conducted monthly from January through March 2026 at the Dvorčický Stream and Municipality of Kočín profiles. The supplementary analyses covered the following parameters: water temperature (field); pH (field); electrical conductivity (field); dissolved-oxygen concentration (field); oxygen saturation (field); chlorides; suspended solids dried at 105 °C (SS_{105}); C_{10}-C_{40} hydrocarbons; and the polycyclic aromatic hydrocarbons (PAHs) benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[g,h,i]perylene, indeno[1,2,3-cd]pyrene, and fluoranthene. Most monitored parameters in the water did not exceed the values established by Government Decree No. 401/2015 Coll. [14]. The exceptions were the PAHs fluoranthene and, at the Municipality of Kočín sampling point, benzo[a]pyrene, whose measured values exceeded the EQS-AA on average. It must be emphasized, however,

that the supplementary analyses were conducted during a period limited to winter, when increased PAH occurrence in the environment is generally observed. PAHs enter water primarily through atmospheric deposition from air polluted by fuel combustion during the heating season. At the Municipality of Kočín profile, a noticeable deterioration in water quality was also present for several other parameters, such as SS_{105}; this may also be caused by the effects of the municipality's built-up area and by the season in which monitoring was conducted. It must again be noted that, because of the timeframe of the study, the scope of the supplementary monitoring was very limited and therefore not fully representative; comparison of the measured values with the values established by legislation is indicative.

Description of the site in terms of the territorial system of ecological stability (affected biocenters and biocorridors)

In the area of interest in the Dvorčický Stream catchment, the territorial system of ecological stability (TSES), designated under Act No. 114/1992 Coll., on Nature and Landscape Protection [77], and Decree No. 395/1992 Coll. implementing certain provisions of Czech National Council Act No. 114/1992 Coll., on Nature and Landscape Protection, as amended [78], comprises local biocenter LBC 1a Dvorčice, consisting of Dvorčice Pond and the surrounding riparian vegetation, and LBC 0205 Na Studánkách, located at the confluence of Dvorčický Stream and an unnamed right-bank tributary and also including parts of the surrounding agricultural land. The two biocenters are connected by local biocorridor LBK 2a, comprising the channel of Dvorčický Stream and its riparian vegetation. Local biocorridor LBK 0332 continues westward from biocenter LBC 0205 Na Studánkách along Dvorčický Stream toward the village of Malešice. This biocorridor comprises the channel of Dvorčický Stream and its immediate surroundings, which lack substantial riparian woody vegetation. The overall configuration of the territorial system of ecological stability in the Dvorčický Stream catchment is apparent from the figure (Fig. 20).

On the other affected minor watercourse, the Strouha, biocorridor LBK 3 Karlovec is designated in the upper part of the catchment, beginning at Karlovec Pond and continuing south as biocorridor LBK 4a Knín, followed by biocorridor LBK 7c Strouha II and LBK 8c Strouha III, which already lies downstream of the Units 1 and 2 safety-basin outfall [79, 80].

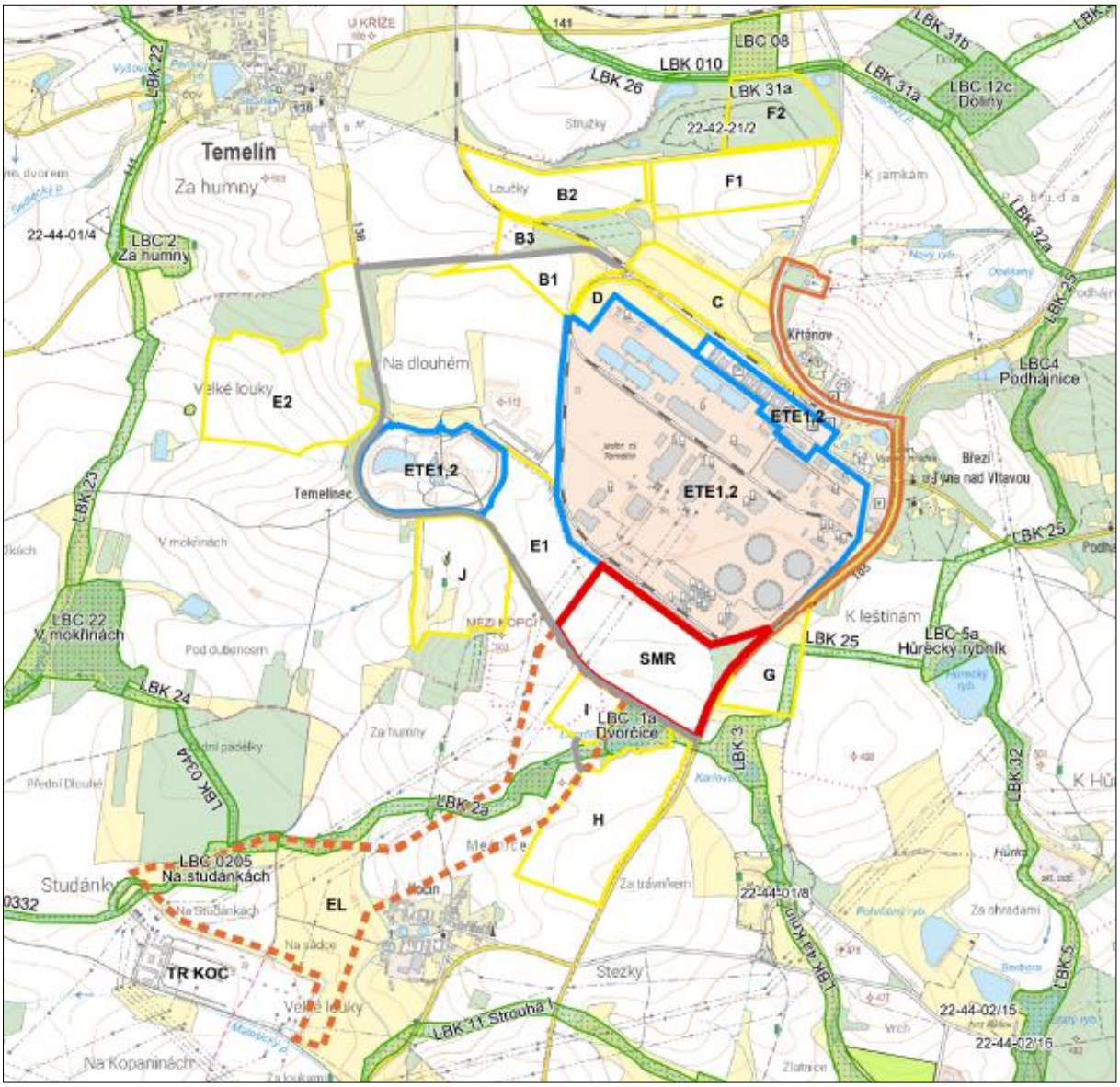


Fig. 20 Location map showing the local biocorridors and local biocenters in the area affected by the SMR ETE project (taken from study [81]).

2.3.2 Effect of the SMR ETE Project on the Affected Minor Watercourses

Effect of the SMR ETE project on the Strouha

The Strouha currently receives groundwater and stormwater discharged from the Units 1 and 2 site; pumped groundwater and stormwater from the SMR ETE site are expected to be discharged in the same manner. These discharged waters will enter between Libívský and Mlýnský fishponds.

The highest estimated total quantity of stormwater and pumped groundwater discharged from the SMR ETE site is up to 238 000 m^3/year, averaging 7.5 l/s [73]. The total for all three parts

of the project, namely the SMR ETE project, Units 1 and 2, and the New NPP ETE, may be up to 759,000 m^3/year, averaging 24 l/s [73].

According to information provided by the client [82, 83], stormwater from within the 18.3 ha inner fenced SMR ETE site will be discharged to the Strouha via a 3 200 m^3 retention basin at the northeastern tip of the site and the existing stormwater drains for Units 1 and 2. The 11.2 ha outer part of the site will be drained by a stormwater sewer to Dvorčice Pond, with an anticipated mean flow of 1.2 l/s, together with pumped groundwater at a mean flow of 1 l/s [83, 84]; however, most stormwater and pumped groundwater will be directed to the Strouha. This means a mean increase of approximately 5.3 l/s for the SMR ETE project alone and as much as 11.8 l/s for all three parts of the project, namely the SMR ETE project, Units 1 and 2, and the New NPP ETE, compared with the current operation of Units 1 and 2, averaging 13 l/s, comprising 10 l/s discharged from Units 1 and 2 plus 3 l/s, the Q_a of the Strouha downstream of Karlovec Pond.

The mixture of groundwater and stormwater, including surface runoff, may exhibit poorer quality for certain parameters, as indicated by the results of indicative PVL monitoring at the outflow from the existing safety basins. This applies primarily to P_{total}, SS_{105}, ammoniacal nitrogen, and TOC.

As indicated by the results of supplementary water-quality monitoring in the Strouha area, the discharge of stormwater, including surface runoff, and groundwater from the Units 1 and 2 site has a fundamental effect on water quality in the Strouha, which is also a result of the water availability in the stream upstream of the outfall and the quantity of water discharged. The fishponds on the Strouha downstream of the safety-basin outfall, namely Mlýnský fishpond/retention basin and Nový fishpond near Býšov, can then contribute to improved water quality by increasing retention time. This is also confirmed by measurements by the ETE Laboratories at the Býšov Retention Basin outflow profile, meaning the outflow from the retention basin at Mlýnský fishpond. Nevertheless, data measured by PVL at the Strouha-Jeznice profile show that slightly elevated values for some parameters, namely organic substances represented by TOC and COD_{Cr}, and SS_{105}, persist along the entire Strouha as far as its confluence with the Vltava in the Hněvkovice water reservoir. Because no significant change in the quality of discharged water is anticipated in connection with commissioning the SMR ETE project, with the main change consisting of an increase in the quantity of water discharged, no significant change in water quality in the Strouha is anticipated either. The shorter retention time in the fishponds along the watercourse due to the higher overall discharges may have a minor adverse effect.

In terms of the current quality parameters of these discharged waters, the waters meet the requirements of Government Decree No. 401/2015 Coll. [14] for most parameters. Certain parameters in Strouha Stream, particularly total phosphorus, SS_{105}, ammoniacal nitrogen, TOC, and PAHs, nevertheless show slightly impaired quality, as demonstrated by the available data supplemented by monitoring conducted as part of study [73]. Elevated concentrations of these substances may adversely affect eutrophication in the affected surface waters. Because no

significant change in the composition of the discharged waters is anticipated, only an increase in their quantity, no fundamental change in water quality in the Strouha is expected. However, an increase in the total substance load entering the receiving water may be expected in view of the increased discharge. Expansion of systematic monitoring of water quantity and quality in the affected watercourses should be recommended.

In addition to being affected as a recipient of discharged groundwater and stormwater, the upper part of the Strouha, including Karlovec Pond, may be affected by reduced groundwater drainage at the SMR ETE site; see Chapter 3.2.3 for further details. Karlovec Pond is significantly dependent on groundwater inflow. Although expert opinion [85] rules out a direct effect of groundwater-level lowering at the SMR ETE site on replenishment of Karlovec Pond, an indirect effect cannot be ruled out. This could reduce the fishpond's area and outflow to the upper part of the Strouha and potentially prolong periods during which the upper Strouha is completely dry. To eliminate these potential adverse effects, expert opinion [85] recommends supplementing Karlovec Pond with stormwater collected from part of the SMR site or using nature-based measures to provide for infiltration of part of the precipitation runoff into groundwater, which could then replenish Karlovec Pond.

Effect of the SMR ETE project on Dvorčický Stream, Dvorčice Pond, and the village of Kočín

Like Karlovec Pond, Dvorčice Pond is significantly dependent on groundwater inflow. Unlike Karlovec Pond, however, inflow to Dvorčice Pond will be directly affected by reduced drainage of stormwater in the area and by groundwater-level lowering at the SMR ETE site [74]; see Chapter 3.2.3 for further details.

According to study [74], construction and operation of the SMR ETE project will cause substantial reductions in surface and groundwater runoff and their redistribution over the course of the year, including seasonal changes in precipitation distribution and greater effects from individual extreme events. This will result in an overall reduction in precipitation infiltration into groundwater at and near the SMR site. As a result of reduced groundwater recharge, shallow groundwater levels are expected to fall by several meters below the ground surface on average compared with current levels in the monitoring wells. A fundamental effect on local minor watercourses will be that groundwater drains into them farther downstream rather than in the current headwater areas immediately at the foot of the ETE site elevation, meaning north of Dvorčice Pond in the case of the SMR ETE project. Overall, over a 30–50-year horizon, surface and groundwater runoff in the catchment terminating at the Dvorčice Pond dam can be expected to decrease from approximately 0.3 l/s to 0.1–0.2 l/s, while pumping from beneath the reactor building can be expected to decrease from 1.5 l/s to 0.7–1.0 l/s. The manner in which stormwater and pumped groundwater are routed will be decisive for the future of Dvorčice Pond and Dvorčický Stream.

If the discharge of stormwater and groundwater into Dvorčice Pond were not planned during operation, the residual natural inflow to the fishpond of 0.3–0.4 l/s would preserve less than

one-quarter of the water-surface area. The fishpond would instead become a marshy area that could dry out temporarily during summer, and Dvorčický Stream would become only an intermittent recipient of water from torrential rainfall [74].

Study [74] concludes that discharging pumped groundwater and, where applicable, part of the stormwater to Dvorčice Pond is essential to preserving the fishpond and Dvorčický Stream. If the controlled artificial inflow to Dvorčice Pond approaches 1.0 l/s, giving a total inflow to the fishpond of 1.3 l/s, which is the upper estimate, the fishpond is likely to be preserved in a condition generally only slightly poorer than at present. However, there will be longer periods of zero discharge from the fishpond into Dvorčický Stream, potentially several summer months each year. It is currently assumed that water from the SMR ETE site will be discharged into Dvorčice Pond and Dvorčický Stream, comprising 1 l/s of groundwater and potentially 1.2 l/s of stormwater [82–84]. Under these conditions, the anticipated total artificial replenishment will be 2.2 l/s, a quantity sufficient for optimal preservation of Dvorčice Pond and Dvorčický Stream [82].

A historic millrace connecting Dvorčický Stream with the Dříteňský Stream catchment passes through the village of Kočín. If Dvorčický Stream were to disappear, the millrace would also lose its function. However, if Dvorčice Pond and Dvorčický Stream were used to discharge part of the stormwater and groundwater from the SMR ETE site, the millrace could be used to supply the fishpond system near Dříteň, particularly when managing higher torrential-rainfall flows.

No data are available on the current water quality in Dvorčice Pond, Dvorčický Stream, or the millrace in the village of Kočín. Supplementary monitoring was therefore conducted at this location as part of the background study, although it was limited in terms of both the range of parameters and the period covered, so the results must be regarded as indicative. Nevertheless, the data obtained showed that water quality is currently good in terms of the parameters monitored, with the exception of several PAH and O_2 parameters, which is related to the season in which the monitoring was conducted.

Groundwater from the SMR ETE site is of suitable quality for replenishing Dvorčice Pond and Dvorčický Stream; however, a mixture with stormwater, including site runoff, may be of poorer quality in terms of phosphorus, ammoniacal nitrogen, and TOC, as indicated by the results of indicative PVL monitoring at the outflow from the existing safety basins. Input of these substances into Dvorčice Pond would introduce nutrients that could promote eutrophication, impair conditions for fish life, and have an overall adverse effect on the fishpond's aquatic ecosystem. Dvorčice Pond itself may then improve water quality for these parameters at the outflow into Dvorčický Stream as a result of retention time and biological degradation.

To prevent deterioration of water quality in Dvorčice Pond and the connected watercourses, meaning Dvorčický Stream and the millrace through the village of Kočín, as a result of the potential discharge of stormwater including surface runoff, measures are required to reduce the input of the pollutants listed above into surface waters. One example is an upstream retention basin in which aeration would oxidize ammoniacal nitrogen, followed by sedimentation of

suspended solids, reducing SS_{105} and P_{total} in particular, and flow attenuation. Measures to prevent petroleum pollution, represented by C_{10}-C_{40}, should also be implemented by installing oil-water separators before stormwater, including surface runoff, is discharged from the SMR ETE site. Systematic monitoring of water quantity and quality in the affected watercourses should also be recommended.

Effect on the local territorial system of ecological stability

Because the local biocorridors and biocenters in the Dvorčický Stream catchment as far as the village of Malešice consist largely of Dvorčice Pond, Dvorčický Stream, and its tributaries, their function is clearly closely related to the functioning of the watercourse and Dvorčice Pond situated on it.

Without controlled discharge of groundwater and stormwater into Dvorčický Stream, the anticipated effect of constructing and operating the SMR ETE project would be a substantial reduction in surface and groundwater runoff and their redistribution over the course of the year. This would result in a decrease in the water level of Dvorčice Pond and gradual conversion of the fishpond area into a wetland, with parts of the biocenter potentially drying out partially, accompanied by changes in vegetation and riparian stands. In the connected local biocorridor LBK 2a, flows would decrease overall throughout the year, and the risk of the watercourse drying out for longer periods during the warm part of the year would increase. This would affect the riparian stands along the watercourse, change the vegetation composition, and shift representation from wetland species toward species that tolerate the site drying out. Most likely, only fragments of the watercourse would remain as small pools in depressions in the original channel. This change would restrict the migration of aquatic animals and could lead to their longer-term disappearance as a result of prolonged drying. The biocenters and biocorridors would continue to function for possible migration of terrestrial animals, provided that the riparian vegetation along the original watercourse channel and in the biocenters did not undergo more substantial degradation.

In terms of preserving the hydrological regime, the anticipated effect of constructing and operating the SMR ETE project under the current option, with pumped groundwater and part of the stormwater discharged into Dvorčický Stream, would be more positive than under the option without discharge. Compared with the option without stormwater discharge, watercourse continuity for the migration of aquatic organisms in Dvorčický Stream could be preserved. One uncertainty is the possible contamination of stormwater in the Strouha identified by monitoring conducted by Povodí Vltavy, státní podnik, at the outflow from the safety basins. Elevated nutrient concentrations, particularly phosphorus and nitrogen, could adversely affect the trophic status of Dvorčice Pond and secondarily impair habitat quality in the connected local biocorridor LBK 2a along Dvorčický Stream. Despite some adverse effects under this option, the functions of the local TSES elements can be expected to remain preserved compared with the current situation.

With respect to the effect of the SMR ETE project on the biocorridors along the upper Strouha, expert opinion [85] indicates that groundwater-level lowering at the SMR ETE site may also have an indirect effect on Karlovec Pond and the connected upper reach of the Strouha. Groundwater replenishment of Karlovec Pond may decrease, reducing its area and its outflow to the Strouha. This could affect biocorridors LBK 3 Karlovec and LBK 4a Knín and part of LBK 7c Strouha II. For this reason, opinion [85] recommends measures to eliminate these adverse effects. After the inflow from the safety basins enters, the Strouha flow will increase again.

3 Groundwater in the Affected Area

Chapter prepared by: RNDr. Josef Vojtěch Datel, Ph.D., Ing. Anna Hrabánková
This chapter is based on background studies [74], [86] and [87]. Other reports listed in the references were also taken into account when preparing the text.

3.1 Current state of groundwater quantity and quality

For the assessment of the SMR ETE project, it is significant that the site lies immediately adjacent to the existing Temelín NPP Units 1 and 2 site and within a broader area previously assessed hydrogeologically in connection with the New NPP ETE project and long-term monitoring of the effects of Temelín Nuclear Power Plant operation. Relatively long time series of groundwater levels and quality are therefore available, generally covering 2009–2024 in the report cited above and supplemented in some places by shorter time series from newly constructed wells. Older data dating from 2001 are also available, as are, to a limited extent, data from the 1990s [88], when the groundwater monitoring network was being constructed. This scope of data makes it possible to assess both the current state of groundwater and longer-term trends in groundwater levels and quality.

The primary purpose of the report is to summarize the hydrogeological conditions in the area that may be significant to further preparation of the SMR ETE project. It also aims to define the area's principal hydrogeological characteristics, identify natural and anthropogenic factors affecting groundwater, and describe the importance of the monitoring network for future monitoring of potential project effects.

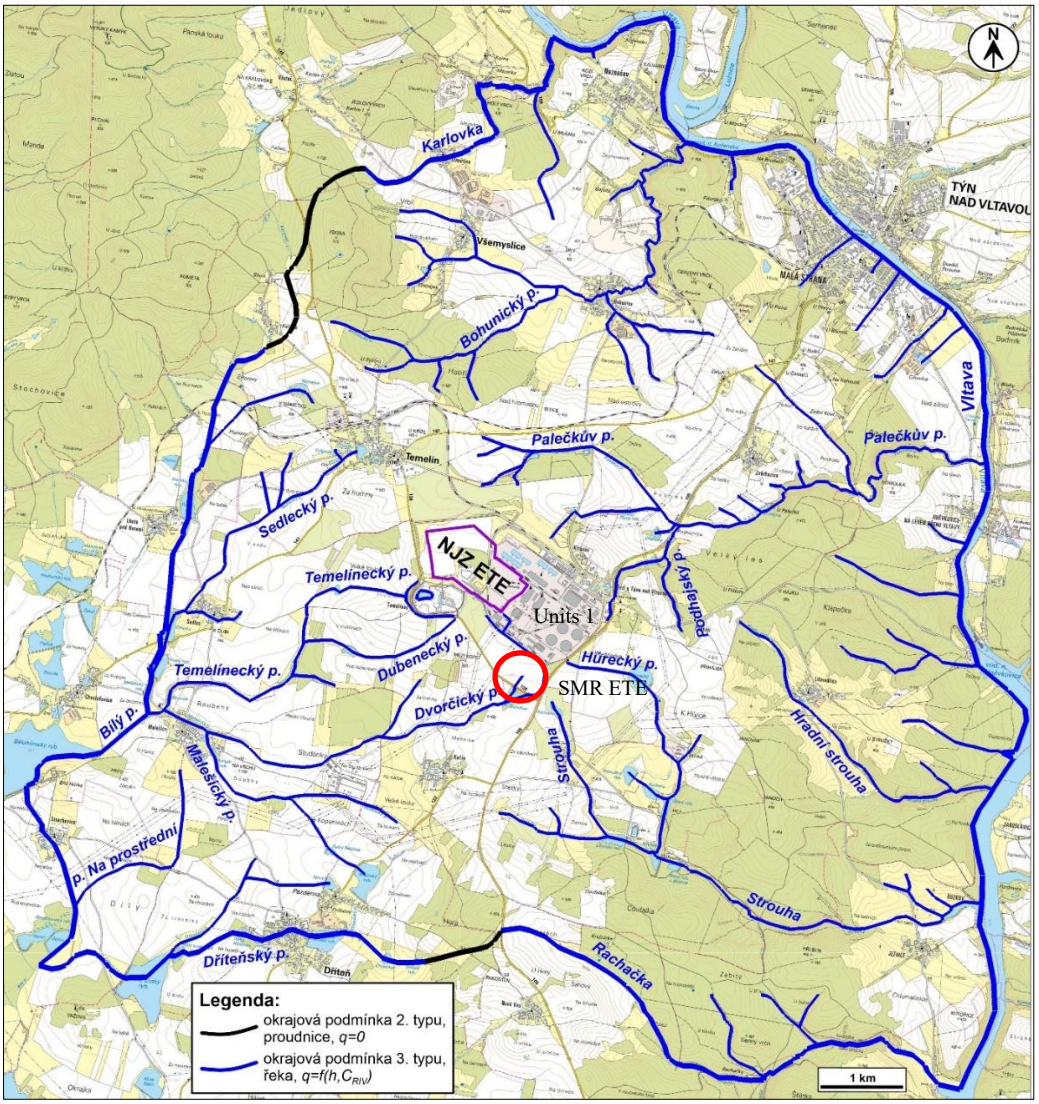
3.1.1 Definition of the groundwater area of interest

The area of interest for assessing groundwater in connection with the SMR ETE project is defined with regard to possible effects on groundwater flow and quality, including hypothetical transport of substances from the project site. Because the SMR ETE project is very close to the existing Units 1 and 2 site and the previously assessed New NPP ETE project, the previously established regional and detailed hydrogeological delineations of the area can be used. The regional framework is based on the conceptual groundwater-flow model prepared for the Temelín site and its surroundings [89]. The broader regional area of interest is elongated approximately north to south, with a length of approximately 30 km, and is up to approximately 14 km wide east to west. The area thus delineated includes the principal directions of shallow and deeper groundwater flow from the morphological elevation of the ETE site toward local and regional drainage bases. The Vltava is a significant regional drainage base to the east; the southern and southwestern parts of the area are associated with a system of streams, ditches, and fishponds. The northern and northwestern boundary is defined primarily by the watershed.

For a more detailed assessment, the narrower area of interest in the detailed mathematical model of groundwater flow and substance transport, defined in report [90] and confirmed as

appropriately delineated by report [91], is important; see Fig. 21. This area includes parts that could be affected by the transport of substances through groundwater flow from ETE, New NPP ETE, and now also SMR ETE sites.

In terms of hydrogeological regionalization, hydrogeological region HGR 6320, Crystalline Rocks in the Middle Vltava Basin, is fundamental to the area of interest. In a broader spatial context, the documentation also mentions the boundary with hydrogeological region HGR 2160, České Budějovice Basin. However, the SMR ETE project and the nearest monitoring wells are located primarily in a crystalline-rock environment, where groundwater flow is associated mainly with weathered and fractured zones in the rock mass. For the area of interest in the assessment of the SMR ETE project, the primary directions of significance are those of groundwater runoff from the SMR site toward local drainage bases, particularly the Dvorčický Stream valley. These directions are consistent with the results of earlier conceptual and mathematical groundwater-flow models.



Legenda:	**Key:**
okrajová podmínka 2. typu, proudnice, q=0	Type 2 boundary condition, flow line, q=0
okrajová podmínka 3. typu, řeka, $q=f(H_pC_{riv})$	Type 3 boundary condition, river, $q=f(H_pC_{riv})$

Fig. 21 Groundwater area of interest also applicable to the SMR ETE project [90] and [91]

3.1.2 Hydrogeological conditions in ETE area of interest

The hydrogeological conditions in the area of interest are determined primarily by the area's geological structure, which consists mainly of crystalline rocks. Gneissic rocks predominate in the rock environment, locally penetrated by irregular veins and bodies of granitoid rocks. In the near-surface zone, these rocks are weathered, locally decomposed to kaolinized, crushed, and overlain by weakly consolidated sandy-loamy soils. The weathered and fractured zones are

particularly important hydrogeologically, allowing shallow to moderately deep fracture flow to develop.

Shallow and intermediate groundwater flow in the area of interest is predominantly related to the relief. The ETE site lies on a morphological elevation from which groundwater flows toward the surrounding drainage bases. At the Units 1 and 2 site, groundwater levels are approximately 497–502 m a.s.l.; immediately around the site, including the SMR ETE site, they decrease to approximately 485–496 m a.s.l.; and toward the southwest they may fall to approximately 463–480 m a.s.l. In the broader surroundings, the groundwater level decreases further in association with the falling terrain and the drainage effect of watercourses.

It is hydrogeologically significant that monitoring confirms the existence of shallow, intermediate, and partly deeper groundwater flow systems. In several deeper wells, typically approximately 100 m deep or more, the groundwater level is recorded near ground level or above ground level within the well casing. This indicates confined conditions in the deeper fractured aquifer. In some pairs of wells of different depths, the similar temporal course of the groundwater levels indicates connectivity between shallow and intermediate flow down to depths of approximately 60–70 m. The deeper flow system cannot be regarded as completely isolated; its hydraulic communication with the shallow and intermediate systems may differ locally depending on fracturing of the rock mass.

The area is also characterized by a combination of natural and anthropogenic effects. The natural groundwater-level regime is affected primarily by precipitation, seasonal infiltration, and the drainage effect of terrain depressions and watercourses. Anthropogenic effects may occur locally, for example as a result of withdrawals, sampling-related pumping, technical interventions in wells, operation of drainage systems, or legacy contamination around landfills. Nevertheless, the overall assessment shows that the groundwater-level conditions are stable over the long term and exhibit no changes indicative of significant disruption of the hydrogeological regime.

3.1.3 Groundwater monitoring network

The groundwater monitoring network at the Temelín site is long-term and has been operated since the 1990s in connection with monitoring the effects of Units 1 and 2 and preparing other projects at the site. Groundwater quantity and quality are monitored in a network of monitoring wells distributed throughout and around the power plant site; see Fig. 22. The monitoring results are assessed over the long term in regular annual reports.

The original monitoring network comprised 22 wells with long time series, some of which also extend to periods before 2009 [88]. Since 2020, the network has been supplemented by four B-series wells, designated B1a, B1b, B2a, and B2b [92], situated in the northern forefield of ETE. Since 2023, a further four wells, HG1, HG2, HG3, and HG4 [93], located directly on the site considered for the SMR ETE project, have been included in the monitoring. These wells are

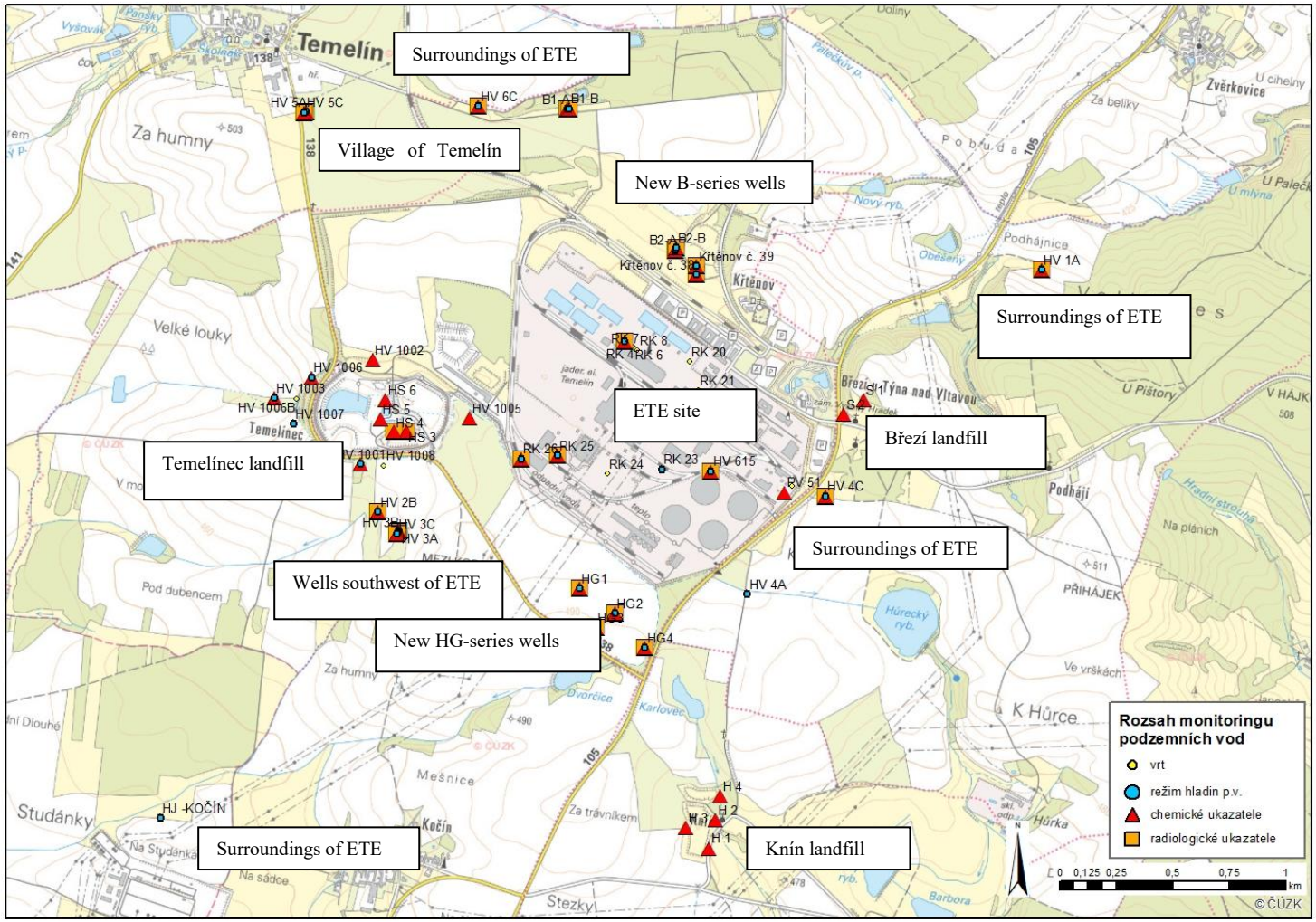
particularly important to the future project because they provide information on local conditions at the planned construction site.

Groundwater levels are currently monitored using automatic level gauges in 30 wells. For interpretation purposes, the wells are divided into subareas comprising the Units 1 and 2 site, the surroundings of Units 1 and 2, the Temelínec landfill, wells southwest of Units 1 and 2, and the new B- and HG-series wells. For assessing groundwater quality, the area is divided in greater detail because not all wells are used for the same scope of monitoring and the individual well groups represent different hydrochemical situations and potentially different anthropogenic effects. For the quality assessment, separate distinctions are therefore made among, for example, the Březí, Knín, and Temelínec landfills; the village of Temelín area; wells southwest of Units 1 and 2; and the new B- and HG-series wells.

Non-radiological groundwater-quality parameters are monitored at a total of 34 wells. All principal monitoring components, meaning water levels, non-radiological quality, and radiological quality, are monitored concurrently at 19 wells. Only some parts of the monitoring are performed at the other wells. The different ranges of parameters monitored reflect the historical development of the monitoring network, in which the individual well groups were created for different purposes. For future monitoring of the SMR ETE project, the scope of monitoring should be further harmonized and optimized so that the network reflects its main current purpose: monitoring the quantitative and qualitative state of groundwater and promptly identifying any groundwater effects originating at the Units 1 and 2, New NPP ETE, or SMR ETE sites.

The current monitoring network provides an adequate basis for assessing the current state of groundwater in the area of interest. However, the current network alone will not be fully adequate for specific monitoring of the SMR ETE area after the project is commissioned. It should therefore be supplemented and modified to provide better coverage of the anticipated flow directions from the SMR ETE site, local drainage bases, and potential sensitive receptors in the surrounding area.

3 Groundwater in the Affected Area



3 Groundwater in the Affected Area

Okolí ETE	Surroundings of ETE
Oblast obce Temelín	Village of Temelín area
Nové vrty řady B	New B-series wells
Okolí ETE	Surroundings of ETE
Skládka Temelínec	Temelínec landfill
Areál ETE	ETE site
Skládka Březí	Březí landfill
Vrty jz. od ETE	Wells southwest of ETE
Okolí ETE	Surroundings of ETE
Nové vrty řady HG	New HG-series wells
Skládka Knín	Knín landfill
Rozsah monitoringu podzemních vod	Scope of groundwater monitoring
vrt	Well
režim hladin p.v.	Groundwater-level regime
chemické ukazatele	Chemical parameters
radiologické ukazatele	Radiological parameters

Fig. 22 Location of monitoring wells around ETE

3.1.4 Legislative requirements for groundwater

The groundwater assessment in connection with the SMR ETE project must be related to the legal framework currently in force. The regulations governing the quality of raw water for drinking-water treatment, drinking-water requirements, and radioactivity parameters in water are particularly relevant to assessing groundwater quality.

Decree No. 428/2001 Coll., as amended [15], particularly in relation to Decree No. 448/2017 Coll. [94], is significant to assessing groundwater as a potential source of raw water for drinking-water production. This legislation distinguishes raw-water treatability categories A1, A2, and A3 according to the level of treatment required to produce drinking water.

Decree No. 252/2004 Coll. [95], establishing public-health requirements for drinking water and hot water and the scope of drinking-water monitoring, applies to a comprehensive assessment of water quality. Although this regulation is intended for drinking water, its limit values are also commonly used in Czechia as a reference framework for assessing groundwater where its potential usability or degree of impact needs to be evaluated.

Radioactivity parameters are governed by Act No. 263/2016 Coll. [50] and Decree No. 422/2016 Coll. [51]. Radon activity concentration, gross alpha activity concentration, and gross beta activity concentration are of particular significance to drinking water. For radon, levels of 100 Bq/l, the reference level, and 300 Bq/l, the maximum permissible value, are distinguished; the higher value means that the parameters for supplying water for public use are not met. The investigation level is 0.2 Bq/l for gross alpha activity and 0.5 Bq/l for gross beta activity. If these values are exceeded, the specific radionuclides must be identified.

The range of parameters monitored under the current groundwater monitoring program at the Temelín site is generally adequate. One disadvantage is the different range of parameters used for individual well groups, which arose historically in connection with their different purposes. Some parameters, such as PAHs, pesticides, and other specific organic substances, are monitored only at selected wells and do not have time series long enough for a full statistical assessment. For long-term monitoring of the SMR ETE project, consideration should therefore be given to harmonizing or at least systematizing the monitoring program.

3.1.5 Current precipitation conditions

Precipitation conditions are one of the principal factors affecting the groundwater-level regime in the area of interest. The most recent assessment is based on monthly precipitation totals at the Temelín station of the Czech Hydrometeorological Institute for 2009–2024. Monthly, annual, and growing-season precipitation totals are available, making it possible to assess both the longer-term trend and the effects of dry and wetter periods on groundwater recharge.

Annual precipitation totals in 2009–2024 ranged widely from 480 to 724 mm. The mean annual total for the assessed period was 619.5 mm. Compared with Czechia's long-term annual normal of 684 mm for 1991–2020, the total at Temelín is approximately 91% of the normal. In terms of precipitation, the site can therefore be assessed as slightly drier than the Czech average.

The driest year in the assessed period was 2015, when the annual total was only 480.2 mm. Conversely, the highest annual totals were recorded in 2009 and 2010, when annual precipitation exceeded 724 mm, and in 2024, when the total reached almost 710 mm. A slightly decreasing precipitation trend is apparent over the assessed period, influenced primarily by the drier period of 2015–2019. However, the higher totals in 2020 and 2024 partly mitigate this trend. The available data therefore do not support inferring a stable long-term decrease in precipitation, but rather fluctuation with a pronounced dry period in the second half of the monitored series.

During the growing season, meaning April through September, the mean precipitation total was 434.3 mm. The highest growing-season total, 566.2 mm, was identified in 2010, while the lowest, only 256.3 mm, was recorded in 2015. The growing season is less effective for groundwater recharge than the cold part of the year because a significant proportion of precipitation is consumed by evapotranspiration. Nevertheless, a substantially dry growing season may subsequently affect both soil-moisture conditions and the shallow groundwater level.

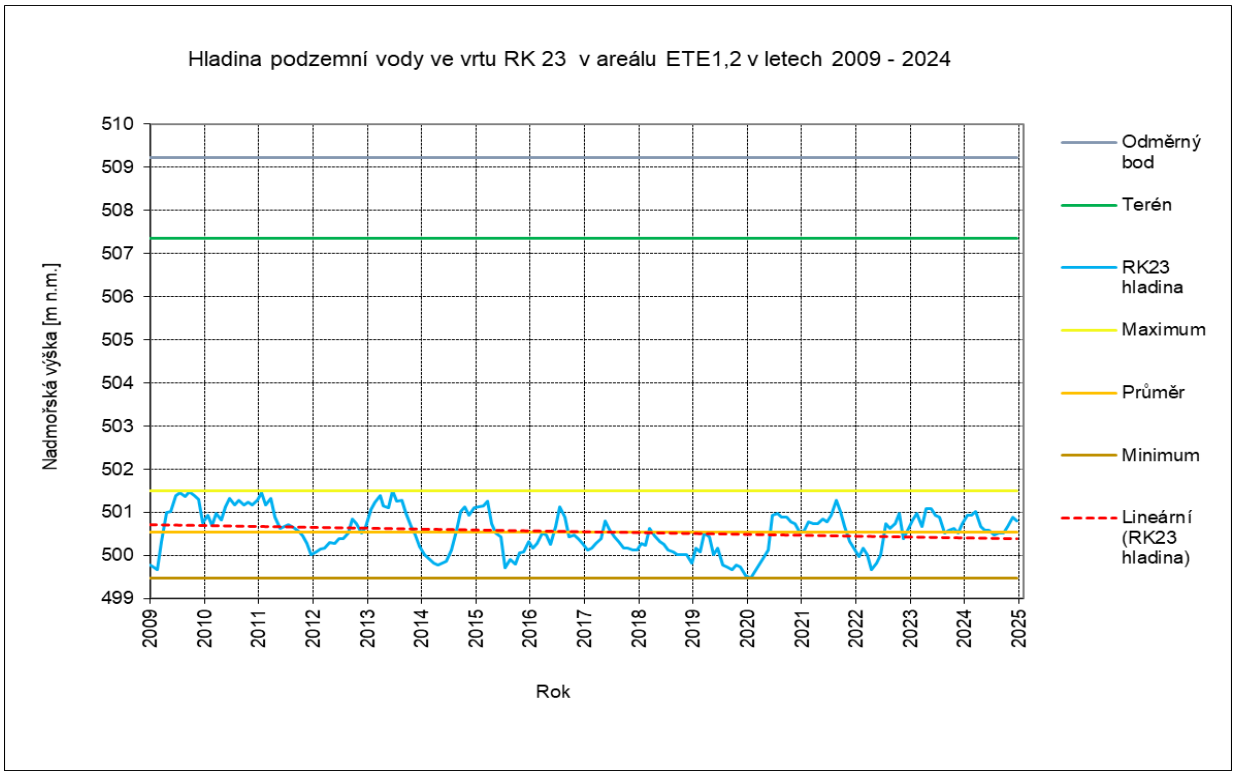
Mean monthly precipitation totals range from approximately 22.8 to 94.7 mm. The highest precipitation generally occurs in June, followed by July, August, and May. The lowest precipitation generally occurs in February, December, March, and January. This seasonality is important to interpreting groundwater-level conditions because groundwater levels respond not only to the annual precipitation balance, but also to the distribution of precipitation over the year, temperature conditions, evapotranspiration, and saturation of the rock environment.

3.1.6 Groundwater-level regime

The groundwater-level regime at and around the ETE site was assessed using time series from 30 monitoring wells for 2009–2024, or shorter periods for newly constructed wells. The fundamental conclusion is that groundwater-level conditions have been stable over the long term throughout the assessed area. Water-level fluctuation during the monitored period is within several meters and is consistent with expectations based on the natural behavior of groundwater levels in the area. This fluctuation is explained primarily by the seasonal course of precipitation, dry and wetter periods, and, locally, artificial interventions, particularly drainage.

Time series covering the entire period 2009–2024 are available for the original 22 wells. The four B-series wells have provided data since 2020, while the four HG-series wells situated on the SMR ETE site have been monitored since 2023. Although the time series for the new wells are shorter, they confirm the basic character of the area's hydraulic regime, and the HG-series wells provide important information on hydrogeological conditions at the SMR ETE site.

At the Units 1 and 2 site, the groundwater level in the monitoring wells is generally several meters below ground level. Some wells representing shallow to intermediate flow exhibit a regular seasonal course and, in some cases, slight long-term fluctuation depending on precipitation conditions. Well RK 2 represents shallow near-surface flow in loosened crystalline bedrock and exhibits a stable long-term groundwater level with a seasonal course. Well HV 615 represents intermediate flow in fracture-permeable crystalline rock and also exhibits a stable regime, locally affected by sampling-related pumping. In addition to seasonality, wells RK 23, RK 25, and RK 26 exhibit certain irregularities that may be related to technical or operating effects. The graph from well RK 23 is provided in Fig. 23 as an example of groundwater-level assessment.



Hladina podzemní vody ve vrtu RK 23 v areálu ETE 1,2 v letech 2009 - 2024	Groundwater level in well RK 23 at the Units 1 and 2 site in 2009–2024
Nadmořská výška [m n.m.]	Elevation [m a.s.l.]
Odměrný bod	Reference point
Terén	Ground level
RK23 hladina	RK23 water level
Maximum	Maximum
Průměr	Mean
Minimum	Minimum
Lineární (RK23 hladina)	Linear (RK23 water level)

Fig. 23 Hydrograph of the water level in well RK 23 in 2009–2024

Around the Temelínec landfill and southwest of Units 1 and 2, the groundwater levels are at lower elevations, corresponding to runoff from the morphological elevation of the ETE site

toward local drainage bases. Some wells have water levels near ground level or even exhibit a confined water level. These phenomena correspond to fracture flow in crystalline rocks and local interconnection of flow paths at different depths.

The overall groundwater-level trend for 2009–2024 is slightly decreasing, primarily as a result of the dry period of 2014–2019. The total decreases in groundwater level in the individual wells range from approximately 0.2 to 2.0 m over 16 years. Minimum groundwater levels were generally recorded around 2020. In recent years, particularly since 2020, levels have stabilized and increased slightly in some places, corresponding to the occurrence of years with higher precipitation at the end of the assessed period.

For the future assessment of the SMR ETE project, it is important that groundwater levels at and around the site confirm the groundwater runoff directions consistent with earlier conceptual and model assumptions. At the SMR ETE project site, the Dvorčický Stream valley is the principal local drainage base. The existing groundwater-level regime exhibits no signs of anthropogenic effects.

For some of the deeper wells, the design and technical condition should be verified, for example by borehole geophysical logging and camera inspection, to establish which deep flow system they actually represent. This applies particularly to wells whose depth indicates monitoring of intermediate flow but whose water levels respond very sensitively to precipitation events. Such verification is important for correctly interpreting the monitored data and for future optimization of the monitoring network throughout the area of interest.

3.1.7 Groundwater quality: non-radiological parameters

Groundwater quality in terms of non-radiological parameters was assessed with respect to natural groundwater chemistry, existing anthropogenic effects, and the usability of the monitoring wells for monitoring potential effects of the SMR ETE project. The assessment is based on data for 2009–2024, with shorter time series available for the newer wells. Sampling is generally conducted two or three times per year, so the interpretation is based primarily on the mean, minimum, and maximum values for the assessed period.

The chemical composition of groundwater in the area of interest is determined primarily by the crystalline-rock geological environment, the intensity of weathering, flow velocity, water residence time in the rock environment, and the degree of local anthropogenic impact. The water is typically soft to very soft, with low mineralization, often with higher iron and manganese concentrations, locally with elevated conductivity and low hardness. The lower nitrate concentrations compared with those commonly found in many areas of Czech agricultural landscapes probably result from restrictions on settlement and agricultural activities around ETE since the power plant was constructed.

At the Units 1 and 2 site, most parameters have values typical of groundwater in an anthropogenically affected industrial area. Elevated values for suspended solids and

conductivity, and also for chlorides in maximum values, warrant attention. The C_{10}–C_{40} parameter, indicating the presence of organic substances, particularly petroleum hydrocarbons, is borderline, although at a level typical of an industrially used area. Higher iron concentrations and lower hardness are interpreted primarily as manifestations of natural conditions. No significant changes in chemical composition or adverse effects of operating Units 1 and 2 were identified during the assessed period. Wells HV 615, RK 25, and RK 26 are particularly significant in this area for monitoring the SMR ETE site because they provide groundwater-quality data from the upgradient direction.

A minor anthropogenic effect is apparent in the Březí landfill area, particularly elevated conductivity and chemical oxygen demand, indicating the presence of degradable organic substances. This is an expected level in the context of a waste-landfill area. No adverse effect of operating Units 1 and 2 on groundwater quality was identified here either. The wells around the Březí landfill cannot be assumed to be usable for monitoring the SMR ETE site.

Minor organic contamination has occurred over the long term in the Knín landfill area, as demonstrated by elevated chemical oxygen demand. In the maximum values, some metals and metalloids, particularly chromium, nickel, lead, and arsenic, are near the limits. These values correspond to the character of a waste-landfill site and are not assessed as a change from the previous condition. If some wells are to be used for SMR ETE monitoring, their structural and technical condition should be assessed.

Water in the Temelínec landfill area also exhibits minor organic contamination, particularly in relation to chemical oxygen demand. In maximum values, fluoride, nickel, lead, and arsenic exceed the limits; however, these values are expected and acceptable in the context of the site. No significant changes in chemical composition or effects of Units 1 and 2 were demonstrated. In view of the location of this group of wells, they cannot be assumed to be usable for direct monitoring of the SMR ETE site.

The wells southwest of Units 1 and 2 characterize groundwater in shallow and deeper flow systems in that runoff direction. Most parameters correspond to values typical of a crystalline-rock environment. Low hardness, low calcium concentrations, and elevated iron, suspended-solids, and conductivity values are typical. The values are assessed as acceptable and predominantly governed by natural conditions. These wells are partly usable for monitoring the western surroundings of the SMR ETE site.

In the village of Temelín area, values failing to meet some of the limits used occur more frequently, both for parameters naturally affected by the rock environment and for parameters of anthropogenic origin. Elevated chemical oxygen demand and ammonium-ion values indicate possible effects from agriculture or sewage. However, because of their distance and upgradient position relative to the SMR ETE site, these wells are not considered usable for monitoring SMR ETE effects.

The new B-series wells contain soft water with a slightly acidic to neutral pH and low mineralization of approximately 200–300 mg/l dissolved solids. The chemical type can be

characterized as Ca-Mg-(Na)-HCO_3-SO_4-(Cl). Mineralization in the deeper B-series wells is slightly lower than in the shallower wells. Traces of pesticides and polyaromatic substances are near the detection limits and do not represent a measurable risk. Elevated iron, manganese, and, in some cases, arsenic and TOC values are explained by conditions in the wells and redox processes rather than anthropogenic contamination. The wells are not usable for SMR ETE monitoring.

The new HG-series wells at the SMR ETE site contain slightly acidic, very soft groundwater with low mineralization of approximately 130–170 mg/l dissolved solids. The chemical type is Ca-Na-(Mg)-HCO_3-SO_4-(Cl). The water probably contains a component from the deeper flow system that may drain in the SMR ETE site area. In terms of quality, the water is typical of the crystalline-rock environment in the area of interest. Elevated iron and manganese values are interpreted as natural or as a result of redox and biochemical processes in the wells. From a structural and engineering perspective, attention should be drawn to the low hardness, low pH, and slight to moderate aggressiveness associated with the occurrence of aggressive CO_2. Because the wells will be removed in connection with construction of the SMR ETE project, they can be used only during the preconstruction stage.

Overall, groundwater quality in terms of non-radiological parameters can be assessed as stable over the long term, with no significant adverse changes identified. Local exceedances or elevations of selected parameters occur, but they are generally occasional exceedances in maximum values resulting from legacy contamination at landfills or the natural chemistry of crystalline rocks. No adverse effect of operating Units 1 and 2 on the chemical composition of groundwater was demonstrated.

3.1.8 Groundwater quality: radioactivity parameters

Groundwater quality in terms of radioactivity parameters is assessed primarily using tritium and cesium-137. These parameters have been monitored over the long term in 15 wells; data for 2020–2024 are available for the new B-series wells, and 2024 data are available for the HG-series wells. In the past, the aggregate parameters gross alpha and beta activity concentration and potassium-40 (^{40}K) were also monitored; however, regular monitoring was discontinued in 2006 because they characterize the natural rock environment rather than effects of the nuclear power plant.

In most cases, the measured values of radioactivity parameters are below or near the detection limit. No values, changes, or trends indicating an effect of the power plant on the monitored radioactivity parameters were identified in the monitored wells during the assessed period. Tritium and cesium-137 activity concentrations remained very low throughout the assessed period of 2009–2024. Measurable tritium values in some samples reflect the existence of a nearby tritium source but are far below the values used as references for water intended for human consumption.

Czech legislation does not establish separate limit values for tritium in groundwater as such. For indicative comparison, the value of 100 Bq/l used for water intended for human consumption may be applied. The values identified by monitoring are far below this level, in the single-digit Bq/l range. Cesium-137 was also predominantly below the detection limit in the monitored samples.

Groundwater quality in terms of radioactivity parameters can therefore be assessed as stable, with no significant effect of operating Units 1 and 2 identified. For future monitoring of the SMR ETE project, tritium and cesium-137 monitoring should continue in wells situated in the downgradient directions from the SMR ETE site.

3.1.9 Water withdrawals and water-source protection zones

Recorded groundwater withdrawals in the area of interest are assessed using data reported by the river-basin authorities under the legislation applicable to the water balance. These records include withdrawals exceeding 6 000 m^3 per year or 500 m^3 per month. Smaller individual withdrawals, below approximately 0.19 l/s, are not recorded centrally and must be understood as minor local groundwater uses, for example through domestic wells.

The recorded groundwater withdrawals in the area of interest are not significant and are associated with hydrogeological region 6320, Crystalline Rocks in the Middle Vltava Basin, primarily involving shallow groundwater flow. The recorded withdrawals include ČEZ Temelín NPP Březí, close to the SMR ETE site, with a mean withdrawal of approximately 1.69 l/s in 2009–2024. The WIENERBERGER Týn nad Vltavou brickworks withdrawal, with a mean of approximately 0.23 l/s, is also recorded, although it was not reported in 2024 because production had ended. The overview also includes the Slavětice Quarry mine-water withdrawal, with a mean of approximately 1.34 l/s; this is formally classified as a surface-water withdrawal even though it is effectively more in the nature of a groundwater withdrawal.

Most of the region's population receives drinking water from regional water-supply systems. The principal source for most of the region's population is the South Bohemia Water-Supply System, supplied by surface water from the Římov water-supply reservoir and groundwater from the Vidov well. Both sources are a considerable distance from ETE, approximately 30–40 km to the south-southeast. The Dolní Bukovsko Water-Supply System is also significant to the northeastern surroundings of ETE; its abstraction area lies approximately 12 km east, beyond the drainage line of the deep Vltava valley.

The municipalities immediately surrounding ETE, including Bohunice, Temelín, Knín, Kočín, Lhota pod Horami, Sedlec, Všemyslice, and Zvěrkovice, are supplied by the regional South Bohemia Water-Supply System. The former municipalities of Březí u Týna nad Vltavou, Křtěnov, Podhájí, and Temelínec are uninhabited. In some local sections or at individual properties, old domestic wells using shallow local groundwater sources may remain in use, particularly for occasional supply, irrigation, or other supplementary purposes.

No officially designated water-source protection zones are recorded in the groundwater area of interest for the SMR ETE project. The nearest officially designated water-source protection zones lie north of ETE, in the Újezd and Albrechtice nad Vltavou areas, approximately 6 km and 9 km from ETE. However, no current groundwater withdrawals are recorded at these locations; they may therefore be either historical abstraction areas no longer in use or locations with below-threshold withdrawals not subject to central recording.

With respect to the current state of groundwater withdrawals for public water supply, it can be concluded that the significant regional abstraction areas for drinking-water supply lie beyond the reach of surface-water and groundwater flow from ETE and therefore also from the SMR ETE project. Local withdrawals in the area of interest are limited, generally small, and associated with shallow groundwater flow in crystalline rocks. For future monitoring of potential effects of the SMR ETE project on groundwater in more distant areas, it is important to monitor potential effects on the nearest local sources in the Dvorčický Stream basin, particularly in the villages of Kočín and Malešice, and to maintain an overview of individual wells not included in the central records. It should be noted, however, that any potential threat to these sources in the event of contaminant release would not be associated with transport through groundwater, but through surface water in Dvorčický Stream.

3.2 Effect of the SMR ETE project on groundwater quantity and quality at the Temelín site

The following text presents an expert hydrogeological assessment of the anticipated effects of the SMR ETE project, meaning a small modular reactor at the Temelín Nuclear Power Plant site, on groundwater quantity and quality during both construction and operation. Particular attention is paid to the interaction between groundwater and surface water, especially in relation to Dvorčický Stream and Dvorčice Pond, which constitute a local drainage base as well as significant aquatic and ecological features near the planned construction.

The SMR ETE project is situated immediately adjacent to the existing Units 1 and 2 site, at the southeastern edge of the power plant site. The assessed area includes the SMR ETE site itself and the associated construction-facility areas designated C, G, H, I, and J. The assessment is based on long-term knowledge of hydrogeological conditions at the Temelín site, groundwater monitoring results, exploratory hydrogeological wells HG1 through HG4 constructed directly at the SMR ETE site [93], and hydrodynamic tests conducted in these wells. Of particular significance are the results of longer hydrodynamic tests conducted in 2025 [96], which made it possible to refine the hydraulic parameters of the rock environment, estimate the pumping rate required to lower the groundwater level, and formulate recommendations for designing the future dewatering system.

In terms of potential project effects, the construction and operating periods must be distinguished. During construction, changes in hydrogeological and runoff conditions will be associated primarily with earthworks, temporary use of construction-facility areas, changes in

infiltration conditions, surface drainage of paved areas, and construction-related groundwater pumping from the reactor-building excavation. During operation, in addition to the permanent change in the use of the SMR ETE site, the long-term effect of climate change will also be significant, particularly rising temperatures, increased evapotranspiration, changes in the seasonal distribution of runoff, and an anticipated reduction in groundwater infiltration.

In terms of groundwater quality, it is decisive that under normal operating conditions, implementation of the project does not itself constitute a source of groundwater pollution, provided that the proposed engineering, operating, and monitoring measures are observed. The risks are associated primarily with the construction period, when soil wash-off, releases of petroleum products from construction machinery, changes in the stormwater runoff regime, and handling of soil and construction materials may occur. These risks can be addressed technically using standard preventive measures, water pretreatment, inspection of drainage systems, and appropriately configured monitoring.

3.2.1 Current hydrogeological conditions at the SMR ETE site

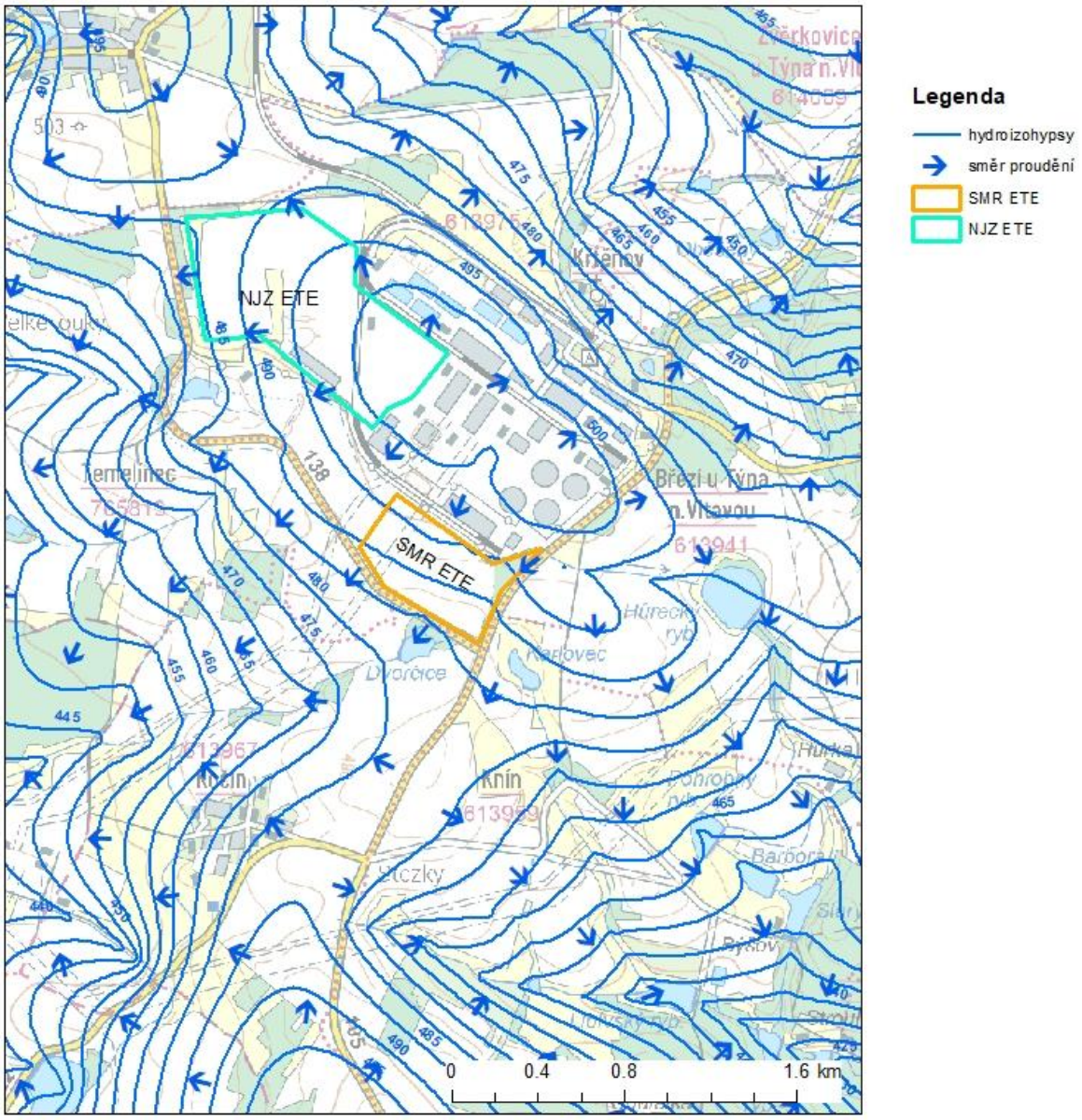
The hydrogeological environment in the area of interest is characterized by a combination of intergranular permeability in Quaternary cover sediments and weathered material and fracture permeability in the underlying crystalline rocks. More intensive groundwater flow occurs in the shallow zone and is closely linked to precipitation infiltration and local terrain morphology. The frequency and transmissivity of fractures decrease with depth; nevertheless, isolated fracture systems may allow groundwater flow to depths of several dozen meters and locally deeper. The exploratory work at the SMR ETE site indicates that bedrock is present within several meters of the ground surface. Weathering extends to variable depths, locally exceeding 16 m. Beneath the Quaternary cover and weathering mantle are biotite-sillimanite paragneisses, locally with quartz veins, quartzitic layers, and aplite bodies. The permeability of the rock environment is therefore highly heterogeneous. Groundwater flow is associated primarily with weathered and fractured zones and locally transmissive fractures.

Four 30 m deep exploratory and monitoring hydrogeological wells, HG1 through HG4, were constructed at the SMR ETE site [93]. These wells were designed and located on the basis of geophysical-survey results. Their purpose was to verify local geological and hydrogeological conditions and subsequently serve as part of the monitoring network. The wells are screened to intercept shallow to intermediate fractured-rock groundwater flow. Since 2023, they have been fitted with automatic water-level gauges and used to record groundwater levels and temperatures regularly.

The groundwater level at the SMR ETE site is shallow beneath the ground surface. The mean depth to groundwater is approximately 0.5–3.6 m below ground level. During some periods of higher precipitation, the water level locally rises above ground level in the well casing, particularly in HG1 and HG4, demonstrating locally confined conditions. These conditions probably result from a combination of lower permeability in the cover and weathered

formations, uneven distribution of fractures, and water inflow from deeper parts of the fracture system. Based on the model representation of groundwater contours [91], the groundwater level at the SMR ETE site is approximately 485–496 m a.s.l.; see Fig. 24. Groundwater flows southwest to south-southwest, toward the Dvorčický Stream basin. Dvorčický Stream is the local drainage base for the SMR ETE site and adjacent Areas H and I. Part of Area J drains toward Temelínecký Stream, Area C toward Palečkův Stream, and Area G toward Strouha Stream. The future drainage design must therefore respect natural hydrological basin boundaries and minimize transfers of water between them.

Along the southern to southeastern edge of the SMR ETE site and farther toward Dvorčice Pond, shallow and partly deeper groundwater is drained through minor concealed springs and potentially through land-drainage features. This is demonstrated by the high water levels in some HG-series wells, particularly HG1 and HG4, and occasional waterlogging in the southern and southeastern parts of the site.



Legenda	Key
hydroizohypsy	Groundwater contours
směr proudění	Flow direction
SMR ETE	SMR ETE
NJZ ETE	New NPP ETE

Fig. 24 Model groundwater-contour map from the mathematical groundwater-flow model [91]

Hydrodynamic tests showed that the rock environment has low overall permeability but is heterogeneous. The short tests conducted in 2023 [93] were supplemented in 2025 by longer individual pumping and recovery tests, which refined the hydraulic parameters [96]. The longer tests demonstrated slightly higher permeability and transmissivity of the rock environment than indicated by the initial indicative tests. The mean radius of influence of the cone of depression during pumping from the HG-series wells was assessed as several dozen meters, typically 40–50 m. The results can be used to derive the anticipated inflows to the excavation and design the parameters of the dewatering system. Future groundwater-level lowering in the reactor-building area is expected to require a system of approximately six to seven dewatering wells, 35–40 m deep, located primarily in the northern and western parts of the area to be dewatered, from which the principal groundwater inflow can be expected. The long-term steady-state pumping rate is estimated at approximately 1.5–2.0 l/s, potentially decreasing gradually to 1.0–1.5 l/s. At the start of pumping, however, inflows may temporarily be higher, exceptionally reaching several l/s, as a result of pumping static groundwater storage around the excavation.

3.2.2 Anticipated changes in hydrogeological and runoff conditions during SMR ETE construction

During SMR ETE construction, hydrogeological and runoff conditions will be affected primarily by temporary changes in land use, earthworks, paving of some areas, changes in stormwater infiltration, surface drainage of construction-site areas, and groundwater pumping from the excavation. However, the available background information indicates that the overall groundwater-flow directions will not change fundamentally. Any changes will be predominantly local and temporary.

Construction-related pumping associated with construction of the reactor building will be the most significant intervention in the groundwater regime. The building is assumed to have a deep foundation approximately 14 m below the future construction-site elevation of 495 m a.s.l., or approximately at elevation 481 m a.s.l. This means that the bottom of the excavation will be well below the current groundwater level. It will therefore be necessary to lower the groundwater level below the excavation bottom, approximately 17 m below the future construction-site elevation, and provide drainage against potential inflows through the bottom or fracture systems. Anticipated long-term steady-state inflows to the excavation are estimated at 1.5–2.0 l/s, with a slightly decreasing tendency over time. At the start of pumping, the rate may be temporarily higher because static groundwater storage in the immediate vicinity of the excavation will be pumped out. In addition to lowering the groundwater level using wells around the excavation, direct drainage from the excavation, for example using sumps or at groundwater discharge points, will probably also be required.

Grading the SMR ETE site to a uniform elevation of 495 m a.s.l. will require a combination of fills and cuts. The terrain will be raised in the southern part of the site, while cuts of several meters are anticipated in the northern part adjacent to the existing Units 1 and 2 site. Cutting work in the northern part of the site may expose the groundwater level or water-bearing

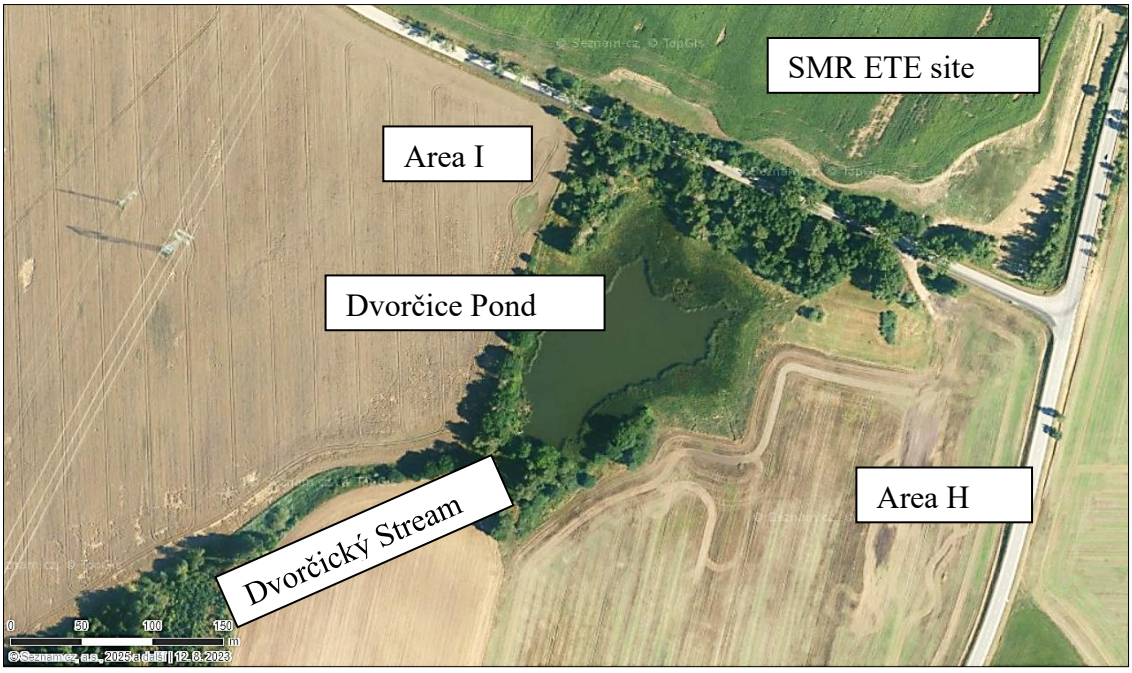
fractures. Continuous water drainage using surface drains and ditches will therefore be required even during this work.

Construction-related pumping and temporary covering of part of the terrain will reduce stormwater infiltration into groundwater. At the SMR ETE site itself, infiltration is expected to decrease from approximately 0.15 l/s to approximately 0.07 l/s. This reduction is small in terms of the regional balance, but significant locally, particularly because the SMR ETE site lies in the headwater area of Dvorčický Stream and near Dvorčice Pond. Reduced infiltration and the change in the hydraulic gradient caused by pumping may substantially reduce the natural groundwater inflow to the fishpond.

The effects of the individual construction-facility areas will depend on their location, the nature of the modifications, and the drainage method. Area C north of ETE will be used for transshipment, storage, and production, potentially including concrete production and a recycling line. The earthworks there will probably not extend below the groundwater level. However, infiltration will decrease as a result of paving and surface modifications. The area will drain toward Palečkův Stream. Area G east of the SMR ETE construction area will serve primarily as the central construction parking lot. In view of the anticipated groundwater level, the earthworks may extend below it, requiring water drainage using surface drains and ditches. Stormwater from the parking lot is to be pretreated in an oil-water separator and routed through a retention basin into the sewer system toward the Strouha receiving water. Area H south of the SMR ETE site will probably be used for operating construction facilities, topsoil, subsoil, and soil stockpiles, and potentially warehouses or transshipment areas. The earthworks should not extend below the groundwater level. Surface drainage will be graded toward Dvorčický Stream and partly toward Dvorčice Pond. Pretreatment of water from paved areas will be important, particularly in view of petroleum products and potential construction-site runoff. Area I also lies in the Dvorčický Stream basin and will serve as a support area for the main construction facilities. The earthworks there are to be performed above the groundwater level. Stormwater from paved areas will be pretreated and discharged to Dvorčický Stream, while water from grassed and gravel areas will partly recharge groundwater flowing toward Dvorčice Pond and Dvorčický Stream. Area J south of the Temelínec landfill will serve as the main construction-facility area, including administrative buildings, warehouses, parking, and other operating facilities. According to the available background information, the earthworks there will not extend below the groundwater level. In view of the area's location, surface drainage will be directed primarily toward Dubenecký and Temelínecký Streams. Infiltration there will decrease to approximately half the current value.

Overall, construction activities are expected to reduce groundwater infiltration in the areas of interest by approximately 0.3 l/s, of which approximately 0.15 l/s is attributable to the Dvorčický Stream basin. However, dewatering of the excavation is more significant to the local balance because it may reduce natural groundwater replenishment of Dvorčice Pond and Dvorčický Stream. It is therefore essential that the pumped groundwater remain within the affected basin and ideally be discharged to Dvorčice Pond or its inflow area.

Dvorčice Pond is one of the most sensitive features in terms of assessing the project effects. It lies immediately adjacent to the SMR ETE site, in the headwater area of Dvorčický Stream, and is an important habitat containing protected species; see Fig. 25 and Fig. 26. The fishpond is currently supplied by surface and subsurface runoff from the surrounding land, land-drainage inflows, and concealed groundwater inflows. Natural groundwater inflow is essential to preserving the water surface. Construction of the SMR ETE project may substantially reduce natural groundwater inflow to the fishpond because pumping from the excavation will alter the hydraulic gradient toward the dewatered area. Natural groundwater replenishment of the fishpond is estimated to potentially decrease from approximately 1.1 l/s to no more than 0.1 l/s. This loss should be replaced with groundwater pumped from the excavation. If approximately 1–2 l/s is pumped and discharged to Dvorčice Pond, it should be possible to preserve the fishpond at approximately its current extent, although its present hydrological condition is not optimal and the water level already falls and the outflow from the fishpond dries up during summer. During construction, soil wash-off, releases of petroleum products and other harmful substances, and pollutant input into surface watercourses must be consistently prevented to protect water quality.



Plocha SMR ETE	SMR ETE site
Plocha I	Area I
Rybník Dvořice	Dvořice fishpond
Dvořický potok	Dvořický Stream
Plocha H	Area H

Fig. 25 Dvorčice Pond, aerial photograph (https://mapy.com)



Fig. 26 Dam and outlet structure of Dvorčice Pond at a lowered water level in November 2025

Discharging part of the collected stormwater from the SMR ETE construction area into Dvorčice Pond may be beneficial to the water balance, but requires a detailed assessment of rainfall-runoff conditions, fishpond retention capacity, outlet-structure capacity, and Dvorčický Stream channel capacity. An indicative assessment shows that, if the fishpond and its outlet are in suitable technical condition, capture of the design rainfall may be acceptable. However, the Dvorčický Stream channel, fishpond outlet, culverts, and other critical locations must also be maintained in good technical condition.

3.2.3 Anticipated Changes in Hydrogeological and Runoff Conditions during SMR ETE Operation

After construction is completed, the construction-facility areas are expected to be restored to conditions close to the original runoff regime. Long-term significant changes will therefore primarily concern the SMR ETE site itself in the context of the broader effects of climate change. According to preliminary considerations, a substantial proportion of the SMR ETE site, potentially up to approximately 60% of the total area, can be expected to consist of paved areas and roofs. For a site area of approximately 29.5 ha, this represents approximately 17 ha of paved and roofed surfaces.

Under one option considered, water from paved areas is to be collected centrally and connected to the existing system discharging stormwater from Units 1 and 2 to the Strouha receiving

water. Such a solution would reduce surface runoff toward Dvorčice Pond in the Dvorčický Stream basin. Permanent groundwater-level lowering around the reactor building is also assumed during operation, as at some structures at the existing Units 1 and 2 site; by reducing groundwater inflow, this would further reduce water replenishment of Dvorčice Pond and Dvorčický Stream. To preserve water conditions in the fishpond and Dvorčický Stream, consideration should therefore be given to whether at least some of the collected stormwater from SMR ETE paved areas and roofs, particularly from the western part of the site, and pumped groundwater could be discharged in a controlled manner to the upper part of the Dvorčický Stream basin or directly to Dvorčice Pond; see Chapter 2.3.2 for further details. However, this solution must respect the fishpond's retention capacity and the capacity of the Dvorčický Stream channel.

As stated by Datel [85], a certain minor risk is also associated with an indirect reduction in drainage of groundwater supplying Karlovec Pond in the headwater area of the Strouha along the eastern boundary of the SMR ETE site; see Chapter 2.3.2 for further details.

Climate change is the most significant long-term factor affecting groundwater in the area. During SMR ETE operation, particularly over the 2060 and 2080 horizons, temperatures are expected to continue increasing, evapotranspiration to increase, and the seasonal distribution of runoff to change. Mean annual precipitation totals may not decrease significantly, but their distribution over the year is expected to change, with a relatively more favorable winter and a substantially less favorable warm season. During summer, a greater proportion of precipitation will be consumed by evapotranspiration or carried away by rapid surface runoff during torrential rainfall, and a smaller proportion will contribute to groundwater infiltration.

These changes can be expected to reduce groundwater recharge and baseflow. Shallow groundwater levels may fall several meters farther below the ground surface on average. Locations where groundwater naturally drains into local watercourses may shift farther downslope, away from the current headwater areas at the foot of the ETE site elevation. For Dvorčický Stream, this means a risk of lower water availability in the upper reach, particularly during summer.

Surface runoff may increase slightly during winter because precipitation will more frequently be liquid and there will be more days with temperatures above freezing. During summer, however, both surface and groundwater runoff are expected to decrease because of higher evapotranspiration. Overall, surface runoff is estimated to decrease by approximately one-third compared with the current situation. Groundwater runoff may decrease even more substantially, by an estimated 40–50%. A similar decrease of approximately 35–40% may be expected in the long-term groundwater pumping rate from beneath the reactor-building foundation because some of the water will originate in the deeper confined flow system, in which the effects of climate change will be delayed and partly smoothed over time.

For Dvorčice Pond and Dvorčický Stream, this means a risk of gradual deterioration in the water balance. Over a longer horizon, inflows to the fishpond can be expected to decrease to

approximately 1 l/s, or approximately 60% of the current value. If pumped groundwater continues to be discharged to the fishpond, it will probably be possible to preserve the fishpond approximately in its current, although hydrologically suboptimal, condition. However, Dvorčický Stream may have longer periods of zero discharge, particularly during summer.

An unfavorable situation would arise if pumped groundwater were not discharged to Dvorčice Pond during operation. The residual inflow could be so low that the fishpond could not be maintained at its current extent. The water surface could shrink substantially, and the fishpond could gradually become a wetland or marshy area at risk of seasonal drying. The upper part of Dvorčický Stream would then become predominantly intermittent, conveying water primarily after torrential rainfall.

To mitigate these risks, consideration should be given to controlled discharge of some of the collected stormwater from SMR ETE roofs and paved areas, particularly from the western half of the SMR ETE site, into Dvorčice Pond. Such a measure could help maintain the water surface and partly extend the periods of outflow from the fishpond into Dvorčický Stream, which is also related to preserving the functionality of local biocorridors; see Chapter 2.3.2 for further details. However, it must be designed on the basis of a detailed rainfall-runoff study assessing the fishpond's retention capacity, outlet-structure capacity, Dvorčický Stream channel capacity, and the quality of the discharged water. The solution is planned in EGP study [83], option A; see Chapter 10 of the study for further details.

In relation to the village of Kočín, it was assessed that the hydrogeological conditions in the village area are not directly connected with those in the SMR ETE area. Groundwater in the Kočín area is recharged predominantly from the east to southeast and drains toward Malešický Stream. Conversely, runoff from the SMR ETE area flows toward Dvorčický Stream and passes north of Kočín. Effects of SMR ETE construction and operation on groundwater in the village of Kočín can therefore be ruled out.

Monitoring of local surface watercourses must be added to groundwater monitoring in order to verify the actual effects of SMR ETE construction and operation. It is particularly important to restore gauging profile P4 on Dvorčický Stream, which would make it possible to monitor discharge and potentially water quality continuously in the reach important to Dvorčice Pond and biocorridor LBK 2a. The entire broader network of profiles P1–P8 on local watercourses around ETE that was operated in 2015–2017 [97] should be restored to allow a comprehensive hydrological balance to be prepared for the entire ETE area and the data to be used for detailed hydrological and hydrogeological modeling of runoff conditions [91].

3.3 Hydrogeological Conditions at the SMR ETE Site in Relation to Stormwater Infiltration

This text summarizes the hydrogeological and hydrological conditions at the planned SMR ETE project site in relation to the feasibility of infiltrating stormwater at the project site [87]. It focuses on assessing the natural and engineering conditions that are decisive to the design of

stormwater management, particularly in terms of the feasibility of infiltration into the rock environment.

Under the Water Act, stormwater infiltration is one of the priority methods for reducing surface-water runoff resulting from atmospheric precipitation falling on structures. However, infiltration may be designed only where natural, engineering, spatial, and safety conditions permit. For the SMR ETE site, the specific character of the location must be taken into account: shallow groundwater levels, locally confined conditions in the fractured aquifer, low to limited permeability of the rock environment, the planned extensive grading, the future deep foundation of the reactor building, and the need for long-term artificial groundwater-level lowering.

The current stormwater management design assumes that stormwater from the SMR ETE area will be discharged through retention basins into surface watercourses. The question is therefore whether stormwater infiltration at the SMR ETE site itself would be feasible, safe, and appropriate from an expert hydrogeological perspective.

3.3.1 Hydrogeological conditions decisive to water infiltration

The hydrogeological conditions in the broader surroundings and at the SMR ETE site are described adequately in preceding Chapters 3.1 and 3.2. Only the principal information essential to assessing the feasibility of water infiltration into the rock environment is therefore provided below.

The rock environment is heterogeneous in terms of permeability. In the near-surface zone, intergranular permeability in the cover and weathered formations is primarily relevant; with increasing depth, fracture permeability in the crystalline bedrock predominates. Deeper groundwater flow is associated with a small number of more permeable fractures and potentially with fractured granitoid-type vein rocks. Overall, however, the environment has low permeability and a limited ability to receive and convey larger quantities of water.

For the SMR ETE site, the findings from exploratory and monitoring hydrogeological wells HG1, HG2, HG3, and HG4 constructed in the project area are decisive [93]. The wells are 30 m deep and penetrate the Quaternary cover, weathering mantle, and upper part of the fracture-permeable crystalline rock mass. The Quaternary cover and weathering mantle were identified at thicknesses of approximately 2–3.5 m. Beneath them are biotite-sillimanite paragneisses, locally with quartz veins, quartzitic layers, and an aplite body. Weathering processes, intense fracturing, and loosening of the rock were encountered to variable depths, locally exceeding 16 m.

The groundwater level at the SMR ETE site is shallow beneath the ground surface. The mean depth to groundwater is approximately 0.5–3.6 m below ground level. During some periods of higher precipitation, the water level locally rises above ground level in the well casing, particularly in HG1 and HG4, demonstrating locally confined conditions. These conditions probably result from a combination of lower permeability in the cover and weathered

formations, uneven distribution of fractures, and water inflow from deeper parts of the fracture system. Part of the deeper groundwater also enters the area, potentially flowing from greater distances to the northwest, from the Písecké Mountains area. The local groundwater-flow direction is southwest to south-southwest, toward the Dvorčický Stream basin.

Hydrodynamic tests conducted in wells HG1 through HG4 in 2025 [96] refined the hydraulic parameters of the rock environment. Hydraulic conductivity coefficients are approximately 10^{-6} m/s, although locally they approach the order of 10^{-7} m/s. This corresponds to a rock environment with low to limited permeability. For infiltration purposes, it is significant that such an environment has only limited ability to receive larger volumes of stormwater over a short period.

3.3.2 Planned modifications at the SMR ETE site

The SMR ETE site covers approximately 29.5 ha and will be used for the principal construction activities associated with constructing the SMR installation. According to the available background information, the site will be graded to a uniform elevation of 495 m a.s.l. The current terrain is a gentle slope with elevations ranging from approximately 488 m a.s.l. in the southeast to 501 m a.s.l. in the north. The grading will therefore include both cuts and fills.

In the southern part of the site, the terrain is expected to be raised using fill to a maximum thickness of approximately 6–7 m. Conversely, a cut of approximately 5–6 m will be made in the northern part adjacent to the existing Units 1 and 2 site. This cut may locally expose fractured bedrock and, in some places, water-bearing fractures or the groundwater level. Continuous drainage of inflowing water using surface drains and ditches will therefore be required even during the cutting work.

Construction of the reactor building will be the most significant activity in terms of the hydrogeological regime. It is to have a foundation approximately 14 m below the graded terrain, at approximately elevation 481 m a.s.l. Because this level will be below the current groundwater level, the groundwater level will have to be permanently lowered below the excavation bottom and subsequently below the deep-founded reactor building. The groundwater level is expected to be lowered to approximately elevation 478 m a.s.l., about 17 m below the graded terrain elevation.

Groundwater-level lowering is to be provided by a system of dewatering wells distributed around the reactor building; during construction, direct drainage from the excavation will probably also be used. The estimated long-term pumping rate is approximately 1.5–2 l/s. Clean pumped groundwater should be discharged to surface waters, with the possibility of discharge to Dvorčický Stream or Dvorčice Pond being assessed in order to support their water balance.

After construction is completed, a high proportion of paved and roofed areas can be expected. According to the available data, buildings and paved surfaces may cover up to 60% of the total SMR ETE site, or approximately 17 ha of the total 29.5 ha. These areas will be a significant

source of precipitation surface runoff. The anticipated solution is to drain this water centrally out of the Dvorčický Stream basin by connecting it to the existing system that discharges stormwater from the Units 1 and 2 site to the Strouha receiving water. Alternatively, discharge of part of the water to the upper Dvorčický Stream basin is being considered, but only subject to an assessment of Dvorčice Pond capacity and Dvorčický Stream channel capacity. The preceding chapter also mentions a proposal to provide some support for Karlovec Pond by discharging part of this collected stormwater there [85].

3.3.3 Stormwater infiltration

The legislative framework for stormwater management is based primarily on Section 5(3) of Act No. 254/2001 Coll., on Water [13]. Under this provision, a developer is to limit stormwater runoff through storage and subsequent use, infiltration, or evaporation, or, where these methods are infeasible or inadequate, through retention and controlled discharge. Infiltration is therefore one of the preferred options, but not the only solution irrespective of local conditions.

The engineering requirements for stormwater infiltration are addressed primarily by ČSN 75 9010, Stormwater Infiltration Facilities [98], and TNV 75 9011, Stormwater Management [99]. The hydrogeological assessment must primarily consider the permeability of the rock environment, depth to groundwater, available storage volume in the unsaturated zone, safety in relation to surrounding structures, slope stability, and the possibility of affecting neighboring land or water sources.

For the Temelín site, the design rainfall is assumed to be the one-year maximum rainfall with a duration of 15 minutes and an intensity of 133.3 l/s/ha. For an assumed built-up and paved area of approximately 17 ha, the volume of stormwater to be captured, stored, and potentially infiltrated would be approximately 2 200 m³. In terms of the annual balance, with a mean annual precipitation total of approximately 620 mm, approximately 20–30 thousand m³ of stormwater would have to be infiltrated per year, depending on the actual evaporation and the effectiveness of the retention and storage measures.

Volumes of this magnitude are highly problematic to infiltrate under the conditions at the SMR ETE site. The rock environment has only limited permeability, the groundwater level is very shallow, and part of the site, in the south and southeast, is naturally waterlogged and drained. Infiltration would therefore require very extensive retention and infiltration areas capable of safe emptying within the period required by the applicable regulations. In view of the planned high proportion of built-up land, the required protective distances from structures, and the area affected by groundwater-level lowering, it is not feasible to delineate areas at the SMR ETE site that are both sufficiently large and safe for infiltration.

A fundamental engineering problem is the conflict between the planned permanent groundwater-level lowering around the reactor building and potential infiltration of stormwater into the same rock environment. The purpose of the dewatering system will be to keep the groundwater level safely below the reactor-building foundation level. Conversely, infiltration

would introduce additional water into this area and increase pumping requirements. Under the assumed annual balance of infiltrated water, mean inflow from infiltration could be on the order of 1 l/s, representing a significant increase over the estimated long-term pumping rate of 1.5–2 l/s. Such a solution would be technically and economically inappropriate and, from a structural-safety perspective, unsuitable and potentially hazardous to the structures.

3.3.4 Exclusion criteria for permitting stormwater infiltration

To permit stormwater infiltration, it must be assessed whether any exclusion criteria are present in the area. At the SMR ETE site, several fundamental constraints apply whose combination constitutes a significant obstacle to the design and implementation of infiltration facilities.

The first criterion is low permeability of the rock environment. A hydraulic conductivity coefficient of approximately 10^{-7} m/s is generally regarded as the limiting value at which infiltration capacity is already substantially restricted. Values at the SMR ETE site were predominantly approximately 10^{-6} m/s, but locally at the boundary of 10^{-7} m/s. The environment must therefore be assessed as having low permeability and limited suitability for infiltration. Infiltration would be slow, would require extensive retention and large infiltration areas, and would be sensitive to seasonal saturation of the rock environment, with a risk of surface waterlogging in the infiltration areas.

The second criterion is a high groundwater level. If the groundwater level is less than 1 m below ground level, the rock environment does not contain sufficient free volume for safe infiltration. At the SMR ETE site, the groundwater level is approximately 0.03–3.55 m below ground level, with maximum levels locally rising above the ground surface. The southern and southeastern parts of the site in particular therefore do not meet the requirement for an adequate thickness of unsaturated zone above the groundwater level.

The third and most serious criterion is the risk of waterlogging of structures and installations. The SMR ETE site will contain the reactor building and other technically significant structures for which contact with an elevated groundwater level is undesirable and unacceptable from a safety perspective. This is precisely why artificial groundwater-level lowering to approximately 478 m a.s.l., about 17 m below the graded ground surface, is planned. Stormwater infiltration in the area affected by the cone of depression would reduce the effectiveness of this hydraulic protection and increase the risk of waterlogging or an undesirable rise in the groundwater level.

The fourth criterion is the risk of impairing the stability of slopes and fills. After the site is graded to an elevation of 495 m a.s.l., sloping areas will be created in its northern and southern parts, particularly in the fill area along the southern boundary. Infiltration into the rock environment or fill bodies may result in soil saturation, groundwater discharge on the slope, erosion, waterlogging, and potentially slope movement. This risk is significant particularly in the southern part of the site, where a shallow groundwater level and concealed drainage toward Dvorčice Pond already occur.

Another constraint is the lack of suitable space. The SMR ETE site will be used intensively for buildings, process equipment, roads, and other paved areas. When the built-up area, groundwater-level-lowering zone, protective distances from structures, sloping areas, and site boundaries are taken into account, a sufficiently large area for safe and effective stormwater infiltration cannot realistically be delineated.

Conversely, water-source protection zones and contaminated areas are not decisive criteria in this case. No water-source protection zones that would directly preclude infiltration have been identified at the SMR ETE site, and no contamination that would in itself prevent infiltration because of a risk of leaching harmful substances into groundwater is assumed there. This does not change the overall assessment because the decisive obstacles are the high groundwater level, waterlogging risk, low permeability, and engineering implications of reactor-building dewatering.

3.3.5 Assessment of the situation and conclusion

From an expert hydrogeological perspective, the SMR ETE site is unsuitable for stormwater infiltration. This unsuitability is not caused by one isolated factor, but by a combination of several unfavorable natural and engineering conditions that reinforce one another. These primarily comprise the shallow groundwater level, which locally rises above the ground surface; limited permeability of the rock environment; the planned deep foundation of the reactor building; the need for long-term groundwater-level lowering; the risk of waterlogging of structures; and the risk of destabilizing fill and sloping areas.

The shallow groundwater level and locally confined conditions significantly restrict the free volume available in the rock environment for infiltration. In some parts of the site, particularly in the south and southeast, the groundwater level is so shallow that infiltration could occur practically directly into the saturated zone or cause groundwater discharge and waterlogging in lower parts of the site. Such conditions conflict with the requirement for safe and controlled infiltration.

The low to limited permeability of the rock environment means that exceptionally extensive retention and infiltration facilities would have to be designed to capture and infiltrate water from paved and roofed areas. For an assumed paved and roofed area of approximately 17 ha, the design-rainfall volume would be on the order of 2 200 m³ and the annual volume potentially requiring infiltration would be tens of thousands of cubic meters. Such a solution is not realistically feasible in view of the site's limited area and high proportion of built-up land.

However, the most serious argument against infiltration is the planned permanent lowering of the groundwater level around the reactor building. Infiltrating stormwater into an area in which the groundwater level is to be artificially lowered to a safe level below the foundation base would be technically counterproductive. It would mean introducing water into an environment from which it would subsequently have to be pumped. Such a solution would increase the

required capacity and reliability of the dewatering system and could also reduce the safety margin against groundwater contact with deep-founded structures.

Another substantial risk is potential saturation of fill soils and subsequent impairment of slope stability, particularly along the southern boundary of the SMR ETE site. In this part, the terrain is to be raised by several meters, and it is also an area of natural drainage toward Dvorčice Pond. Infiltration there could cause groundwater discharge on the slope, erosion, waterlogging, and local slope movement.

Based on the assessment of hydrogeological, hydrological, engineering, and safety conditions, stormwater infiltration at the SMR ETE site cannot be recommended. Significant exclusion criteria for designing infiltration facilities are present in the area, particularly the risk of waterlogging of structures and installations, the risk of impaired stability of fills and slopes, the high groundwater level, and low to limited permeability of the rock environment.

A more appropriate stormwater management solution is retention, storage, and controlled discharge to surface waters, potentially combined with partial use of stormwater where technically and operationally feasible. The Strouha or Dvorčický Stream are the primary potential receiving waters, provided in each case that their capacity is respected and water from higher-risk areas is pretreated. This solution would also have the advantage of protecting important local habitats with aquatic and water-dependent ecosystems, including Dvorčice Pond, Dvorčický Stream with biocorridor LBK 2a, and Karlovec Pond; see Chapter 2.3.2 for further details.

Overall, it can be concluded that hydrogeological conditions at the SMR ETE site are unfavorable in relation to stormwater infiltration. Infiltration would be neither a safe nor an appropriate stormwater management method and could conflict with engineering requirements for protecting deep-founded structures, particularly the reactor building. Other stormwater management methods must therefore be preferred, particularly retention, potential use, and controlled discharge to surface waters, where the water could have a positive effect on stabilizing hydrological conditions in local watercourses and reservoirs.

4 Status of Surface Water Bodies and Groundwater Bodies

4.1 Surface water bodies

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This chapter is based on background study [100].

4.1.1 Current Status of Surface Water Bodies

Assessment of surface-water-body status is a comprehensive process based on European legislation, namely the Water Framework Directive (2000/60/EC) [1], and implemented in Czech law by the Water Act [13] and related legislation, particularly Decree No. 98/2011 Coll., on the method for assessing the status of surface water bodies, the method for assessing the ecological potential of heavily modified and artificial water bodies, and the particulars of surface-water status monitoring and assessment programs, known as the Surface-Water Monitoring Decree [101], and by methodologies of the Ministry of the Environment. The objective is to achieve good status in all water bodies.

The overall status of surface water bodies, which are designated by Decree No. 49/2011 Coll. [102], comprises two principal components, ecological and chemical status, which are further assessed using the following parameters:

- Ecological status: reflects the quality of aquatic ecosystems
  - Biological quality elements (phytoplankton, phytobenthos, macrophytes, benthic invertebrates, fish fauna)
  - Physicochemical quality elements
    - General parameters: Temperature; oxygenation conditions, including biochemical oxygen demand (BOD_5) and dissolved oxygen (O_2); pH; nutrients, including phosphorus and nitrogen; and salinity.
    - River-basin-specific pollutants
  - Hydromorphological quality elements (hydrological regime, river continuity, morphological conditions)
- Chemical status: assessed using concentrations of priority substances established at the EU level.

It is assessed by comparison with reference conditions. The assessment has several classes designated verbally or numerically:

- Ecological status/potential: High (1), Good (2), Moderate (3), Poor (4), Bad (5)
- Chemical status: Good (2), Failing to Achieve Good Status (3), Unknown (U)

The key rule governing the entire assessment is that if any individual quality element, whether biological, chemical, or physicochemical, is worse than good, the entire water body is classified as failing. Thus:

- Overall status
  - Good (ecological status is high or good and chemical status is good)
  - Failing (ecological status is moderate, poor, or bad, or chemical status is failing to achieve good status)

Under Decree [102], surface-water-body status assessment is type-specific, meaning that different conditions are established for water bodies depending on their characteristics, including category, hydromorphological character, and type. The surface-water-body categories are "lake" for standing waters and "river" for running waters. Depending on the physical nature of the water body and the degree to which it is affected by human activity, its hydromorphological character is "natural," "heavily modified," or "artificial." Surface-water-body type includes additional attributes. For the river category these are the drainage basin, elevation, geology, and watercourse order; for the lake category they are elevation, latitude and longitude, maximum depth, geology, area, mean depth, and retention time. The water-body type is then expressed by a numerical code comprising the attributes listed above.

For heavily modified water bodies, meaning water bodies substantially modified for navigation, power generation, or flood protection, such as dams, and for artificial water bodies, ecological potential is assessed instead of ecological status.

Assessment is conducted in six-year cycles, known as planning periods, as part of the River Basin Management Plans and serves as a basis for proposing corrective measures, such as watercourse restoration or construction of wastewater treatment plants. The third planning period/cycle is currently underway and the fourth planning cycle is being prepared [103].

The assessment of the SMR ETE project's effects in study [100] focused on chemical status and, for ecological status, on the physicochemical quality elements that affect the biological quality elements. The assessed water bodies are those affected in these components by wastewater discharge, meaning those downstream of the outfall in the Kořensko water reservoir dam structure.

Hydromorphological quality elements, which include the hydrological regime, may also be affected farther upstream along the Vltava, primarily because the withdrawal of process water for the SMR ETE project will reduce the discharge in the river. However, no specific assessment of effects on the hydromorphological quality elements was conducted because a methodology for assessing hydromorphological quality elements in lake-type surface water bodies and sufficient background data are lacking.

The ecological-status/potential and chemical-status assessment data for the area of interest were taken from the Upper Vltava Sub-basin Plan [9] and the Lower Vltava Sub-basin Plan [10], specifically their updates for the third planning period. The assessment results in these documents are based on monitoring data for 2016–2018; because data for the following three-year period were unavailable when the plans were prepared, the status for 2021 was estimated as part of these River Basin Management Plans. This is currently the most recent published

update to the River Basin Management Plans; the update for the fourth planning period is being prepared and has not yet been published [103].

Table 59 summarizes the ecological-status and ecological-potential assessment results for the assessed water bodies in the area of interest, including a list by name of the parameters and quality elements that caused failure to achieve good status in the affected water bodies [9, 10].

In the ecological-status/potential assessment, water bodies HVL_1055_J, HVL_1525_J, DVL_0015_J, and DVL_0030 are classified as poor; DVL_0110 is classified as moderate; and only DVL_0095_J is classified as good. Biological quality elements determine the overall ecological-status/potential assessment for most water bodies because they have the worst classification. The poorer assessment for general physicochemical quality elements is most commonly caused by nutrient conditions, particularly P_{total}, followed by temperature and O_2 saturation.

Chemical status is reported as unknown for most water bodies in the assessed reach and as good only for DVL_0110 (Table 60).

Overall status is assessed as failing for all water bodies covered by this study except DVL_0095_J (Table 60).

The SMR ETE project is located near the existing Temelín Nuclear Power Plant site in South Bohemia, near Týn nad Vltavou. Wastewater from the SMR ETE project is planned to be discharged to the Vltava River at Kořensko, through the profile shared with Units 1 and 2 and the New NPP ETE. According to the current water-body status assessment under the third planning cycle [9, 10], the status of most of these water bodies is assessed as failing. The only exception is the status of the Slapy Reservoir on the Vltava SWB (DVL_0095_J), which is assessed as good. The other water bodies fail because they do not achieve good ecological status/potential, which is attributable, in addition to the biological quality elements, primarily to P_{total} and, in some cases, O_2 saturation or temperature.

4 Status of Surface Water Bodies and Groundwater Bodies

Table 59 Surface-water-body chemical-status assessment results in the area of interest for the third planning period: verbal assessment (numerical assessment) [9, 10].

		Ecological status/potential assessment					
SWB ID	**Water-body name**	**Biological quality elements**	**Hydromorphological quality elements**	**General physicochemical quality elements**	**River-basin-specific pollutants**	**Overall**	**Failing parameters**
HVL_1055_J	Orlík I reservoir on the Vltava	Poor (4)	Unknown (NA)	Moderate (3)	Good (2)	Poor potential (4)	Phytoplankton, P_{total}
HVL_1525_J	Orlík II reservoir on the Otava	Poor (4)	Unknown (NA)	Moderate (3)	Good (2)	Poor potential (4)	Phytoplankton, P_{total}
DVL_0015_J	Orlík III Reservoir on the Vltava	Poor (4)	Unknown (NA)	Moderate (3)	Good (2)	Poor potential (4)	Phytoplankton, P_{total}
DVL_0030	Vltava from the Orlík reservoir dam to the backwater of the Slapy reservoir	Poor (4)	Moderate (3)	Moderate (3)	Good (2)	Poor potential (4)	Benthic invertebrates, temperature, O_2 saturation, P_{total}
DVL_0095_J	Slapy reservoir on the Vltava	Good (2)	Unknown (NA)	Good (2)	Good (2)	Good (2)	---
DVL_0110	Vltava from the Slapy reservoir dam to the Sázava	Good (2)	Moderate (3)	Moderate (3)	Good (2)	Moderate (3)	Temperature, O_2 saturation,

Table 60 Overall surface-water-body status assessment results in the area of interest for the third planning period: verbal assessment (numerical assessment) [9, 10].

SWB ID	**Water-body name**	**SWB category**	**Heavily modified or artificial SWB**	**Assessment of SWB ecological status and ecological potential**	**Assessment of SWB chemical status**	**Overall SWB status assessment**
HVL_1055_J	Orlík I reservoir on the Vltava	Lake	YES	Poor (4)	Unknown (U)	Failing
HVL_1525_J	Orlík II reservoir on the Otava	Lake	YES	Poor (4)	Unknown (U)	Failing
DVL_0015_J	Orlík III Reservoir on the Vltava	Lake	YES	Poor (4)	Unknown (U)	Failing
DVL_0030	Vltava from the Orlík reservoir dam to the backwater of the Slapy reservoir	River	YES	Poor (4)	Unknown (U)	Failing

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DVL_0095_J	Slapy reservoir on the Vltava	Lake	YES	Good (2)	Unknown (U)	Good
DVL_0110	Vltava from the Slapy reservoir dam to the Sázava	River	YES	Moderate (3)	Good (2)	Failing

4.1.2 Effect of the SMR ETE Project on Surface-Water-Body Status

The assessment of the effect of SMR ETE operation on surface-water-body status/potential conducted in background study [100] was based on modeled values from DP20 study [8], which describes the model in detail. Concentrations at the critical profiles defined in study [104] were modeled in study [8] for two capacity scenarios:

1. SMR ETE + Units 1 and 2
2. SMR ETE + Units 1 and 2 + two 1 700 MWe New NPP ETE units

For both alternatives, surface-water quality at the critical profiles was modeled for two hydrological situations:

1. "Normal flow": long-term mean flow (Q_a) was used for the modeling
2. "Drought, effect of climate change": flow Q_{355} was used for the modeling

Modeling was conducted for two discharge scenarios:

1. Average Discharge: Actual concentrations measured in wastewater from Units 1 and 2, averaged over 2015–2024, were used in the calculation. The same concentrations were also used for the SMR ETE project and the New NPP ETE [66]. For radioactivity parameters, actual measured discharged-activity values from Units 1 and 2, averaged over 2015–2024, were used. For the other parts of the assessed project capacity alternative, meaning the SMR ETE project and, where applicable, the New NPP ETE), the specified SMR source term [67] or, where applicable, the design radionuclide discharges according to the New NPP ETE EIA Documentation (2010) [68] were used conservatively.
2. Maximum Discharge: For Units 1 and 2, the "maximum" emission limits [t/year and Bq/year], or "m" where applicable, established in the permit for wastewater discharge from Units 1 and 2 [69] were used in the calculation. For the other parts of the assessed capacity alternatives, meaning the SMR ETE project and, where applicable, the New NPP ETE, the same approach as for the Average Discharge scenario was used. This scenario was prepared only for parameters listed in permit [69]. It represents an extreme boundary condition that has not been attained in practice by Units 1 and 2.

Modeled concentrations taken from study [8] and calculated at the critical profiles were used to assess the effect of SMR ETE operation on the status/potential of the assessed surface water bodies. The first critical profile was the profile downstream of the Kořensko water reservoir, followed by others depending on the purpose, including bathing-water areas, abstractions for drinking-water purposes, assessment of surface-water-body status, and waters for fish life.

Ecological-status/potential assessment: general physicochemical quality-element parameters

The poorer assessment of the current status in terms of general physicochemical quality elements is most commonly caused by nutrient conditions, particularly P_{total}, followed by temperature and O_2 saturation. P_{total} is the only general physicochemical quality-element

parameter for which modeled values according to [8] are available for assessing the status of surface water bodies, specifically water bodies HVL_1055_J and DVL_0030. A comparison of the current status assessed according to [8], the type-specific values for general physicochemical ecological-status/potential parameters [18, 25], and the values modeled according to [8] for the individual scenarios is provided in Table 61. No model data are available for the other parameters.

Table 61 Comparison of the current status assessed according to [8], the type-specific value for P_{total} at the good/moderate potential boundary, and values modeled according to [8] for the individual scenarios

SWB ID	Current status, mean/ median*	Specific value D/W	SMR + Units 1 and 2				SMR + Units 1 and 2 + New NPP			
			Average Discharge		Maximum Discharge		Average Discharge		Maximum Discharge	
			Q_a	Q_{355}	Q_a	Q_{355}	Q_a	Q_{355}	Q_a	Q_{355}
HVL_1055_J	0.067	0.04	0.08	0.07	0.08	0.08	0.08	0.08	0.08	0.08
HVL_1525_J	**	0.04	-	-	-	-	-	-	-	-
DVL_0015_J	0.030	0.03	-	-	-	-	-	-	-	-
DVL_0030	0.053*	0.05	0.061	0.055	0.062	0.06	0.06	0.06	0.06	0.06
DVL_0095_J	0.029	0.03	-	-	-	-	-	-	-	-
DVL_0110	0.053*	0.07	-	-	-	-	-	-	-	-

* Median; ** not assessed in study [8]
Note: format indicating attainment/exceedance of the type-specific value

The first SWB affected by the SMR ETE project is HVL_1055_J, Orlík I Reservoir on the Vltava, in which P_{total} is one of the causes of failure to achieve good status/potential. The results clearly show that the modeled P_{total} concentrations in the watercourse [8] under the individual scenarios are also higher than the type-specific value at the good/moderate potential boundary. The contribution of the project itself to the values calculated at the wastewater outfall at the profile downstream of the Kořensko water reservoir is only 0.5–2.4% under the individual scenarios, while the "background," meaning the P_{total} mass flow in the Vltava and Lužnice Rivers, accounts for 90.2–97.7%. In the other water bodies farther downstream, dilution by tributaries, particularly the Otava River, will make the project's contribution even smaller relative to background mass flows. Nevertheless, P_{total} is currently one of the parameters causing failure to achieve good status in SWB DVL_0030 and, as is apparent from the modeled values, will remain a critical parameter causing failure to achieve good status/potential in terms of the general physicochemical quality elements.

No model data on the concentrations of substances in the receiving water according to [8] are available for the other general physicochemical quality-element parameters in the individual water bodies assessed because the underlying data are lacking. Nevertheless, the project itself contributes up to 5.3% to the values calculated at the wastewater outfall at the profile downstream of the Kořensko water reservoir for the individual parameters and scenarios, as provided in Table 62–Table 65; this is similar to P_{total}, while the "background" is the principal mass flow. It can be assumed that, in the other affected water bodies farther downstream, dilution, particularly by the Otava River and other tributaries, will make the project's contribution to background mass flows even smaller than at the wastewater outfall, particularly

under normal-flow conditions. For Q_{355}, which was used to model drought due to climate change, the project's contribution is greater.

Temperature and O_2 saturation are additional failing parameters causing failure to achieve good status/potential in SWBs DVL_0030 and DVL_0110. For these parameters, the conditions result from operations at the water reservoirs upstream of the water bodies, and the calculated contribution from the project is even smaller than for P_{total}.

Overall, the SMR ETE project's contribution to the general physicochemical quality-element parameters in the ecological-status/potential assessment can be summarized as very small under normal flow (Q_a), at approximately 1%. The principal source underlying failure to achieve good ecological status/potential in the assessed water bodies is background mass flow in the Vltava, Lužnice, and Otava Rivers.

Table 62 Contributions of individual sources to mass flows of the general physicochemical quality elements at the profile downstream of the Kořensko water reservoir, Average Discharge scenario, SMR ETE plus Units 1 and 2, according to [8]

Parameter	Q_a			Q_{355}		
	SMR ETE	Units 1 and 2	Background	SMR ETE	Units 1 and 2	Background
T	0.4%	1.2%	98.4%	1.5%	4.5%	94.0%
pH	0.2%	0.7%	99.0%	1.0%	2.8%	96.2%
BOD_5	0.1%	0.3%	99.5%	0.5%	1.5%	98.0%
P_{total}	0.6%	1.7%	97.7%	2.4%	7.4%	90.2%
$P\text{-}PO_4^{3-}$	1.1%	3.3%	95.6%	4.2%	12.7%	83.1%
$N\text{-}NO_3^-$	1.3%	4.1%	94.6%	5.3%	16.1%	78.7%
$N\text{-}NH_4^+$	0.3%	0.8%	99.0%	0.9%	2.7%	96.4%

Table 63 Contributions of individual sources to mass flows of the general physicochemical quality elements at the profile downstream of the Kořensko water reservoir, Average Discharge scenario, SMR ETE plus Units 1 and 2 plus New NPP ETE, according to [8]

Parameter	Q_a				Q_{355}			
	SMR ETE	Units 1 and 2	New NPP ETE	Background	SMR ETE	Units 1 and 2	New NPP ETE	Background
T	0.4%	1.2%	1.7%	96.7%	1.4%	4.2%	5.9%	88.4%
pH	0.2%	0.7%	1.0%	98.0%	0.9%	2.7%	3.8%	92.5%
BOD_5	0.1%	0.3%	0.5%	99.1%	0.5%	1.5%	2.1%	95.9%
P_{total}	0.5%	1.7%	2.3%	95.5%	2.2%	6.7%	9.3%	81.8%
$P\text{-}PO_4^{3-}$	1.0%	3.2%	4.5%	91.3%	3.6%	10.8%	15.1%	70.5%
$N\text{-}NO_3^-$	1.3%	3.8%	5.4%	89.5%	4.3%	13.1%	18.4%	64.2%
$N\text{-}NH_4^+$	0.3%	0.8%	1.1%	97.9%	0.9%	2.6%	3.6%	92.9%

Table 64 Contributions of individual sources to mass flows of the general physicochemical quality elements at the profile downstream of the Kořensko water reservoir, Maximum Discharge scenario, SMR ETE plus Units 1 and 2, according to [8]

Parameter	Q_a			Q_{355}		
	SMR ETE	Units 1 and 2	Background	SMR ETE	Units 1 and 2	Background
T	0.4%	1.9%	97.7%	1.4%	7.1%	91.5%
pH	0.2%	0.8%	98.9%	0.9%	3.1%	96.0%
BOD_5	0.1%	2.3%	97.6%	0.5%	9.7%	89.8%
P_{total}	0.5%	4.6%	94.9%	2.1%	18.0%	79.8%
$P\text{-}PO_4^{3-}$	1.0%	8.3%	90.7%	3.5%	27.7%	68.8%
$N\text{-}NO_3^-$	1.3%	8.4%	90.3%	4.5%	29.4%	66.2%
$N\text{-}NH_4^+$	0.3%	0.8%	99.0%	0.9%	2.7%	96.4%

Table 65 Contributions of individual sources to mass flows of the general physicochemical quality elements at the profile downstream of the Kořensko water reservoir, Maximum Discharge scenario, SMR ETE plus Units 1 and 2 plus New NPP ETE, according to [8]

Parameter	Q_a				Q_{355}			
	SMR ETE	Units 1 and 2	New NPP ETE	Background	SMR ETE	Units 1 and 2	New NPP ETE	Background
T	0.4%	1.9%	2.6%	95.1%	1.3%	6.4%	9.0%	83.3%
pH	0.2%	0.8%	1.1%	97.8%	0.9%	3.0%	4.2%	92.0%
BOD_5	0.1%	2.3%	0.9%	96.7%	0.4%	9.4%	3.8%	86.4%
P_{total}	0.5%	4.5%	2.1%	92.9%	2.0%	16.6%	7.7%	73.6%
$P\text{-}PO_4^{3-}$	1.0%	7.9%	4.2%	86.8%	3.0%	24.1%	12.9%	60.0%
$N\text{-}NO_3^-$	1.1%	7.6%	10.2%	81.1%	3.2%	21.1%	28.4%	47.4%
$N\text{-}NH_4^+$	0.2%	0.7%	4.3%	94.7%	0.8%	2.3%	13.5%	83.4%

Ecological-status/potential assessment: river-basin-specific pollutants

River-basin-specific pollutants do not cause failure to achieve good status/potential in the assessed SWBs. According to assessment [9, 10], all water bodies are classified as having good status/potential in this category . Radioactivity parameters are also included among the river-basin-specific pollutants. Tritium is the only parameter in this group for which modeled values were calculated according to [8] for the individual scenarios; the results are provided in Table 66. For SWB DVL_0030, the modeled values for the Vltava-Solenice profile were used. No model data are available for the other parameters, primarily because of insufficient input data; these substances are not monitored in the assessed water bodies.

Table 66 Comparison of the current tritium activity concentrations assessed according to [8], the EQS-AA, and the values modeled for the individual scenarios according to [8]

Activity concentration of ^3H [Bq/l] SWB ID	Current Current-status mean	EQS-AA	SMR ETE + Units 1 and 2				SMR ETE + Units 1 and 2 + New NPP			
			Average Discharge		Maximum Discharge		Average Discharge		Maximum Discharge	
			Q_a	Q_{355}	Q_a	Q_{355}	Q_a	Q_{355}	Q_a	Q_{355}
HVL_1055_J	31.0 *	1 000	31	115	61	228	109	409	139	520
HVL_1525_J	**		-	-	-	-	-	-	-	-
DVL_0015_J	**		-	-	-	-	-	-	-	-
DVL_0030	23.2 ***		21	75	40	148	71	265	91	337
DVL_0095_J	**		-	-	-	-	-	-	-	-
DVL_0110	**		-	-	-	-	-	-	-	-

* Vltava-Hladná; ** not assessed in study [8]; *** Vltava-Solenice

The table shows that tritium is not expected to cause failure to achieve good status/potential.

For the other river-basin-specific pollutants, the calculated contributions from the SMR ETE project at the profile downstream of the Kořensko water reservoir according to [8], provided in Table 67–Table 70, may be used; radioactivity parameters are provided separately in Table 71–Table 74. As with the general physicochemical quality elements, the calculated contribution from the SMR ETE project is very small, up to 4%. It can be assumed that, in the other affected water bodies farther downstream, dilution, particularly by the Otava River and other tributaries, will make the project's contribution to background mass flows even smaller than at the wastewater outfall, particularly under normal-flow conditions, and that river-basin-specific pollutants, including radioactivity parameters, will not cause failure to achieve good ecological status/potential in the future either.

Table 67 Contributions of individual sources to mass flows of the assessed river-basin-specific pollutants at the profile downstream of the Kořensko water reservoir, Average Discharge scenario, SMR ETE plus Units 1 and 2, according to [8]

Parameter	Q_a			Q_{355}		
	SMR ETE	Units 1 and 2	Background	SMR ETE	Units 1 and 2	Background
C_{10}-C_{40}	0.5%	1.4%	98.2%	1.7%	5.1%	93.2%
Phenanthrene	1.0%	2.9%	96.1%	3.4%	10.4%	86.2%
Pyrene	1.1%	3.3%	95.6%	3.6%	10.9%	85.5%
AI	0.9%	2.9%	96.2%	3.4%	10.3%	86.4%
AOX	1.0%	3.1%	95.8%	3.9%	11.8%	84.4%
Metolachlor and its metabolites	0.4%	1.2%	98.3%	2.2%	6.6%	91.3%
Terbuthylazine and its metabolites	0.4%	1.3%	98.3%	2.2%	6.7%	91.1%
EDTA	0.9%	2.6%	96.6%	3.2%	9.8%	87.0%

Table 68 Contributions of individual sources to mass flows of the assessed river-basin-specific pollutants at the profile downstream of the Kořensko water reservoir, Average Discharge scenario, SMR ETE plus Units 1 and 2 plus New NPP ETE, according to [8]

Parameter	Q_a				Q_{355}			
	SMR ETE	Units 1 and 2	New NPP ETE	Background	SMR ETE	Units 1 and 2	New NPP ETE	Background
C_{10}-C_{40}	0.4%	1.3%	1.9%	96.3%	1.6%	4.8%	6.7%	87.0%
Phenanthrene	0.9%	2.8%	4.0%	92.3%	3.0%	9.1%	12.7%	75.2%
Pyrene	1.0%	3.2%	4.4%	91.4%	3.1%	9.4%	13.3%	74.2%
Al	0.9%	2.8%	3.9%	92.5%	3.0%	9.0%	12.6%	75.5%
AOX	1.0%	3.0%	4.2%	91.8%	3.3%	10.1%	14.2%	72.4%
Metolachlor and its metabolites	0.4%	1.2%	1.7%	96.6%	2.0%	6.0%	8.4%	83.6%
Terbuthylazine and its metabolites	0.4%	1.3%	1.8%	96.5%	2.0%	6.1%	8.6%	83.2%
EDTA	0.8%	2.5%	3.5%	93.2%	2.8%	8.6%	12.1%	76.5%

Table 69 Contributions of individual sources to mass flows of the assessed river-basin-specific pollutants at the profile downstream of the Kořensko water reservoir, Maximum Discharge scenario, SMR ETE plus Units 1 and 2, according to [8]

Parameter	Q_a			Q_{355}		
	SMR ETE	Units 1 and 2	Background	SMR ETE	Units 1 and 2	Background
C_{10}-C_{40}	0.3%	0.8%	99.0%	0.9%	2.7%	96.4%

Table 70 Contributions of individual sources to mass flows of the assessed river-basin-specific pollutants at the profile downstream of the Kořensko water reservoir, Maximum Discharge scenario, SMR ETE plus Units 1 and 2 plus New NPP ETE, according to [8]

Parameter	Q_a				Q_{355}			
	SMR ETE	Units 1 and 2	New NPP ETE	Background	SMR ETE	Units 1 and 2	New NPP ETE	Background
C_{10}-C_{40}	0.2%	0.7%	4.3%	94.7%	0.8%	2.3%	13.5%	83.4%

Table 71 Contributions of individual sources to activity fluxes of the assessed radioactive substances at the profile downstream of the Kořensko water reservoir, Average Discharge scenario, SMR ETE plus Units 1 and 2, according to [8]

Parameter	Q_a			Q_{355}		
	SMR ETE	Units 1 and 2	Background	SMR ETE	Units 1 and 2	Background
^{137}Cs	0.8%	4.4%	94.8%	3.0%	16.5%	80.5%
^{90}Sr	0.9%	8.1%	91.0%	2.8%	25.2%	72.0%
^{3}H	10.3%	86.2%	3.5%	10.6%	88.5%	0.9%

Table 72 Contributions of individual sources to activity fluxes of the assessed radioactive substances at the profile downstream of the Kořensko water reservoir, Average Discharge scenario, SMR ETE plus Units 1 and 2 plus New NPP ETE, according to [8]

Parameter	Q_a				Q_{355}			
	SMR ETE	Units 1 and 2	New NPP ETE	Background	SMR ETE	Units 1 and 2	New NPP ETE	Background
^{137}Cs	0.8%	4.3%	3.6%	91.4%	2.6%	14.5%	12.1%	70.8%
^{90}Sr	0.9%	7.8%	3.7%	87.7%	2.5%	22.5%	10.7%	64.3%
^{3}H	3.0%	24.9%	71.2%	1.0%	3.0%	25.1%	71.7%	0.3%

Table 73 Contributions of individual sources to activity fluxes of the assessed radioactive substances at the profile downstream of the Kořensko water reservoir, Maximum Discharge scenario, SMR ETE plus Units 1 and 2, according to [8]

Parameter	Q_a			Q_{355}		
	SMR ETE	Units 1 and 2	Background	SMR ETE	Units 1 and 2	Background
^{3}H	5.3%	92.9%	1.8%	5.4%	94.2%	0.5%

Table 74 Contributions of individual sources to activity fluxes of the assessed radioactive substances at the profile downstream of the Kořensko water reservoir, Maximum Discharge scenario, SMR ETE plus Units 1 and 2 plus New NPP ETE, according to [8]

Parameter	Q_a				Q_{355}			
	SMR ETE	Units 1 and 2	New NPP ETE	Background	SMR ETE	Units 1 and 2	New NPP ETE	Background
^{3}H	2.3%	41.0%	55.9%	0.8%	2.3%	41.2%	56.2%	0.2%

Assessment of chemical-status parameters

Chemical status is unknown for most assessed SWBs, and only DVL_0110 has good chemical status [9, 10]. No values for the chemical-status parameters were modeled according to [8] for the individual scenarios, primarily because of insufficient input data on the concentrations of these substances in the affected SWBs. The assessment can be based on the SMR ETE contributions calculated according to [8] at the profile downstream of the Kořensko water reservoir, as provided in Table 75 and Table 76. As with the general physicochemical quality elements, the calculated contribution from the SMR ETE project is very small, up to 6%. However, the PAH input may be significant, particularly in combination with the other parts of the ETE site under unfavorable flow conditions. For benzo[g,h,i]perylene, the maximum contribution at Q_{355} is calculated as 38% for the SMR ETE plus Units 1 and 2 plus New NPP ETE capacity option, and the inputs of the other PAHs are not negligible either. The cause is the scrubbing of PAHs from the atmosphere into cooling water at the cooling towers, followed by their discharge to the receiving water in blowdown as wastewater. Elevated atmospheric PAH values are associated primarily with the heating season, so the highest concentrations can be expected during winter. Even so, the background pollutant mass flow from the Vltava and Lužnice Rivers exceeds the input from the SMR ETE project, including in combination with the other parts of the ETE site.

Although PAH parameters warrant attention in terms of the effect of the SMR ETE project on surface-water chemical status, it can be assumed that, in the other affected water bodies farther downstream, dilution, particularly by the Otava River and other tributaries, will make the project's contribution to background mass flows even smaller than at the wastewater outfall, particularly under normal-flow conditions, and that chemical-status parameters will not cause failure to achieve good status at the representative profiles of the affected SWBs in the future either.

Table 75 Contributions of individual sources to mass flows of the assessed chemical-status parameters at the profile downstream of the Kořensko water reservoir, Average Discharge scenario, SMR ETE plus Units 1 and 2, according to [8]

Parameter	Q_a			Q_{355}		
	SMR ETE	Units 1 and 2	Background	SMR ETE	Units 1 and 2	Background
Fluoranthene	0.8%	2.5%	96.6%	2.8%	8.6%	88.5%
Benzo[a]pyrene	1.4%	4.3%	94.3%	4.4%	13.3%	82.3%
Benzo[b]fluoranthene	1.7%	5.1%	93.3%	5.2%	15.7%	79.1%
Benzo[k]fluoranthene	1.5%	4.4%	94.1%	4.6%	14.0%	81.4%
Benzo[g,h,i]perylene	1.9%	5.7%	92.4%	5.7%	17.2%	77.2%
Ni	0.4%	1.1%	98.5%	1.6%	4.9%	93.5%
Alachlor metabolites	0.5%	1.4%	98.1%	2.3%	7.1%	90.6%

Table 76 Contributions of individual sources to mass flows of the assessed chemical-status parameters at the profile downstream of the Kořensko water reservoir, Average Discharge scenario, SMR ETE plus Units 1 and 2 plus New NPP ETE, according to [8]

Parameter	Q_a				Q_{355}			
	SMR ETE	Units 1 and 2	New NPP ETE	Background	SMR ETE	Units 1 and 2	New NPP ETE	Background
Fluoranthene	0.8%	2.4%	3.4%	93.3%	2.5%	7.7%	10.8%	79.0%
Benzo[a]pyrene	1.3%	4.0%	5.6%	89.0%	3.7%	11.2%	15.8%	69.3%
Benzo[b]fluoranthene	1.6%	4.7%	6.6%	87.1%	4.2%	12.9%	18.0%	64.9%
Benzo[k]fluoranthene	1.4%	4.2%	5.9%	88.6%	3.9%	11.7%	16.4%	68.0%
Benzo[g,h,i]perylene	1.7%	5.3%	7.4%	85.6%	4.6%	13.8%	19.4%	62.2%
Ni	0.4%	1.1%	1.6%	96.9%	1.5%	4.6%	6.4%	87.5%
Alachlor metabolites	0.5%	1.4%	2.0%	96.2%	2.1%	6.5%	9.1%	82.4%

Assessment of achievement or failure to achieve good water-body status

The ecological-status/potential and chemical-status assessments are aggregated for the overall assessment of the status of the affected water bodies. The overall status/potential assessment is failing for most assessed SWBs, and only DVL_0095_J is good [9, 10]. The biological and general physicochemical quality elements are the principal reason for failure to achieve good status.

In general, failure to achieve good status in the biological quality elements is caused in most cases by poorer status in one of the supporting quality elements, particularly the general physicochemical quality elements, or other quality elements assessed as failing. Modeled values for the general physicochemical quality elements according to [8] are available only for P_{total}, although this is one of the most common causes of failure to achieve good status. The assessment showed that P_{total} will remain a critical parameter causing failure to achieve good status/potential in the general physicochemical quality elements at the assessed profiles. The estimated contribution of the SMR ETE project to the other general physicochemical quality-element parameters in the ecological-status/potential assessment is very small. The principal source underlying failure to achieve good ecological status/potential in the assessed water bodies is background mass flow in the Vltava, Lužnice, and Otava Rivers.

River-basin-specific pollutants do not cause failure to achieve good status/potential. According to assessment [9, 10], all water bodies are classified as having good status/potential in this category. Tritium is the only parameter in this group for which modeled values were calculated according to [8] for the individual scenarios. Under no option is tritium expected to cause failure to achieve good status/potential. For the other river-basin-specific pollutants, including radioactivity parameters, the calculated contribution from the SMR ETE project is very small, in the single-digit percent range. It can be assumed that, in the other affected water bodies farther downstream, dilution, particularly by the Otava River and other tributaries, will make the project's contribution to background mass flows even smaller than at the wastewater outfall, particularly under normal-flow conditions, and that river-basin-specific pollutants will not cause failure to achieve good status/potential in the future either.

Chemical status is unknown for the assessed SWBs [9, 10], except DVL_0110, which has good chemical status. No values for the chemical-status parameters were modeled according to [8] for the individual scenarios. Based on the project contributions calculated at the profile downstream of the Kořensko water reservoir [8], it can be assumed that chemical-status parameters will not cause failure to achieve good status in the future. PAH parameters are a potential risk: the contribution from the SMR ETE project alone is small under normal conditions, but may become significant in combination with the other parts of the project, meaning the SMR ETE plus Units 1 and 2 plus the New NPP ETE, and at reduced flows (Q_{355}).

4.2 Groundwater bodies

Chapter prepared by: Mgr. Pavel Eckhardt and RNDr. Hana Prchalová
This chapter is based on background study [105].

4.2.1 Current status of groundwater bodies

The requirement to assess groundwater-body status in European Union Member States arises from Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy, hereinafter the

Water Framework Directive [1], and its daughter instrument, Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration [106], as amended by Commission Directive 2014/80/EU of 20 June 2014 [107], hereinafter the Groundwater Directive. The requirements for assessing the chemical and quantitative status of groundwater bodies were transposed into Czech law primarily by Title III of Act No. 254/2001 Coll., on Water and on Amendments to Certain Acts (the Water Act), as amended [13], and Decree No. 5/2011 Coll., on the designation of hydrogeological regions and groundwater bodies, the method for assessing groundwater status, and the particulars of groundwater status monitoring and assessment programs, as amended [108], known as the Groundwater Monitoring Decree.

Principle of groundwater-body status assessment

The procedures for assessing the quantitative and chemical status of groundwater bodies differ significantly. Whereas quantitative-status assessment is based on a balance procedure, namely the ratio of actual withdrawals to natural resources at the hydrogeological-region level, chemical-status assessment is much more complex: status is assessed first at the level of individual monitoring sites, then at the level of the groundwater body's working units, and only then is the result aggregated for the groundwater body. The method is described in detail in the methodology for assessing chemical and quantitative status for the second River Basin Management Plan cycle [109]. Groundwater-body status is determined by whichever of the chemical- and quantitative-status assessments is worse. Chemical-status assessment is determined by the assessment results for individual parameters and their aggregation. Quantitative status is assessed using the balance method.

Under the Water Framework Directive (2000/60/EC) [1], both chemical and quantitative status are assessed as either good or poor.

For the purposes of assessing the effect of the SMR ETE project on groundwater-body status, the most recent groundwater-body chemical- and quantitative-status assessment, prepared for the plan update using data for 2019–2024, the fourth cycle, was used. The plan update will be published in September 2026, but these are official new data that differ quite substantially from the third-cycle results.

Assessment of groundwater-body quantitative status

Under the Water Framework Directive [1], good groundwater quantitative status is achieved where the monitored groundwater-level regime indicates that the available resource exceeds the long-term mean annual rate of abstraction. Furthermore, anthropogenic effects on groundwater quantitative status must not cause:

- Failure to achieve the environmental objectives established for surface water bodies hydraulically connected with the groundwater
- Any significant deterioration in the status of such waters

- Any significant damage to terrestrial ecosystems directly dependent on the groundwater body
- Local changes in flow direction causing or potentially causing intrusion of lower-quality or polluted water

The fundamental quantitative-status parameter is the groundwater level in wells. It is also recommended that the assessment use the following additional parameters: spring yields, surface-water flows, baseflow, and characteristic water levels of significant groundwater-connected surface-water environments. In addition to current conditions, historical long-term intensive withdrawals must also be taken into account when assessing quantitative status. Their effects may persist to the present even though they have already been reduced to an acceptable level.

The methodology used in Czechia is based on the principles of assessing the groundwater-quantity balance and on data provided for the balance and, for Quaternary groundwater bodies, on verification of minimum mean water levels and quantities abstracted.

To assess quantitative status, withdrawal ratios were calculated relative both to natural-resource values for the individual years 2019–2024 and to long-term groundwater natural-resource values for 1991–2020, expressed as medians, or 50th-percentile values, and 80th-percentile values, using data from the Czech Hydrometeorological Institute [110] and the Groundwater Resources Reassessment [111]. The Reassessment also specifies available resources for most assessed water bodies, indicating the quantity of groundwater that can be abstracted without deterioration in the status of surface waters or terrestrial ecosystems. Because fewer data are available, natural-resource values from the Hydrogeological Regionalization are expressed as long-term means. The assessment itself then consists of evaluating the ratio of actual withdrawals to natural or available groundwater resources, with the individual ratios not permitted to exceed the good-status limit, or critical thresholds.

The following values were compared for the quantitative-status assessment:

- Mean values of all groundwater withdrawals over the six-year period against long-term natural-resource values expressed as the median and 8th percentile, using Czech Hydrometeorological Institute data;
- Mean values of all groundwater withdrawals over the six-year period against long-term natural-resource values expressed as the median and 80th percentile and against available resources, using data from the Groundwater Resources Reassessment project;
- Mean values of all groundwater withdrawals over the six-year period against long-term natural-resource values;
- Mean values of all groundwater withdrawals in a given year against normal natural-resource values in that year, using Czech Hydrometeorological Institute data;
- Maximum values of all groundwater withdrawals in a given year, meaning the highest mean annual withdrawals, against the lowest normal annual natural-resource values over the entire assessed period.

When comparing withdrawals with available resources, a simple ratio is not used. Instead, the proportion of available resources remaining after the actual withdrawal is calculated: the actual withdrawal is first subtracted from the available resources, and the result is divided by the available-resource value. If the resulting ratio is less than or equal to 0.2, meaning that less than 20% of the available resources remain in the region after the withdrawal, the result is poor.

The overall quantitative-status assessment also included aggregation of the individual results: if a water body failed in relation to mean values of either long-term or annual natural resources, it was classified as poor. If it failed only at the 80th percentile and/or for the ratio of the highest withdrawals to the lowest natural resources, it was classified, for working purposes, as potentially poor.

Assessment of groundwater-body chemical status

Unlike surface-water chemical status, the Groundwater Directive (2006/118/EC) [106] requires each Member State to assess parameters that may pose a risk to the natural environment or to the use of groundwater for drinking-water purposes. The assessment must cover both groundwater itself and associated aquatic and terrestrial systems. The good-status limits are then established in accordance with these requirements and, for naturally occurring substances, should also take account of background values, meaning that the good-status limit should not be lower than the natural background. For all substances, the limits should also take account of the requirements for good ecological and chemical status of associated surface water bodies, requirements for protected terrestrial ecosystems directly dependent on groundwater, and requirements for raw groundwater used for drinking-water supply. It is clear that the limits may differ for different requirements, so different limits for a single parameter may apply concurrently in one groundwater body. In such a case, the stricter requirements need be met only at locations representative of those requirements.

The assessment was therefore first conducted at the monitored sites. The characteristics of values measured by Czech Hydrometeorological Institute monitoring, including means and maximum values, were compared with threshold values for the groundwater receptor and, at selected monitoring stations, with the type-specific nitrate and ammonium-ion limits for the surface-water receptor. Because the type-specific limits for surface water are stricter than those for the groundwater receptor, these results were taken into account in the assessment only if the groundwater limit was met; otherwise, the results automatically also failed for surface water. For the assessment of groundwater use for drinking-water purposes, quality data from groundwater abstractions for drinking-water purposes were included. Their assessment procedure was essentially the same as for the Czech Hydrometeorological Institute monitoring data, except that the maximum rather than the mean was used because of the small number of values.

The assessment results for the monitoring sites and groundwater abstractions were then applied to the working units and subsequently to the groundwater bodies according to the proportion of contaminated areas. The following chemical-status parameters were assessed for groundwater

bodies according to the good-status limits listed; see Table 77. Where associated surface waters, meaning surface waters with a significant groundwater component, were present in a groundwater body, the stricter type-specific values for good ecological status of surface waters were adopted for ammonium ions and nitrates in groundwater; see Table 78.

Table 77 Parameters used to assess the chemical status of groundwater bodies and their limits

CAS No.	Substance name	Unit	Good-status limit
	Sum of 1,1,2-trichloroethene and tetrachloroethene (PCE)	µg/l	10
288-88-0	1,2,4-Triazole	µg/l	0.1
2008-58-4	2,6-Dichlorobenzamide	µg/l	0.1
	Acetochlor and its metabolites	µg/l	0.1
	Alachlor and its metabolites	µg/l	0.1
83643-88-3	AMPA	µg/l	0.1
7440-38-2	Arsenic and its compounds	µg/l	10
	Atrazine and its metabolites	µg/l	0.1
25057-89-0	Bentazone	µg/l	0.1
71-43-2	Benzene	µg/l	1
50-32-8	Benzo(a)pyrene	µg/l	0.01
205-99-2	Benzo(b)fluoranthene	µg/l	0.03
191-24-2	Benzo(g,h,i)perylene	µg/l	0.002
207-08-9	Benzo(k)fluoranthene	µg/l	0.03
1702-17-6	Clopyralid	µg/l	0.1
	Dimethachlor and its metabolites	µg/l	0.1
	Dimethenamid and its metabolites	µg/l	0.1
1071-83-6	Glyphosate	µg/l	0.1
51235-04-2	Hexazinone	µg/l	0.1
7429-90-5	Aluminum and its compounds	µg/l	200
	Chloridazon and its metabolites	µg/l	0.1
	Chlorothalonil metabolites	µg/l	0.1
193-39-5	Indeno(1,2,3-cd)pyrene	µg/l	0.002
7440-43-9	Cadmium and its compounds	µg/l	0.25
	Metazachlor and its metabolites	µg/l	0.1
	Metolachlor and its metabolites	µg/l	0.1
	Metribuzin and its metabolites	µg/l	0.1
91-20-3	Naphthalene	µg/l	0.1
7439-92-1	Lead and its compounds	µg/l	1.2
106700-29-2	Pethoxamid	µg/l	0.1
	Sum of pesticides and their metabolites	µg/l	0.5
7439-97-6	Mercury and its compounds	µg/l	0.05
7440-02-0	Nickel and its compounds	µg/l	20
67-66-3	Trichloromethane	µg/l	2.5
	Acid-neutralizing capacity to pH 4.5*	mmol/l	0.2
	Ammonium ions	mg/l	0.5
	Nitrates	mg/l	50
	Nitrites	mg/l	0.5
	Chlorides	mg/l	200
	Phosphates	mg/l	0.5
	Cyanides	mg/l	0.05
	Sulfates	mg/l	400
	Hydrogen carbonates	mg/l	10

Table 78 Parameters used to assess the chemical status of groundwater bodies in relation to associated surface waters and their limits

CAS No.	Substance name	Unit	Good-status limit
	Ammonium ions	mg/l	0.21; 0.3
	Nitrates	mg/l	15.5; 16.82; 19.92

Current status assessment of groundwater bodies potentially affected by SMR ETE construction and operation

The planned SMR ETE development itself lies in groundwater body 63201, Crystalline Rocks in the Middle Vltava Basin, Southern Part. For the purposes of assessing the effect of the SMR ETE project, however, other groundwater bodies or working units must also be taken into account.

Groundwater bodies potentially affected by construction of the SMR ETE project

Groundwater bodies potentially affected by construction may include those affected by changes in water quantity and chemical composition, primarily basic-layer groundwater body 63201, Crystalline Rocks in the Middle Vltava Basin, Southern Part. More distant basic-layer bodies are 21600, České Budějovice Basin; 63101, Crystalline Rocks in the Upper Vltava and Úhlava Basins; and 21510, Třeboň Basin, Northern Part; together with upper-layer body 12300, Quaternary Deposits of the Otava and Blanice. The location of groundwater bodies around SMR ETE is shown in the following figure (Fig. 27).

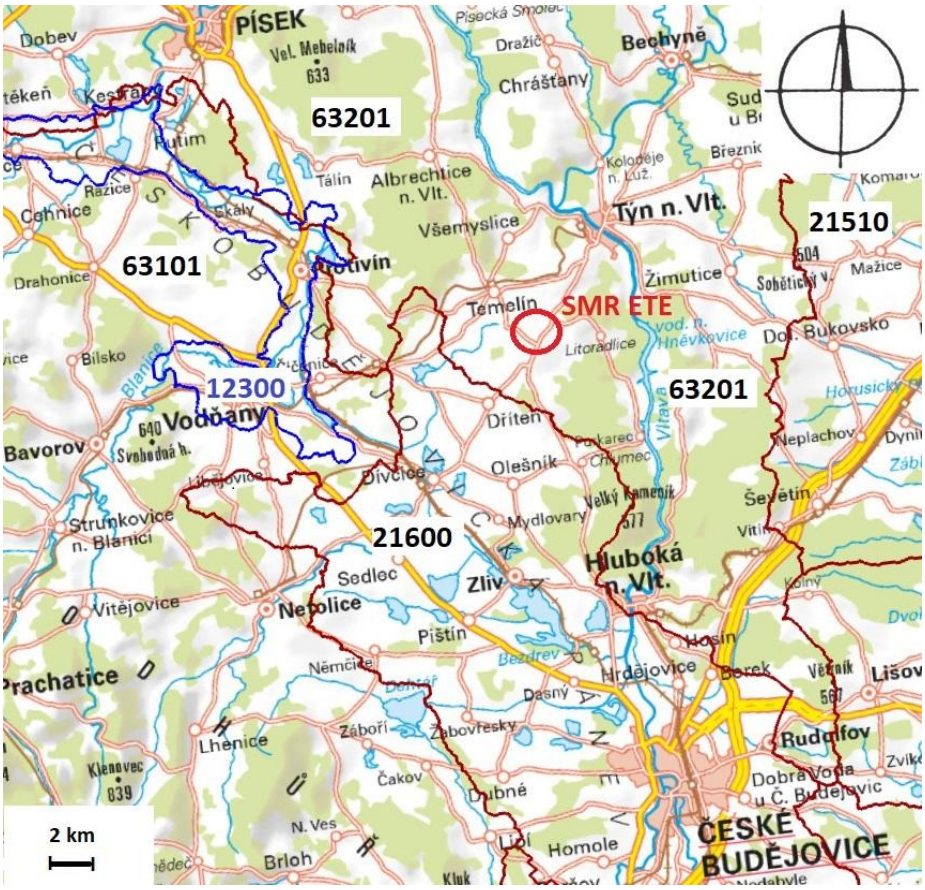


Fig. 27 Location of groundwater bodies surrounding the SMR ETE project. Upper-layer bodies are shown in blue and basic-layer bodies in black

The construction effect will decrease downstream along the watercourses and will be unmeasurable at the latest after the confluence with Bílý Stream, or after homogenization and retention in Bělohůrecký fishpond. Similarly, the effect of construction on groundwater will not be measurable after Strouha Stream and Palečkův Stream enter the Vltava. Consequently, the more distant groundwater bodies will not be affected by construction and are not assessed further. The effect of construction of the SMR ETE project on groundwater bodies could therefore be significant only for body 63201 and the somewhat more distant body 21600. The boundary between these bodies runs approximately through the confluence of Temelínecký Stream with Bílý Stream; Bělohůrecký fishpond already lies within groundwater body 21600. The current status assessment of the bodies potentially affected by the project is presented clearly in Table 79 (in the direction away from the SMR ETE site):

Table 79 Status assessment of groundwater bodies potentially affected by construction of the SMR ETE project

Body ID	Groundwater body name	Area (km²)	Quantitative status assessment	Chemical status assessment
63201	Crystalline rocks in the Middle Vltava catchment – southern part	2,852.8	good	poor (pesticides)
21600	České Budějovice Basin	449.1	good	good

Some groundwater bodies are too extensive, so the assessment must be presented by working unit or, where applicable, by individual monitoring point. In this case, the České Budějovice Basin consists of only one working unit, so the status of the body is identical to that of the working unit. The situation is different for body 63201, which is divided into 38 units.

The entire SMR ETE construction area lies within two working units with areas of 38.7 and 25.9 km^2; however, neither contains an assessed monitoring point. Given the minimal significant anthropogenic pressures other than agricultural land use, it may be assumed that, as in the neighboring working units, chemical status is good except for certain pesticide metabolites.

Groundwater bodies and working units potentially affected by operation of the SMR ETE project

Groundwater bodies potentially affected by operation of the SMR ETE project are located both around the facility itself and along the Vltava downstream of the Kořensko waterworks, where wastewater will be discharged. The assignment for this study required an assessment of the effect on groundwater bodies along the Vltava from the discharge point at Kořensko to the confluence with the Sázava. These comprise basic-layer groundwater body 63201 – Crystalline rocks in the Middle Vltava catchment – southern part, which extends from the discharge point at Kořensko to the confluence of the Vltava and Otava rivers (the backwater of Orlík Reservoir). The Vltava then flows through basic-layer groundwater body 63204 – Crystalline rocks in the Middle Vltava catchment – northern part; downstream of Kamýk nad Vltavou it flows through body 63203 – Crystalline rocks in the Middle Vltava catchment – Vltava inter-catchment from the confluence with Vápenický Stream to Slapy; and downstream of the Slapy Dam it again flows through groundwater body 63204. Downstream of the Štěchovice Dam, the right bank remains within groundwater body 63204, while the left bank lies within basic-layer body 62500 – Proterozoic and Paleozoic rocks in the catchments of the Vltava tributaries, as far as the confluence of the Vltava and Sázava rivers. The locations of the groundwater bodies in the section of interest along the Vltava from Kořensko to the confluence with the Sázava are shown in Fig. 28; their current status assessments are presented in Table 80.

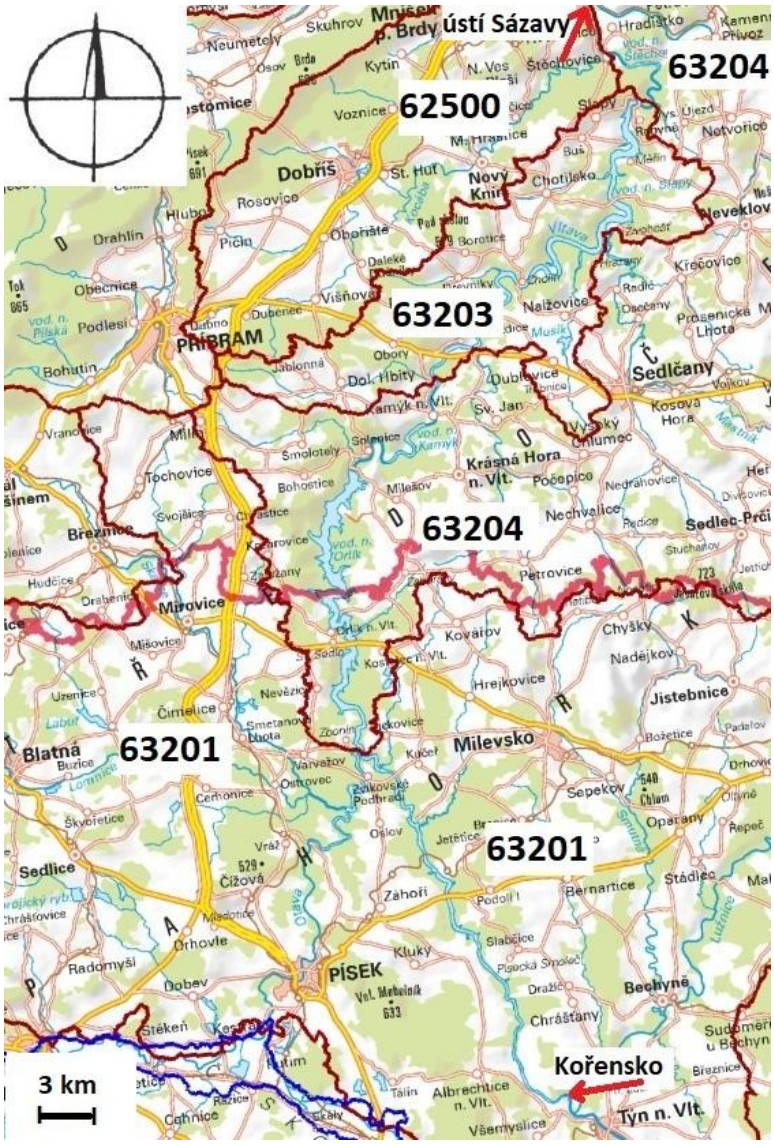


Fig. 28 **Locations of groundwater bodies in the section from Kořensko to the mouth of the Sázava**

Table 80 **Current status assessment of groundwater bodies potentially affected by operation of the SMR ETE project**

Body ID	Groundwater body name	Area (km^2)	Quantitative status assessment	Chemical status assessment
63201	Crystalline rocks in the Middle Vltava catchment – southern part	2,852.8	good	poor (pesticides)
63204	Crystalline rocks in the Middle Vltava catchment – northern part	2,393.1	good	good
63203	Crystalline rocks in the Middle Vltava catchment – Vltava inter-catchment from the confluence with Vápenický Stream to Slapy	264.6	good	poor (nitrates, pesticides)
62500	Proterozoic and Paleozoic rocks in the catchments of the Vltava tributaries	1,181.5	good	good

In the area that may be affected by wastewater discharge at Kořensko, all groundwater bodies except 63203 are too large, and the relevant working units must therefore be considered, as shown in the following Table 81.

Table 81 Assessment of relevant groundwater-body working units

Body ID	Groundwater-body working unit ID	Area (km²)	Chemical status assessment
63201	632010225	27.4	unknown
63201	632010227	255.6	unknown
63204	632040246	121.6	unknown
63204	632040247	54.6	unknown
63204	632040248	45.9	poor (nitrates, pesticides)
63204	632040254	14.1	unknown
63203	632030280	264.6	poor (nitrates, pesticides)
63204	632040256	31.2	unknown
62500	625000115	313.2	good (only the nitrate criterion for associated aquatic ecosystems is not met)

Note: The working units are ordered downstream along the Vltava from Kořensko.

4.2.2 Effect of the SMR ETE project on the status of groundwater bodies

The assessment of the effect of the SMR ETE project on the status of groundwater bodies in the wider area is divided into an assessment of effects during construction, an assessment during facility operation, and overall summaries for the chemical and quantitative status of groundwater bodies. The assessment is based on the underlying study [105].

Effect of construction on groundwater in the wider area during the construction phase

This part of the assessment addresses temporary effects during construction.

During construction, topsoil and subsoil will be stripped at the site and rough grading will be carried out, leveling the construction area. Extensive impermeable surfaces will be created and stormwater will be drained from them.

The construction site will be dewatered. The most intensive pumping will take place in the excavation on the SMR site (excavation dimensions 50 × 50 m, depth 26 m).

The site and supporting areas will contain construction facilities, accommodate a larger workforce and greater numbers of construction machines, trucks and passenger vehicles, and be used for parking and equipment maintenance. Topsoil and subsoil will be stripped from part of the area and rough grading will be carried out. Heating will be provided by a boiler plant.

A local lowering of the groundwater level will therefore occur in the SMR ETE construction area over an area of 50 × 50 m; the cone of depression may extend over an area of up to approximately 150 × 150 m.

Pumped groundwater and stormwater from paved surfaces will be conveyed to Dvorčice Pond and nearby watercourses. These are the headwater areas of the watercourses, so the difference between the pumped water and the water naturally discharged from springs will be small. The effect of the discharge will diminish downstream along the watercourses. The watercourses have a drainage function in the area of interest.

Operation of machinery and the boiler plant may locally increase the concentrations of certain substances, particularly C_{10}–C_{40} hydrocarbons, in shallow groundwater. The production and placement of concrete mixtures may locally increase concentrations of calcium, bicarbonates, and total dissolved solids in shallow groundwater. The listed parameters are not relevant to assessment of groundwater-body status.

Conversely, the application of substances from existing agricultural activity, particularly fertilizers and pesticides, will cease and the associated input to groundwater will decrease. This may reduce certain parameters, for example concentrations of nitrates, ammonium ions, individual pesticides, or total phosphorus.

Conveying stormwater to surface waters will not have a material effect on groundwater quality, because some stormwater would enter the watercourses in any event, shallow groundwater has low dissolved-solids content, and the watercourses have a drainage function in the area. Consequently, there is no substantial infiltration of surface water from the watercourses into groundwater.

No significant groundwater abstraction area used for drinking-water purposes lies within the reach of changes in watercourse quality and flow caused by construction of the SMR ETE project. The nearest groundwater abstraction (groundwater abstraction ID 111068) is located within the Units 1 and 2 site. It lowers the groundwater level beneath building foundations at a rate of approximately 1.6 l/s [11]. The second-nearest registered groundwater abstraction is located north of the area of interest (groundwater abstraction ID 111155). It supplies water for industrial use by Dynín Bohunice nad Vltavou agricultural services, specifically for the production of industrial livestock feed, at a rate of 0.4 l/s [11]. This abstraction is located near the municipality of Bohunice nad Vltavou outside the catchment of interest and will not be affected by construction or normal operation of the SMR ETE project. The third-nearest registered groundwater abstraction is located east-northeast of the SMR ETE construction site (groundwater abstraction ID 111117). It is a former abstraction for agricultural livestock production operated by ZD Nova Lhota pod Horami until 2021 at a rate of approximately 0.25 l/s [11]. The abstraction took place in the Bílý Stream catchment northwest of the settlement of Lhota pod Horami. This abstraction was outside the catchment of interest and will not be affected by construction or normal operation of the SMR ETE project.

The area of interest around Units 1 and 2 was depopulated in the past, including the municipalities of Křtěnov, Knín, and Temelínec. The nearest existing municipality, Kočín, does

not lie within a catchment where groundwater could be affected by construction of the SMR ETE project; the same applies to the built-up area of the municipality of Temelín.

On the basis of the available information, it may be concluded that construction is not expected to cause even a temporary deterioration in the chemical or quantitative status of groundwater bodies or in the status of their working units. With respect to chemical status during construction, no significant input of pollutants relevant to groundwater-body status assessment is expected. With respect to quantitative status, although water will be pumped from the excavation, the scale of pumping and the extent of the cone of depression mean that the effect will be local only and will not affect the status of groundwater bodies.

Effect of construction on groundwater in the wider area during operation

This part of the assessment addresses effects on the wider surroundings of the SMR ETE project during operation. The groundwater bodies in the wider area are shown on the maps in Fig. 27 and Fig. 28. Effects on the more distant surroundings, including wastewater discharge, are addressed in the next subsection.

During operation of the SMR ETE project, the activities potentially affecting groundwater bodies around the facility will consist primarily of pumping groundwater from beneath building foundations and conveying stormwater to the surrounding watercourses.

Pumping groundwater from beneath the SMR ETE building foundations will create a local cone of depression with a maximum extent of 150 × 150 m. The average groundwater pumping rate will be up to approximately 2.5 l/s.

Compared with the current situation, in which some precipitation infiltrates into groundwater, some runs off over the surface, and some evaporates, stormwater averaging approximately 1 l/s will be conveyed to local watercourses. Stormwater has a lower dissolved-solids content and lower pH than groundwater. Because this is a headwater area on crystalline bedrock, the groundwater has a low dissolved-solids content. The watercourses have a drainage function in the area of interest, so there will be no significant infiltration of surface water into groundwater and conveying stormwater will therefore have no material effect on groundwater quality.

No significant groundwater abstraction area used for drinking-water purposes lies within the reach of changes in watercourse quality and flow caused by operation of the proposed SMR ETE facility. The nearest groundwater abstraction (groundwater abstraction ID 111068) is located within the Units 1 and 2 site. It lowers the groundwater level beneath building foundations at a rate of approximately 1.6 l/s [11]. The second-nearest registered groundwater abstraction is located north of the area of interest (groundwater abstraction ID 111155). It supplies water for industrial use by Dynín Bohunice nad Vltavou agricultural services, specifically for the production of industrial livestock feed, at a rate of 0.4 l/s [11]. This abstraction is located near the municipality of Bohunice nad Vltavou outside the catchment of interest and will not be affected by construction or normal operation of the SMR ETE project. The third-nearest registered groundwater abstraction is located east-northeast of the SMR ETE construction site (groundwater abstraction ID 111117). It is a former abstraction for agricultural

livestock production operated by ZD Nova Lhota pod Horami until 2021 at a rate of approximately 0.25 l/s [11]. The abstraction took place in the Bílý Stream catchment northwest of the settlement of Lhota pod Horami. This abstraction was outside the catchment of interest and will not be affected by construction or normal operation of the SMR ETE project.

The area of interest around Units 1 and 2 was depopulated in the past, including the municipalities of Křtěnov, Knín, and Temelínec. The nearest existing municipality, Kočín, does not lie within a catchment where groundwater could be affected by construction of the SMR ETE project; the same applies to the built-up area of the municipality of Temelín.

With respect to groundwater-body status, it may be concluded that operation in the vicinity of the SMR ETE project is not expected to cause even a temporary deterioration in the chemical or quantitative status of groundwater bodies or in the status of their working units. With respect to chemical status, operation of the SMR ETE project is not expected to cause any significant input of relevant pollutants around the construction site. With respect to quantitative status, although water will be pumped from the excavation, the scale of pumping and the extent of the cone of depression mean that the effect will be local only and will not affect the status of groundwater bodies.

Effect of operation of the SMR ETE project on groundwater-body status

While construction will primarily affect minor watercourses around ETE, operational effects will, to some extent, also affect the Vltava and its surroundings downstream of Kořensko Reservoir. The assessment of project effects is based on the available information (for details, see [105]).

No significant groundwater abstraction area that could be affected by normal operation of the SMR ETE project lies within the reach of changes in watercourse quality and flow caused by such operation; for details, see [105]. The area of interest around Units 1 and 2 was depopulated in the past, including the municipalities of Křtěnov, Knín, and Temelínec. No significant hydrogeological structures occur at the site of interest or in its immediate vicinity.

Effect of surface-water abstraction and wastewater discharge on groundwater-body status

Wastewater from the SMR ETE project is planned to be discharged into the Vltava at Kořensko through the shared outlet used by Units 1 and 2 and the New NPP ETE. As required by the assignment, the cumulative effect on groundwater bodies of surface-water abstraction and wastewater discharge from all three facilities was assessed for the section from Kořensko to the confluence of the Sázava and Vltava rivers.

Water consumption by the existing Units 1 and 2 is already included in the flow values. Based on the annual quantities of raw water abstracted and wastewater discharged, average water consumption of 0.27 m^3/s is assumed for the SMR ETE project and 1.64 m^3/s for the New NPP ETE. This change in flow is negligible compared with the long-term mean flow at the Kořensko profile (49.1 m^3/s). No significant change in Q_{355} flow is expected because, during dry periods, low flows in the Vltava will be augmented through reservoir operations on the Vltava. Surface-

water abstraction for the SMR ETE project will therefore have no significant effect on groundwater quantity or levels.

The Kořensko waterworks, where the discharge occurs, is immediately followed by the next part of the Vltava Cascade. The Vltava then flows through Prague and enters the Elbe approximately 200 km downstream of the Kořensko waterworks.

When assessing the effect of the SMR ETE project on groundwater status, a distinction must be made between the groundwater-body level, the level of relevant working units, and groundwater sources used for drinking-water purposes.

For quantitative status, there is no reason to consider the sources in use: all are too far away, and even if a source were affected in quantitative terms, this would not mean that the effect was significant enough to jeopardize the quantitative status of the entire body. Moreover, given the available data on natural and available groundwater resources, quantitative status can be assessed at the level of the entire groundwater body and only exceptionally at working-unit level. With respect to quantitative status, the effect of operation of the SMR ETE project will be the same as during construction, because groundwater pumping will continue on approximately the same or a smaller scale. An adverse effect on body status can therefore be excluded.

Distinguishing the effect of the SMR ETE project at the individual levels is relevant only to the assessment of chemical status. In general, given the scale involved, the SMR ETE project may have its greatest adverse effect on sources in use; any effect on working units will certainly be smaller, and the effect on groundwater bodies smaller still. For this reason, groundwater sources used for drinking-water purposes are assessed first.

Discharges from the SMR ETE project can affect groundwater sources in use only where significant infiltration of surface water into groundwater occurs. The entire assessed section of the Vltava from the wastewater discharge point at Kořensko to Štěchovice lies in crystalline bedrock, comprising hydrogeologic-massif rocks that generally have only low fracture permeability. There are no significant hydrogeologic structures through which infiltrated water could spread farther from the Vltava than tens or the first few hundreds of meters. Apart from the more permeable parts of floodplains and river terraces, there are no highly permeable hydrogeologic environments. Much of the floodplain along the original Vltava channel was depopulated and inundated by reservoir water in the past. These inundated areas are not used as groundwater sources.

More substantial infiltration of surface water into groundwater may occur in the area of interest through induced bank filtration, whereby higher groundwater pumping rates can draw surface water from the Vltava at suitable locations. Some infiltration of surface water into groundwater may also occur near reservoir dams, where there is a significant difference between surface-water levels upstream and downstream of the dam.

Analysis of the locations and configuration of abstraction areas identified six groundwater abstraction areas in the area of interest, from Kořensko to the confluence of the Vltava and Sázava rivers, that could be affected by Vltava surface water downstream of the SMR ETE

wastewater discharge. These abstraction areas were therefore characterized in greater detail and examined more closely for potential effects of SMR ETE wastewater discharge on the sources. In downstream order along the Vltava, these abstraction areas are:

- Municipality of Milešov, Orlické Zlátkovice (groundwater abstraction ID: 121739)
- Municipality of Kamýk nad Vltavou (groundwater abstraction ID: 120702)
- VLTAVA Smilovice training facility (groundwater abstraction ID: 120720)
- VOS Benešov, Štěchovice (groundwater abstraction ID: 120527)
- VHS Davle, Hradišťko (groundwater abstraction ID 120502)
- A-Z THERM, Štěchovice, Masečín Hvozd (groundwater abstraction ID 120539)

The assessment found that only two of the six abstraction areas examined were relevant to potential effects on the quality of abstracted groundwater: the Municipality of Kamýk nad Vltavou abstraction and the VHS Davle Hradišťko abstraction. The individual abstraction areas examined and the results of the examination are characterized and assessed in greater detail in report [105].

Municipality of Kamýk nad Vltavou groundwater abstraction

This is an existing groundwater abstraction used for the public water supply of Kamýk nad Vltavou. The abstraction area lies on the right bank of the Vltava immediately north of the built-up area of Kamýk nad Vltavou.

In the most recent reporting year, 2024, the average abstraction rate was 1.2 l/s. Abstraction took place throughout the year. The maximum permitted abstraction volume was 60,000 m^3 per year. The actual volume abstracted in 2024 was 39,170 m^3. Abstraction has been taking place for many years. Annual abstraction volumes are also stable over the long term, at least since 2006.

A representative of Povodí Vltavy, s.p., noted that the reported abstraction is the sum of two abstractions from two abstraction areas. In addition to the Na Pile abstraction area of interest on the right bank of the Vltava, the second abstraction area for Kamýk nad Vltavou is near Humenná hill and has two abstraction wells. It lies on the left bank of the Vltava in the Zduchovický Stream catchment, beyond the potential reach of infiltration from the Vltava.

The source of interest on the right bank of the Vltava is a medium-sized groundwater source used to supply drinking water to the population. The abstraction structures lie near the Vltava in its floodplain. Some groundwater originates from precipitation infiltrating in the hinterland on the right bank of the Vltava, particularly in the water-source protection zone. Some groundwater, particularly at higher pumping rates and when inflow from the higher parts of the protection zone is lower, may originate as surface water from the Vltava that enters groundwater through induced bank filtration.

The hydrogeologic catchment, or hinterland, of the abstraction area of interest on the right bank of the Vltava covers approximately 0.3 km^2. Groundwater recharge in this area is based on

precipitation totals; long-term baseflow under dry conditions was based on the driest year in the 2010-2019 period.

The map of long-term mean baseflow [112], meaning dynamic natural groundwater resources, prepared by the Czech Geological Survey, gives a baseflow of 0.41–0.6 l/s/km^2 for 1991–2010 and only 0.01–0.2 l/s/km^2 under dry conditions. Given the small hinterland area and low baseflow values, inflow from the hinterland is approximately 0.15 l/s under mean conditions and only 0.03 l/s under dry conditions.

If a maximum average of 1.2 l/s of groundwater is abstracted from the abstraction area of interest on the right bank of the Vltava, for example if the other groundwater source is unavailable, inflow of water infiltrated from the Vltava is approximately 1.05 l/s under normal mean conditions, representing 87.5% of the abstracted quantity, and up to 1.17 l/s under dry conditions, representing 97.5% of the abstracted groundwater quantity. These figures should be regarded as maxima because the registered abstraction for Kamýk nad Vltavou also draws from another independent source and is therefore less dependent on the quality of water in the Vltava.

For the purpose of assessing the effect of the SMR ETE project on the Kamýk nad Vltavou groundwater abstraction, the high proportion of water infiltrated from the river allows the conservative assumption that only surface water will be abstracted.

The SMR ETE wastewater discharge will impair certain parameters of the quality of surface water infiltrating from the Vltava into groundwater. Changes in Vltava surface-water quality are modeled in study [8]. The described Kamýk nad Vltavou profile should be relevant to the site of interest; however, because only a minimum number of parameters were modeled at the Kamýk profile, the upstream Kořensko profile was used. As with the proportion of infiltrated water, this is a conservative assumption because the Kořensko profile can be expected to be the most affected by the SMR ETE project. Although a drinking-water source in use is being assessed here, the groundwater good-status limits are applied because they are either equal to or stricter than drinking-water limit values and also cover additional parameters not included in drinking-water requirements, such as phosphates and certain polycyclic aromatic hydrocarbons. Of the modeled values, the median values at Q_{355} flow were used, again representing the most conservative case.

The results are summarized in [105] and show that, even using the most conservative values, only aluminum fails to meet the good-status limit. The current-status results for abstraction [105] show that aluminum could not be assessed because of the high limit of quantification. The relatively stringent aluminum limit applies to a filtered sample, and filtered groundwater aluminum values are significantly lower than unfiltered values. The current aluminum concentration can likewise be expected to be similar, because the SMR ETE contribution to aluminum concentrations is only 3.4%.

If future concentrations were calculated from the modeled shares for all monitored current-status parameters, the results would be similar: at Q_{355} flow, the highest estimated SMR ETE share for nonradioactive parameters is 5.7%, for benzo[g,h,i]perylene, while all monitored

parameters that could be assessed reach no more than 30% of the limit. They are therefore unlikely to exceed it.

It may therefore be concluded that operation of the SMR ETE project will not cause deterioration of groundwater chemical status at the Kamýk nad Vltavou abstraction.

VHS Davle Hradišťko groundwater abstraction

The abstraction area lies on the right bank of the Vltava near the river, downstream of Štěchovice Reservoir. The abstraction wells lie on the right bank of the Vltava and draw from a shallow aquifer in Quaternary sediments and the near-surface fractured zone of the bedrock. This is an existing groundwater source used to obtain drinking water for the public water supply [11]. In the most recent reporting year, 2024, the average abstraction rate was 3.2 l/s. Abstraction took place throughout the year. The maximum permitted abstraction rate was 5 l/s. The actual volume abstracted in 2024 was 100,742 m^3. Abstraction has been taking place for many years. Annual abstraction volumes are also stable over the long term, with the quantity abstracted increasing over the past decade from 1.6 l/s in 2013 to 3.2 l/s in 2024. The hydrogeologic catchment, or hinterland, of the abstraction area on the right bank of the Vltava covers approximately 1.7 km^2. Groundwater recharge in this area is based on precipitation totals; long-term baseflow under dry conditions was based on the driest year in the 2010–2019 period. The map of long-term mean baseflow [112], meaning dynamic natural groundwater resources, prepared by the Czech Geological Survey, gives a baseflow of 0.81–1.0 l/s/km^2 for approximately the lower third, or western part, of the infiltration area of interest, and 0.61–0.8 l/s/km^2 under dry conditions, both for 1990–2010. For approximately the upper two-thirds, or eastern part, of the infiltration area of interest, baseflow according to the same source is 0.61–0.8 l/s/km^2, or 0.2–0.4 l/s/km^2 under dry conditions. This gives a median groundwater inflow of approximately 1.3 l/s from the abstraction-area hinterland, and only 0.73 l/s under dry conditions.

If groundwater is abstracted from the abstraction area at an average rate of 3.2 l/s, inflow of water infiltrated from the Vltava is approximately 1.9 l/s under normal mean conditions, representing 59% of the abstracted quantity, and up to 2.5 l/s under dry conditions, representing 78% of the abstracted groundwater quantity.

For the purpose of assessing the effect of the SMR ETE project on the VHS Davle Hradištko groundwater abstraction, the simplifying, conservative assumption may be made that only surface water will be abstracted.

The SMR ETE wastewater discharge will impair certain parameters of the quality of surface water infiltrating from the Vltava into groundwater. Changes in Vltava surface-water quality are modeled in study [8]. The described Štěchovice profile should be relevant to the site of interest; however, because only a minimum number of parameters were modeled at the Štěchovice profile, the upstream Kořensko profile was used. As with the proportion of infiltrated water, this is a conservative assumption because the Kořensko profile can be expected to be the most affected by the SMR ETE project. Although a drinking-water source in use is being assessed here, the groundwater good-status limits are applied because they are

either equal to or stricter than drinking-water limit values and also cover additional parameters not included in drinking-water requirements, such as phosphates and certain polycyclic aromatic hydrocarbons. Of the modeled values, the median values at Q_{355} flow were used, again representing the most conservative case.

The results correspond to the drinking-water source assessment, meaning that only aluminum fails to meet the limit. The current-status results for abstraction [105] show that aluminum was below the limit of quantification, which was equal to one-half of the limit, so the limit is not expected to be exceeded during operation of the SMR ETE project.

If future concentrations were calculated from the modeled shares for all monitored current-status parameters, the results would differ most for nitrates, which currently reach 98% of the limit. Because nitrate concentrations in surface water are significantly lower even at present, any future exceedance of the good-status limit, which is highly probable, would not be caused by operation of the SMR ETE project. All other monitored parameters that could be assessed reach no more than 25% of the limit, so they are not expected to exceed it.

It may therefore be concluded that operation of the SMR ETE project will not cause deterioration of groundwater chemical status at the VHS Davle Hradištko abstraction.

Assessment of operational effects on the chemical status of groundwater bodies

When the chemical status of groundwater bodies is assessed, status is first assessed at individual monitoring sites, then at the level of a groundwater-body working unit, and only then is the result aggregated to groundwater-body level. Chemical-status assessment is determined by the assessment results for individual parameters and their aggregation.

With respect to the chemical status of groundwater bodies, no significant input of relevant pollutants is expected around the construction site during construction or operation of the SMR ETE project. No significant groundwater abstraction area used for drinking-water purposes lies within the reach of changes in watercourse quality and flow caused by construction of the SMR ETE project. Pumping groundwater from the excavation and subsequently from beneath building foundations will have no effect on the chemical status of groundwater bodies.

Wastewater from the SMR ETE project is planned to be discharged into the Vltava at Kořensko through the shared outlet used by Units 1 and 2 and the New NPP ETE. As required by the assignment, the cumulative effect on groundwater bodies of surface-water abstraction and wastewater discharge from all three facilities was assessed for the section from Kořensko to the confluence of the Sázava and Vltava rivers. An analysis was conducted of the potential effects of wastewater discharge on groundwater abstraction areas within the reach of the discharge. The assessment found that existing significant groundwater sources used for drinking-water purposes will not be affected with respect to parameters determining the assessment of groundwater chemical status. Operation of the SMR ETE project will therefore not cause deterioration of groundwater chemical status at groundwater abstractions used for drinking-water purposes.

Operation of the SMR ETE project will not impair the chemical status of the individual relevant groundwater abstractions used for drinking-water purposes. Because the individual abstractions are most sensitive to the effects of operation of the SMR ETE project, it follows that operation will not impair the chemical status of either the working units or the groundwater bodies.

Assessment of operational effects on the quantitative status of groundwater bodies

The quantitative-status assessment of groundwater bodies is based on a water-balance method, namely the ratio of actual abstractions to natural resources at the hydrogeologic-region level.

With respect to quantitative status, water will be pumped from the excavation during construction, and groundwater will be pumped from beneath building foundations during operation of the SMR ETE project. Given the scale of pumping and the extent of the cone of depression, the effect will be local only and will not affect the status of groundwater bodies. No significant groundwater abstraction area used for drinking-water purposes lies within the reach of changes in watercourse flow caused by construction and operation of the SMR ETE project. Consequently, groundwater abstraction areas used for drinking-water purposes that are relevant to the assessment cannot be affected in any way by the planned groundwater pumping.

As demonstrated above, operation of the SMR ETE project will have no significant effect on the quantitative status of groundwater bodies.

Assessment of whether good groundwater-body status will be achieved

Under the Water Framework Directive (2000/60/EC) [1], both chemical and quantitative status are assessed as either good or poor. Groundwater-body status is determined by whichever of the chemical- and quantitative-status assessments is worse.

Neither construction nor operation of the SMR ETE project will impair the chemical status of groundwater bodies. Neither construction nor operation of the SMR ETE project will have any significant effect on the quantitative status of groundwater bodies.

On the basis of the work performed and findings described above, it may be concluded that construction and operation of the SMR ETE project will not affect whether good status of groundwater bodies is achieved.

5 Summary

5.1 Surface waters

Surface-Water Quantity: Vltava River

The current surface-water quantity in the affected area can be characterized as stabilized by water management but sensitive to climate. The climatological data show a clear increase in air temperatures, while precipitation totals predominantly exhibit altitudinal and spatial variability without an equally clear long-term trend. Higher temperatures nevertheless increase evapotranspiration demand and change the relationship between precipitation and runoff. Flows may therefore decrease even where annual precipitation totals do not show a substantial decrease.

From a hydrologic perspective, the key finding of DP07 is that 2010–2023 had lower flows than 2003–2009. Annual flows in the main profiles decreased by approximately 15–19% between the two periods. The greatest differences occur in the spring months, particularly March and April, when lower precipitation, higher temperatures, and higher evapotranspiration act in combination. At the same time, it is confirmed that water-management infrastructure mitigates, but does not eliminate, these differences [4].

From the perspective of water-management-system operation, Lipno I and Hněvkovice are the principal stabilizing elements. Lipno I has substantially greater active storage and allows flows to be augmented at downstream Vltava profiles. Hněvkovice is the immediate raw-water source for the Temelín site and also a profile at which accurate water-balance assessment is particularly important. Kořensko is the downstream control profile incorporating the effects of the Vltava, the Lužnice, the incremental catchment, and discharges from the ETE site.

For the EIA Documentation, it is important that current conditions cannot be assessed solely from historical averages or solely from observed flows. The current 2010–2023 period, long-term climatological data, derived natural flows, reservoir operating data, and water-management-system modeling results must be combined. This combination is used in supporting documents DP20, DP20A, and DP07 and provides a consistent framework for the subsequent assessment of the effects of the SMR ETE project.

In summary, the current quantity of surface water in the area of interest is sufficient under normal and modeled current hydrologic conditions to meet existing water-management requirements, including minimum flows at the main control profiles. At the same time, trends and changes are apparent that reduce flows in the current period compared with the higher-flow reference period 2003–2009 and increase the importance of managing reservoir active storage. These facts constitute the baseline conditions for the subsequent assessment of project effects on surface-water quantity. In terms of surface-water quantity, the SMR ETE project represents an additional requirement for raw-water abstraction from the Hněvkovice waterworks and additional wastewater discharge at the Kořensko profile. In the cumulative 5,600 MWe plus SMR ETE scenario, total annual abstraction is 134.9 million m^3 and total annual discharge is

30.0 million m^3. The SMR ETE project itself accounts for approximately 8.9% of total abstraction and approximately 11.9% of total discharge.

Water-management modeling for current hydrologic conditions and warming of 2 °C demonstrates reliable abstraction for ETE and compliance with minimum-flow requirements downstream of the Lipno II, Hněvkovice, and Kořensko waterworks. Under these conditions, the effect of the SMR ETE project on surface-water quantity is not assessed as significantly adverse.

Under climate-change conditions, the overall assessment depends on the climate model used. For the EC-Earth3, MPI-ESM1-2-HR, and ALADIN-CLIMATE/CZ models, abstractions under scenario SSP2-4.5 are reliable for both 2060 and 2080. The TaiESM1 model, however, indicates a significant reduction in the reliability of abstractions and minimum flows, particularly by 2080. This result is an important limiting signal and indicates that under adverse climate development the total cumulative load on the water-management system, rather than the isolated contribution of the SMR ETE project, may be decisive.

In summary, under current conditions and most modeled future conditions, the SMR ETE project is compatible with the functioning of the Vltava water-management system in terms of surface-water quantity. At the same time, the assessment confirms the need to update hydrologic and climate data continuously and to monitor actual technological water-abstraction and discharge requirements during subsequent preparation stages and long-term project operation. Compared with the operating life, and potential climate-change development, the preparation period will be relatively short.

DP29 [7] confirms that, under current hydrologic conditions, the Vltava Cascade can meet the minimum-flow requirement at the Vrané waterworks profile and the minimum residual-flow requirement at the Prague-Chuchle profile for the assumed 5,600 MWe plus SMR ETE capacity scenario. The reliability of meeting these requirements is 99.9%, and under current conditions the SMR ETE project is not a limiting factor for the lower part of the cascade.

The uncertainty of climate models becomes significant under climate-change conditions. Under the more favorable or intermediate models, the reliability of meeting requirements remains predominantly very high. The most adverse model, TaiESM1, indicates a reduction in reliability below the recommended values, particularly for reference year 2080. This scenario is important as a limiting case for assessing system resilience.

The effect of the SMR ETE project on the Vltava Cascade therefore cannot be assessed in isolation. Its significance lies in increasing the cumulative water-abstraction requirement at the Temelín site. Under current conditions, this requirement is met by the water-management system; under adverse climate projections, however, it reduces the reserve available in reservoir active storage, particularly at Orlík and Slapy.

The EIA Documentation should therefore state that the effect of the SMR ETE project on the Vltava Cascade is acceptable under current hydrologic conditions, but its long-term assessment is conditional on regular updates of climate scenarios, hydrologic series, actual technological water requirements, and the operating assumptions governing Vltava Cascade operations. In

view of potential climate-change development, waterworks operating rules may also be reassessed in the future, for example by reducing the required flow, which would produce different reliability results. The effect of the project itself would essentially be negligible because climate change would be the dominant influence.

Surface-water quality – Vltava

Data on selected nonradioactive parameters and temperature available for the area of interest were processed to describe current surface-water quality in 2015–2024 in terms of legislative requirements, specifically Government Decree No. 401/2015 Coll. [14], covering the general assessment of permissible surface-water pollution and use for drinking-water treatment and bathing; the assessment of the ecological potential of flowing or standing surface-water bodies, specifically the good/moderate potential boundary for the relevant water-body type [18, 23, 25]; and requirements for the protection of waters suitable for fish life and reproduction [12].

The range of parameters monitored differs among profiles, and data are missing at some profiles, so the assessment is limited by data availability at each profile. With respect to Government Decree No. 401/2015 Coll. [14], the requirements were reliably met for temperature, N_{total}, $N\text{-}NO_3^-$, $N\text{-}NO_2^-$, $N\text{-}NH_4^+$, DS_{105}, Cl^-, SO_4^{2-}, Mg, Ca, benzo[k]fluoranthene, dissolved Ni, phenanthrene, pyrene, EDTA, Al, metolachlor and its metabolites, and terbuthylazine and its metabolites. Attainment or exceedance of the requirements at least at one profile was identified for pH, dissolved oxygen, BOD_5, COD_{Cr}, TOC, P_{total}, SS_{105}, fluoranthene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[g,h,i]perylene, AOX, and alachlor metabolites. The assessment shows that attainment or exceedance of requirements for many parameters occurs not only in the catchment affected by the existing Units 1 and 2 and, in the future, by the SMR ETE project and New NPP ETE, but also at reference profiles upstream of the affected area. From this perspective, the most problematic tributary is the Lužnice, assessed at the Lužnice-Bechyně profile. With respect to requirements for the protection of waters suitable for fish life and reproduction [12], attainment or exceedance of the requirements was assessed for $N\text{-}NH_4^+$, or NH_4^+, and dissolved oxygen. Assessment of temporal development in 2015–2024 identified no statistically significant trend in temperature or in the concentrations of BOD_5, $N\text{-}NO_3^-$, SS_{105}, benzo[a]pyrene, Al, or terbuthylazine and its metabolites. Improvement, meaning decreasing concentrations over time, or increasing concentrations in the case of oxygen, was assessed at least at one profile for pH, oxygen, $N\text{-}NH_4^+$, SO_4^{2-}, Ca, fluoranthene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[g,h,i]perylene, AOX, phenanthrene, pyrene, EDTA, and alachlor metabolites. Conversely, deterioration, meaning a significant upward trend in values or a downward trend in the case of oxygen, was identified at least at one profile in 2015–2024 for pH, oxygen, COD_{Cr}, TOC, P_{total}, N_{total}, $N\text{-}NO_2^-$, $N\text{-}NH_4^+$, DS_{105}, Cl^-, SO_4^{2-}, Mg, Ca, dissolved Ni, and metolachlor and its metabolites.

Data on selected radioactivity parameters available for the area of interest were processed to describe conditions in 2015–2024 in terms of the legislative requirements of Government Decree No. 401/2015 Coll. [14]. The significant radioactivity parameters cα, cβ, cβ-^{40}K, ^{137}Cs, ^{90}Sr, and ^{3}H were assessed. The range of parameters monitored differs among profiles, and data

are missing at some profiles, so the assessment is limited by data availability at each profile. With respect to Government Decree No. 401/2015 Coll. [14], the requirements were reliably met for all parameters assessed. Assessment of temporal development identified no statistically significant trend in activity concentrations for cβ-^{40}K. Improvement, meaning a decrease in activity concentrations during the period monitored, was assessed at least at one profile for cα, ^{137}Cs, ^{90}Sr, and ^{3}H. Conversely, a significant upward trend in values during the period monitored was identified for cβ at the Hněvkovice downstream profile.

The effect of operation of the SMR ETE project on surface-water quality was estimated for concurrent operation with the existing Units 1 and 2 and, where applicable, the New NPP ETE, resulting in two capacity scenarios:

1. SMR ETE + Units 1 and 2
2. SMR ETE + Units 1 and 2 + two 1 700 MWe New NPP ETE units

For both scenarios, the effect of operation of the SMR ETE project was modeled at critical profiles for two hydrologic situations:

1. "Normal flow": long-term mean flow (Q_a) was used for the modeling
2. "Drought, effect of climate change": flow Q_{355} was used for the modeling

In addition, maximum or minimum values were modeled at the profile downstream of Kořensko Reservoir using the minimum guaranteed flow (Q_{guar}).

The modeling was also conducted for two discharge scenarios:

1. Average Discharge.
2. Maximum Discharge

At the profile downstream of Kořensko Reservoir, immediately downstream of the project wastewater outfall, the modeled average concentrations were assessed as failing for organic-matter and oxygen-regime parameters (BOD_5, COD_{Cr}, TOC), P_{total} in terms of bathing-water requirements, and PAH parameters (fluoranthene, benzo[a]pyrene), for both capacity scenarios and both flow situations (Q_a and Q_{355}). In terms of maximum values, additional PAH parameters failed to meet the requirements: benzo[b]fluoranthene, benzo[g,h,i]perylene, and also benzo[k]fluoranthene for capacity scenario 2, together with pH. It should be noted that inflow from the Lužnice is the principal contributor to this pollution of the Vltava at the downstream Kořensko profile, particularly under normal flow conditions.

Another profile assessed was the Zvíkovský Bridge profile on Orlík Reservoir, which is the representative profile for water body HVL_1055_J – Orlík I Reservoir on the Vltava. Only a limited range of data was available at this profile, so it was not possible to model project effects for all parameters. Of the parameters modeled, TOC and P_{total} remain problematic for both capacity scenarios and both flow situations (Q_a and Q_{355}).

The Solenice profile was assessed with respect to surface-water abstraction for drinking-water purposes. From this perspective, TOC remains problematic for both capacity scenarios and both flow situations (Q_a and Q_{355}).

Another critical profile was Kamýk nad Vltavou. This is the representative profile for water body DVL_0030 – Vltava from the Orlík Reservoir dam to the backwater of Slapy Reservoir. The modeled concentrations failed to meet the requirements for good ecological potential of the water body for both total phosphorus and phosphate phosphorus, under both capacity scenarios and both flow situations (Q_a and Q_{355}).

The final profile assessed was Štěchovice, where salmonid waters occur. Modeled concentrations exceeded the requirement for N-NH_4^+ for both capacity scenarios and both flow situations (Q_a and Q_{355}). The project contribution to the N-NH_4^+ load is insignificant.

Overall, at the profile downstream of Kořensko Reservoir and at other critical profiles farther downstream along the affected Vltava, water quality fails to meet legislative values derived from different types of requirements. The existing surface-water quality, particularly polluted water from the Lužnice, is the decisive influence. The SMR ETE contribution to this pollution is very small: wastewater from the SMR ETE project accounts for tenths of a percent to several percent of the mass flow of the assessed parameters in the receiving water.

In summary, under both capacity scenarios the receiving water meets the legislative requirements for radioactivity parameters in both flow situations (Q_a and Q_{355}). The exception is tritium, which fails to meet the indicative value for water intended for drinking-water use at the Solenice profile under the adverse combination of maximum discharge and climate-change flow conditions, meaning low flows. This problem may also be reflected farther downstream at the Prague-Podolí profile. Modeling of maximum activity concentrations showed that they will not normally fail to meet the requirements at the profile downstream of Kořensko Reservoir. Concurrent discharges from the individual components of the assessed capacity scenarios must nevertheless be coordinated, and the flow situation in the receiving water must be taken into account, to prevent the extreme simultaneous occurrence of a very low receiving-water flow and discharge of the maximum permitted instantaneous quantity of these parameters.

For the future, supplementary surface-water quality monitoring may also be recommended for assessing the effects of the SMR ETE project.

Minor watercourses around the SMR ETE project

Of the minor watercourses, Strouha Stream and Dvorčický Stream may be affected.

Strouha Stream will be the main receiving water for stormwater and pumped groundwater drained from the SMR ETE site. These waters will enter Strouha Stream through the safety basins between Libívský and Mlýnský fishponds. Downstream of the outfall, these waters will affect both the quantity, or flow, and the quality of Strouha Stream.

The anticipated quantity of stormwater and pumped groundwater from the entire SMR ETE site is up to 238,000 m^3/year; from all three parts of ETE, namely Units 1 and 2, the New NPP ETE, and the SMR ETE project, it may reach up to 759,000 m^3/year. Conveyance of some of this water to Dvorčice Pond and Dvorčický Stream is currently being considered. The quantities currently discussed average approximately 1.2 l/s of stormwater and 1 l/s of groundwater, or

2.2 l/s in total. Most water drained from the site will nevertheless continue to be directed to Strouha Stream. Based on the above, the average flow in Strouha downstream of the drained-water outfall may be expected to increase by approximately 5.3 l/s compared with the current flow of approximately 13 l/s.

As regards the current qualitative parameters of these drained waters, they meet the requirements of Government Decree No. 401/2015 Coll. for most parameters. [14] However, their quality is slightly impaired for certain parameters, specifically total phosphorus, SS_{105}, ammoniacal nitrogen, TOC, and PAHs. Because no significant change is expected in the composition of the drained water compared with the current situation, namely water drained from Units 1 and 2, and only its quantity will increase, no fundamental change in the quality of water in Strouha Stream is expected. The total input of substances to the receiving water may nevertheless increase.

In addition to the drained-water outfall, minor watercourses around the SMR ETE project may be affected by lowered groundwater levels caused by pumping and reduced precipitation infiltration. The headwater areas of both watercourses, Strouha Stream and Dvorčický Stream, lie immediately adjacent to the SMR ETE site, where the streams flow from Karlovec Pond and Dvorčice Pond, respectively. Groundwater inflow accounts for a decisive share of water inflow to these fishponds and will be reduced by the lowering of groundwater levels.

This effect on Karlovec Pond and Strouha Stream flowing from it is only indirect and partial; for Dvorčice Pond and Dvorčický Stream, this factor is decisive. Weakening the natural headwater area upstream of Dvorčice Pond as a result of construction of the SMR ETE project would jeopardize the very existence of Dvorčice Pond and of Dvorčický Stream, which it supplies. Controlled augmentation of Dvorčice Pond and Dvorčický Stream with water drained from the SMR ETE site at an average rate of 2.2 l/s appears to be essential to preserving their ecological functions.

A historic millrace runs through the municipality of Kočín and connects Dvorčický Stream with the Dříteňský Stream catchment. At higher flows resulting from the conveyance of some stormwater and groundwater from the SMR ETE site, this millrace could be used to supply the fishpond system near Dříteň.

No systematic data are available on water quality in Dvorčice Pond, Dvorčický Stream, or the millrace in Kočín, so only short-term, limited monitoring conducted for the study could be used. This monitoring showed that current water quality in the Dvorčický Stream catchment is good. Groundwater from the SMR ETE site that could be used to augment Dvorčice Pond and Dvorčický Stream is suitable in terms of quality. Stormwater, including runoff from the site, may nevertheless have impaired quality with respect to phosphorus, nitrogen, and TOC. Measures are therefore required to prevent deterioration of water quality in Dvorčice Pond and the connected watercourses, Dvorčický Stream and the millrace through Kočín. These may include an upstream retention basin within the SMR ETE site and oil separators.

Furthermore, given the lack of flow and water-quality data for the minor watercourses affected by the SMR ETE project, systematic monitoring of both water quantity and quality in these watercourses should be recommended.

Several biocenters and biocorridors forming part of the territorial system of ecological stability are designated along both watercourses, Strouha Stream and Dvorčický Stream. Under the scenario without conveyance of groundwater and stormwater to Dvorčický Stream, the anticipated effects of construction and operation of the SMR ETE project will include a significant reduction in surface-water and groundwater runoff, with a significant adverse effect on the functioning of the local territorial system of ecological stability. Under the scenario involving controlled augmentation of the Dvorčický Stream catchment with the recommended quantity of water, runoff will not decrease compared with current conditions and the function of the biocorridors and biocenters will be preserved for aquatic organisms during most of the year. Suitable measures are similarly recommended to compensate for the adverse effect on Karlovec Pond and the upper reach of Strouha Stream.

Status of surface-water bodies

The assessment of the effect of operation of the SMR ETE project on the status or potential of affected surface-water bodies focused on the Vltava downstream of the discharge point at Kořensko, including the reservoirs of the Vltava Cascade: Orlík, Kamýk, Slapy, and Štěchovice. This section contains a total of six water bodies.

According to the current water-body status assessment under the third planning cycle [9, 10], the status of most of these water bodies is assessed as failing. The only exception is the status of the Slapy Reservoir on the Vltava SWB (DVL_0095_J), which is assessed as good. The other water bodies fail because they do not achieve good ecological status/potential, which is attributable, in addition to the biological quality elements, primarily to P_{total} and, in some cases, O_2 saturation or temperature.

The assessment of the effect of the SMR ETE project on surface-water-body status was based on a study prepared in 2025 [8], which modeled concentrations of selected substances in the receiving water for wastewater from the SMR ETE project. Two capacity scenarios were modeled: concurrent operation of the SMR ETE project and the existing Units 1 and 2, and concurrent operation of the SMR ETE project, Units 1 and 2, and the future New NPP ETE. Two hydrologic situations were assessed for these scenarios: normal flow (Q_a) and climate-change-affected dry conditions (Q_{355}). The modeling used mean- and maximum-substance-discharge scenarios based on the available data.

The modeling results show that the contribution of the SMR ETE project itself to the total load in the receiving waters is generally very small. For P_{total}, which is critical to the failure of water bodies to achieve good status, the project contribution at Kořensko accounts for only 0.5–2.4% of the total mass flow at the profile downstream of Kořensko Reservoir. When the project is assessed concurrently with the other parts of ETE, the P_{total} input ranges from 2.3% for SMR ETE plus Units 1 and 2 at Q_a and average discharge to 18.2% for SMR ETE plus Units 1 and 2

plus the New NPP ETE at Q_{355} and maximum discharge. The background, meaning the mass flow conveyed by the Vltava and Lužnice, accounts for the dominant share of pollution and represents 81.8–97.7% of the total load. The effect on temperature and O_2 saturation is minimal; current adverse values for these parameters primarily result from reservoir operations in the Vltava Cascade.

Of the specific pollutants, particular attention is paid to tritium, which is also the key parameter for effects on the receiving water in terms of radioactivity. For tritium, however, the modeled activity concentrations remain well below the annual-average environmental quality standard (EQS-AA = 1,000 Bq/l). At the profile downstream of Kořensko Reservoir, the SMR ETE contribution for the other specific pollutants assessed is several percent, below 4%. When the project is assessed concurrently with the other parts of ETE, the highest contribution is 28%, for AOX from SMR ETE plus Units 1 and 2 plus the New NPP ETE at Q_{355}. The background, meaning the mass flow conveyed by the Vltava and Lužnice, remains the greatest source of pollution. Further dilution downstream will reduce the contribution of the discharge further, so it will not cause a failure to achieve good status in terms of specific pollutants in the downstream water bodies either.

The effect of the SMR ETE project on chemical-status parameters is likewise assessed as very small, contributing up to 6% of the total mass flow at the profile downstream of Kořensko Reservoir. When assessed concurrently with the other parts of ETE, the maximum contribution is 38%, for benzo[g,h,i]perylene from SMR ETE plus Units 1 and 2 plus the New NPP ETE at Q_{355}. In addition to benzo[g,h,i]perylene, inputs of other PAHs are also non-negligible. They arise when PAHs are scrubbed from the atmosphere into cooling water in the cooling towers and subsequently discharged to the receiving water as wastewater in the blowdown. Even so, the background pollution mass flow from the Vltava and Lužnice predominates over the input from the SMR ETE project, including when the project operates concurrently with the other parts of ETE.

Operation of the SMR ETE project, either alone or concurrently with other parts of ETE, namely Units 1 and 2 or the New NPP ETE, will therefore have no significant adverse effect on future achievement of good status in the affected surface-water bodies. Most of these bodies already fail to achieve good status, and the main cause must be sought in the catchment upstream of the project. In connection with the assessment of project effects on water status, the lack of data on specific pollutants and chemical-status parameters in the affected water bodies should also be noted. Expanded monitoring of at least selected parameters would clearly improve future knowledge of ETE's effect on surface-water status.

5.2 Groundwater

Groundwater quantity and quality

On the basis of available data for 2009–2024, current groundwater quantity and quality in the area around the SMR ETE project can be assessed as stable over the long term. The area of

interest is well defined hydrogeologically in relation to earlier regional and detailed groundwater-flow models for the Temelín site. The SMR ETE project is located in crystalline rocks, where groundwater flow is associated with weathered and fracture-permeable zones in the rock mass. The principal flow directions are determined by the terrain morphology and run from the elevation of the ETE site toward local drainage bases, particularly Dvorčický Stream.

The groundwater monitoring network provides an adequate basis for assessing current conditions. The long time series from the original wells are supplemented by newer B-series and HG-series wells, of which the HG wells are particularly important for direct monitoring of the SMR ETE site. Although the existing network allows current conditions to be assessed effectively, it should be expanded for comprehensive project monitoring after commissioning.

The groundwater-level regime is stable. Level fluctuations correspond to natural seasonality, precipitation conditions, and local operational interventions. Groundwater levels exhibited a slight downward trend in 2009–2024, caused primarily by the dry period of 2014–2019. Since 2020, levels have stabilized and in some places risen slightly in response to years with more favorable precipitation. No changes indicating significant disturbance of the hydrogeologic regime were identified.

Groundwater quality with respect to nonradioactive parameters is stable over the long term. The natural chemistry is consistent with a crystalline-rock environment and is typically characterized by soft water, lower dissolved-solids content, elevated iron and manganese, and locally lower hardness. Anthropogenic effects occur locally, particularly as elevated chemical oxygen demand and, in some places, chlorides, C_{10}–C_{40} hydrocarbons, ammonium ions, or certain metals and metalloids around landfills. These findings are consistent with the long-term characteristics of the specific sites, are not assessed as environmentally significant, and represent stable conditions. No adverse effect of operating Units 1 and 2 on the chemical composition of groundwater was demonstrated.

Groundwater radioactivity parameters show no significant values or trends indicating a material adverse effect from the power plant. During the period assessed, tritium and cesium-137 were predominantly below the detection limit or at very low measurable levels. The tritium values identified are far below the screening indicative value used for water intended for human consumption.

No officially designated water-source protection zones used for public water supply are registered in the area of interest. Significant regional public water-supply sources serving the surrounding municipalities lie beyond the reach of flow from ETE. Registered local abstractions are limited and concern shallow groundwater circulation in crystalline rocks. Individual small wells may be present in the area but are not included in the central register if they do not reach the statutory abstraction thresholds.

Overall, the current groundwater quantity and quality in the area around the SMR ETE project can be concluded to be stable and well monitored. The available data indicate no significant adverse condition or trend in the level regime or the chemical or radiological quality of groundwater. For subsequent preparation stages and any implementation of the SMR ETE

project, it is essential to maintain and develop the monitoring system, focus on flow directions from the project site toward local drainage bases, harmonize the range of parameters monitored, and verify continuously the technical condition of wells to be used for long-term assessment of project effects.

The SMR ETE project can be considered feasible with respect to groundwater, provided that the proposed technical, operational, adaptation, and monitoring measures are implemented. The most important measures include retaining pumped groundwater within the Dvorčický Stream catchment, considering controlled conveyance of some stormwater to Dvorčice Pond, potentially also providing partial support to Karlovec Pond, and ensuring continuous groundwater and surface-water monitoring.

Overall, the identified effects of the SMR ETE project on groundwater quantity and quality will be predominantly local and technically manageable. The most sensitive issue is not a threat to public water-supply sources but preservation of the local water balance of Dvorčice Pond and Dvorčický Stream. Some augmentation of inflows to Karlovec Pond is also recommended, particularly in combination with future climate-change effects. Implementation of the recommended measures can minimize adverse effects and preserve the function of the affected aquatic and ecological features in the area.

Status of groundwater bodies

An assessment was conducted of the potential effect of construction and operation of the SMR ETE project on groundwater-body status. Both the quantitative and chemical status of groundwater bodies and the potential risks and effects of any deterioration in groundwater-body status were assessed.

The quantitative-status assessment of groundwater bodies is based on a water-balance method. The study found that neither construction nor operation of the SMR ETE project will have any significant effect on the quantitative status of groundwater bodies. Construction and operation of the SMR ETE project will likewise not impair the chemical status of the individual relevant groundwater abstractions used for drinking-water purposes. Because the individual abstractions are most sensitive to the effects of operation of the SMR ETE project, it follows that operation will not impair the chemical status of either the working units or the groundwater bodies. On the basis of the work performed and the findings, it may be concluded that construction and operation of the SMR ETE project will not affect whether good status of groundwater bodies is achieved.

5.3 Response to requirements arising from the EIA screening conclusion

10) With respect to surface water and groundwater, prepare:

a) a comprehensive assessment of the project's effects on the water regime, always including the combined effects of the existing ETE units and the planned New Nuclear Power Plant at the Temelín site (hereinafter the "New NPP ETE"), in all phases of project implementation (construction, operation, and decommissioning), also taking account of the anticipated effects of ongoing climate change;

A comprehensive assessment of the project's effects on the surface-water regime in terms of quantity was conducted in relation to the Vltava and the connected water-management system. The assessment focuses particularly on raw-water abstraction from the Hněvkovice waterworks, discharge of some of the abstracted water back to the river at Kořensko, maintenance of minimum flows, and use of reservoir storage functions. The SMR ETE project is not assessed in isolation but as part of the cumulative water-management configuration of the Temelín site, meaning in combination with the existing Units 1 and 2 and the proposed New NPP ETE. This satisfies the requirement to assess the project in the broader water-management context and in relation to other significant surface-water-use requirements at the site.

Of the individual implementation phases, operation is decisive for surface-water quantity because it involves long-term water abstraction from the Hněvkovice waterworks and wastewater discharge at Kořensko. During construction and decommissioning, predominantly temporary changes in water-management requirements and runoff conditions may be expected. These phases must therefore be managed organizationally and technically to prevent adverse effects on minimum flows or disruption of water-management-system function. During decommissioning, operational requirements for abstraction and discharge may generally be expected to decrease gradually; controlled and supervised water management will nevertheless remain essential.

The direct quantitative effect of the project is determined primarily by the difference between abstraction and discharge, its seasonal distribution, and the system's ability to augment flows from stored water. The decisive factor is therefore not simply the absolute abstraction quantity, but the overall balance between the Hněvkovice abstraction profile and the Kořensko profile, including the fact that some abstracted water is returned to the Vltava farther downstream. The assessment is therefore based on modeling of the managed water-management system, not merely on a simple comparison of abstraction with long-term flow.

Under current hydrologic conditions, high reliability of water abstractions and minimum flows was demonstrated for the cumulative 5,600 MWe plus SMR ETE scenario. Water-management modeling indicates that the system can meet abstraction and minimum-flow requirements under current conditions. This reliability, however, results from managed use of active storage, particularly at Lipno I and Hněvkovice reservoirs. Under current conditions, the project therefore has no significantly adverse effect on surface-water quantity, but it increases the cumulative water requirement and thereby reduces the system's operating reserve.

Climate-change effects were taken into account through current hydrologic conditions, a sensitivity scenario involving warming of 2 °C, and SSP2-4.5 scenarios for reference years 2060 and 2080. The results show that, in most modeled future scenarios, abstraction and minimum-flow requirements continue to be met reliably or at an acceptable level. The most adverse climate scenarios nevertheless indicate a potential reduction in reliability, particularly when low flows, higher evapotranspiration demand, and the cumulative requirements of the Temelín site coincide. These results should therefore be understood as indicating the system's climate sensitivity and the need for continuous updating of hydrologic and climate data.

From the perspective of the wider Vltava Cascade, the project is assessed as acceptable under current hydrologic conditions. The assessment confirms that the minimum flow at the Vrané waterworks profile and the minimum residual flow at the Prague-Velká Chuchle profile are maintained with high reliability under the assumed cumulative scenario. In the long term, however, adverse climate development may reduce the reserve available in reservoir active storage, particularly at Orlík and Slapy. The resulting effect therefore cannot be attributed solely to the SMR ETE project but must be understood as the combined effect of climate development, catchment flow conditions, the operating options of the Vltava Cascade, and the cumulative requirements of the entire Temelín site.

b) an assessment of the effect of the planned surface-water abstraction from the major Vltava watercourse on the affected surface-water bodies, including hydrologic relationships with upstream and downstream bodies, with emphasis on effects on the natural hydrologic regime;

Assessment of the ecological status of surface-water bodies in accordance with the Water Framework Directive [1] also includes assessment of the hydromorphologic quality element, which, for river-category bodies, includes assessment of the impact of anthropogenic pressures on the natural hydrologic regime. Under the Water Framework Directive [1], hydromorphology is a supporting element in ecological-status assessment; the status of biological elements is decisive. For surface-water bodies designated as heavily modified, ecological potential is assessed instead of ecological status. In simplified terms, this means that the requirements for achieving good status or potential may be adjusted, or reduced, in view of the water use for which the bodies were designated as heavily modified.

Seven river-category water bodies are designated along the Vltava between Lipno I and Prague-Velká Chuchle. Except for body HVL_0140, Vltava from Větší Vltavice to the Polečnice/Kájovský Stream, where hydrologic-regime status is classified as good, the hydrologic regime of these bodies is classified as moderate or worse, the lowest category.

Surface-water abstraction and water storage or flow augmentation are always associated with modification of the natural flow regime. Increased water-abstraction requirements for ETE will lead to greater flow augmentation in the Lipno I to Hněvkovice Reservoir section. They should therefore have no adverse effect on the ecological status of water bodies in this section. Flows will decrease in the Vltava section downstream of Kořensko. However, given the low ratio of the increased water-abstraction requirements for ETE to the long-term flow characteristics at

Kořensko and farther downstream along the Vltava, the effect on ecological status in this section can likewise be expected to be insignificant. For dry conditions, the studies assessed the reliability of the required minimum flows at the Kořensko, Vrané, and Prague-Velká Chuchle profiles.

c) a water-management assessment of the project's effects on the purposes and functions of the Vltava Cascade waterworks, including their filling and drawdown regimes, with regard to all purposes for which the reservoirs are used;

Increased water abstraction for ETE relates to maintaining the storage function of Lipno I, Hněvkovice, Orlík, and Slapy reservoirs. Maintaining water abstractions and minimum flows is the primary purpose of these reservoirs and was addressed in the studies listed in Sections 2.1.2 and 2.1.3. Other related purposes are maintaining reservoir levels for recreation and navigation and operating hydroelectric power plants. For Lipno I Reservoir, the studies also assessed the reliability of maintaining the recreational water level. With respect to operation of the hydroelectric power plant at this reservoir, increased abstraction requirements do not reduce total reservoir outflow. However, the need for greater use of active storage to maintain water abstractions for ETE may reduce the scope for discretionary operations and consequently the ability to optimize power-plant operation. Flows will decrease in the Vltava section downstream of Kořensko. However, given the low ratio of the increased water-abstraction requirements for ETE to the long-term flow characteristics at Kořensko and farther downstream, the increased abstractions for ETE cannot be expected to have a significant effect on maintaining water levels for recreation and navigation or on the operation of hydroelectric power plants. The studies, see Section 2.1.3, indicate that any adverse effect on the storage function of Orlík and Slapy reservoirs could be caused to a greater extent by the effect of climate change on Vltava flows.

d) an assessment of the effect of discharging process wastewater and treated domestic wastewater into the major Vltava watercourse, including quantitative and qualitative characterization of the discharged water, with regard to physicochemical and radiochemical parameters and an assessment of the potential occurrence of radioactive substances;

The estimated effect of operation of the SMR ETE project is described in detail in Section 2.2.2. The estimate was prepared for concurrent operation with the existing Units 1 and 2 and, where applicable, the New NPP ETE, resulting in two capacity scenarios:

1. SMR ETE + Units 1 and 2
2. SMR ETE + Units 1 and 2 + two 1 700 MWe New NPP ETE units

For both scenarios, the effect of operation of the SMR ETE project was modeled at critical profiles for two hydrologic situations:

1. “Normal flow”: long-term mean flow (Q_a) was used for the modeling
2. “Drought, effect of climate change”: flow Q_{355} was used for the modeling

In addition, maximum or minimum values were modeled at the profile downstream of Kořensko Reservoir using the minimum guaranteed flow (Q_{guar}).

The modeling was also conducted for two discharge scenarios:

1. Average Discharge.
2. Maximum Discharge

The effect of the SMR ETE project on surface-water quality was estimated for the following critical profiles:

- Downstream of Kořensko water reservoir: non-radiological parameters, including temperature; radioactivity parameters;
- Orlík water reservoir, Zvíkov Bridge: non-radiological parameters, including temperature; radioactivity parameters;
- Solenice: non-radiological parameters, including temperature; radioactivity parameters;
- Kamýk nad Vltavou: non-radiological parameters, including temperature;
- Štěchovice: non-radiological parameters, including temperature; radioactivity parameters.

The effect of tritium on the watercourse was also assessed at the Podolí and Hřensko profiles.

At the profile downstream of Kořensko Reservoir, immediately downstream of the project wastewater outfall, the modeled average concentrations were assessed as failing for organic-matter and oxygen-regime parameters (BOD_5, COD_{Cr}, TOC), P_{total} in terms of bathing-water requirements, and PAH parameters (fluoranthene, benzo[a]pyrene), for both capacity scenarios and both flow situations (Q_a and Q_{355}). In terms of maximum values, additional PAH parameters failed to meet the requirements: benzo[b]fluoranthene, benzo[g,h,i]perylene, and also benzo[k]fluoranthene for capacity scenario 2, together with pH. It should be noted that inflow from the Lužnice is the principal contributor to this pollution of the Vltava at the downstream Kořensko profile, particularly under normal flow conditions.

Another profile assessed was the Zvíkovský Bridge profile on Orlík Reservoir, which is the representative profile for water body HVL_1055_J – Orlík I Reservoir on the Vltava. Only a limited range of data was available at this profile, so it was not possible to model project effects for all parameters. Of the parameters modeled, TOC and P_{total} remain problematic for both capacity scenarios and both flow situations (Q_a and Q_{355}).

The Solenice profile was assessed with respect to surface-water abstraction for drinking-water purposes. From this perspective, TOC remains problematic for both capacity scenarios and both flow situations (Q_a and Q_{355}).

Another critical profile was Kamýk nad Vltavou. This is the representative profile for water body DVL_0030 – Vltava from the Orlík Reservoir dam to the backwater of Slapy Reservoir. The modeled concentrations failed to meet the requirements for good ecological potential of the water body for both total phosphorus and phosphate phosphorus, under both capacity scenarios and both flow situations (Q_a and Q_{355}).

The final profile assessed was Štěchovice, where salmonid waters occur. Modeled concentrations exceeded the requirement for N-NH_4^+ for both capacity scenarios and both flow situations (Q_a and Q_{355}). The project contribution to the N-NH_4^+ load is insignificant.

Overall, at the profile downstream of Kořensko Reservoir and at other critical profiles farther downstream along the affected Vltava, water quality fails to meet legislative values derived from different types of requirements. The existing surface-water quality, particularly polluted water from the Lužnice, is the decisive influence. The SMR ETE contribution to this pollution is very small: wastewater from the SMR ETE project accounts for tenths of a percent to several percent of the mass flow of the assessed parameters in the receiving water.

In summary, under both capacity scenarios the receiving water meets the legislative requirements for radioactivity parameters in both flow situations (Q_a and Q_{355}). The exception is tritium, which may exceed the indicative value for water intended for drinking-water use at the Solenice profile under the adverse combination of maximum discharge and climate-change flow conditions, meaning low flows. This problem may also be reflected farther downstream at the Prague-Podolí profile. Modeling of maximum activity concentrations showed that they will not normally fail to meet the requirements at the profile downstream of Kořensko Reservoir. Concurrent discharges from the individual components of the assessed capacity scenarios must nevertheless be coordinated, and the flow situation in the receiving water must be taken into account, to prevent the extreme simultaneous occurrence of a very low receiving-water flow and discharge of the maximum permitted instantaneous quantity of these parameters.

e) an assessment of the effect of the planned conveyance of stormwater to minor watercourses, particularly Strouha Stream, focusing on potential effects on receiving-water quality and taking account of the obligations under Section 5(3) of Act No. 254/2001 Coll., on Waters (the Water Act), as amended;

The hydrogeologic conditions at the SMR ETE site are unfavorable for stormwater infiltration. Infiltration would be neither a safe nor an appropriate stormwater management method and could conflict with engineering requirements for protecting deep-founded structures, particularly the reactor building. Other stormwater management methods must therefore be preferred, particularly retention, potential use, and controlled discharge to surface waters, where the water could have a positive effect on stabilizing hydrological conditions in local watercourses and reservoirs. This is described in detail in Section 3.3.

The effect of conveying stormwater to minor watercourses was addressed in Section 0 of this study. Strouha Stream is currently used to convey pumped groundwater and stormwater from the Units 1 and 2 site in a quantity of approximately 316,000 m^3/year, averaging 10 l/s. The anticipated quantity of stormwater and pumped groundwater from the entire SMR ETE site is up to 238,000 m^3/year. During operation of the SMR ETE project, water from within the fenced SMR ETE site is expected to be conveyed to Strouha Stream together with water conveyed from the Units 1 and 2 site and, where applicable, the New NPP ETE site. For this purpose, a retention basin at the northeastern corner of the SMR ETE site and the existing storm sewer should be used. If water from the outer SMR ETE site is conveyed to Dvorčice Pond and

Dvorčický Stream, the average outflow to Strouha Stream should increase by approximately 6.3 l/s compared with the current situation.

As regards the current qualitative parameters of this conveyed water, it meets the requirements of Government Decree No. 401/2015 Coll. for most parameters. In Strouha Stream, however, the quality is slightly impaired for certain parameters, particularly total phosphorus, SS_{105}, ammoniacal nitrogen, TOC, and PAHs, as shown by the available data supplemented by monitoring conducted for this study. The input of these substances may adversely affect eutrophication in the affected surface waters. Because no significant change in the composition of the discharged waters is anticipated, only an increase in their quantity, no fundamental change in water quality in the Strouha is expected. However, an increase in the total substance load entering the receiving water may be expected in view of the increased discharge. Expansion of systematic monitoring of water quantity and quality in the affected watercourses should be recommended.

f) an assessment of the effect of expanding the system of drainage wells for artificially lowering the groundwater level, particularly in terms of potential effects on the possible use of groundwater as a drinking-water source in the wider area.

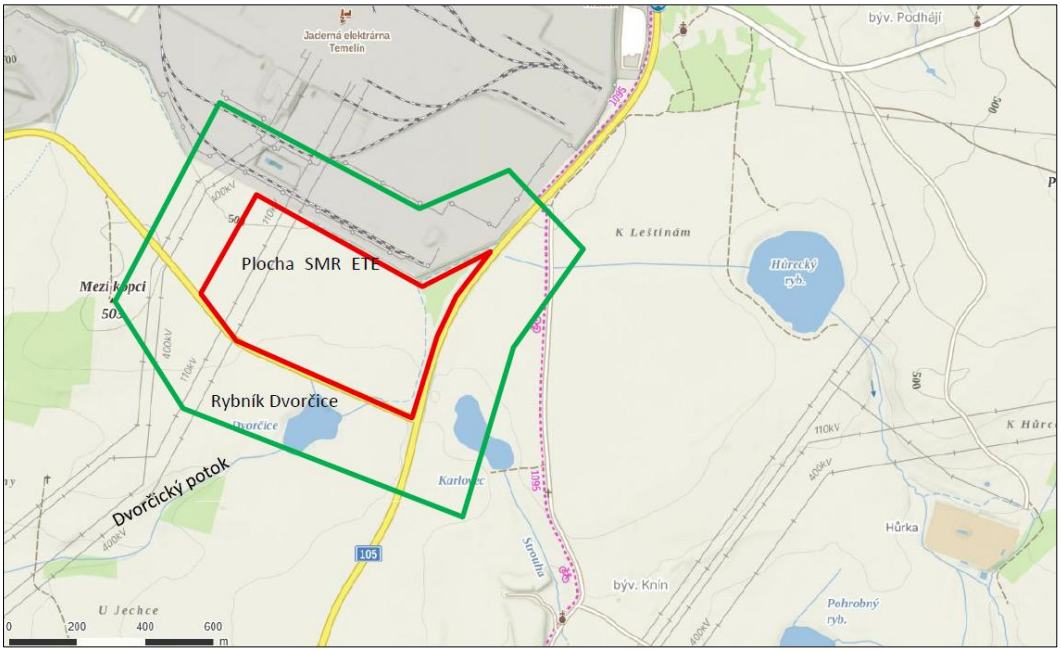
A significant intervention in the area's water regime will be the lowering of the groundwater level in the excavation for construction of the reactor building, followed by permanent lowering beneath its foundations, as currently occurs on the adjacent Units 1 and 2 site using OTKA-series wells. To minimize the effect on the water balance of the affected catchment, support flows in Dvorčický Stream, and preserve the important habitat of Dvorčice Pond, this water should be retained within the relevant catchment.

After conditions stabilize, average inflows are estimated at approximately 1.5–2 l/s. This intervention and development of the site will reduce stormwater infiltration into groundwater within the cone of depression. All findings to date indicate that the effects of artificially lowering the groundwater level using drainage wells on the SMR ETE site will be local only. Under the most adverse conditions, the drainage wells will be located near the boundaries of the SMR ETE construction area, meaning that the cone of depression will extend several dozen meters beyond the construction-area boundary. Under the precautionary principle, a maximum drawdown reach of up to 100 m from the boundaries of the SMR ETE construction area may be assumed.

To prevent the cones of depression from potential groundwater abstractions from overlapping the reach of drawdown at the SMR ETE site, a 200 m zone may be defined around the SMR ETE construction area, see Fig. 29, within which any groundwater abstractions could be affected by lowering the groundwater level beneath the reactor building. No groundwater sources in use or potentially usable are located within this distance. There is no development or other need for groundwater drinking-water sources in this area. Karlovec Pond, which is significantly dependent on groundwater inflow, extends partly into this zone around the construction area (Fig. 29). The risk that it will be adversely affected by lowering the groundwater level around the reactor building is not considered high. Nevertheless, as a

preventive measure, steps are recommended to stabilize this water body in the future, when the effects of climate change will become fully apparent. The proposed measures are listed in [85]. They primarily involve slowing stormwater runoff and promoting infiltration in the Karlovec Reservoir catchment, and potentially conveying some stormwater to Strouha Stream through Karlovec Reservoir.

Hydrogeologic region HGR 6320 contains no significant hydrogeologic structure with substantial groundwater reserves. Only smaller water sources of local importance are located in the wider area. Potential groundwater sources in the wider area that could be used for drinking-water supply and are located more than 200 m from the SMR ETE site will not be affected in any way by the planned drainage or otherwise impacted.



Jaderná elektrárna Temelín	Temelín Nuclear Power Plant
Plocha SMR ETE	SMR ETE site
Rybník dvořice	Dvořice fishpond
Dvořický rybík	Dvořický fishpond

Fig. 29 The 200 m zone (green) around the SMR ETE construction area (red) within which groundwater abstractions may be affected (https://mapy.com)

Brief summary of opinions and comments on the published project notification:

Municipality of Temelín, dated December 18, 2024: The municipality requires (…) an assessment of (…) effects on surface water and groundwater in relation to the municipality of Kočín and the nearby biocorridor (…).

The effects of the SMR ETE project on water in relation to the municipality of Kočín and the nearby biocorridor are discussed in greater detail in Section 0 of this study.

A historic millrace connecting Dvorčický Stream with the Dříteňský Stream catchment passes through the village of Kočín.

Dvorčice Pond is naturally supplied by drainage from the southern slope below Units 1 and 2. No water from the Units 1 and 2 site is currently conveyed to Dvorčice Pond or Dvorčický Stream. As noted above, use of this receiving water to convey some pumped groundwater and stormwater is being considered as part of implementation of the SMR ETE project. The reasons are not only the question of sufficient capacity in the existing storm sewer if all three parts of ETE are implemented, namely Units 1 and 2, the New NPP ETE, and the SMR ETE project, but also reduced natural inflow to Dvorčice Pond resulting from weakening of the natural headwater area upstream of the fishpond due to construction of the SMR ETE project. This would jeopardize the very existence of Dvorčice Pond and of Dvorčický Stream, which it supplies. Controlled augmentation of Dvorčice Pond and Dvorčický Stream with water drained from the SMR ETE site is therefore a condition for preserving their functions. If groundwater and some stormwater from the SMR ETE site are drained to Dvorčice Pond at an anticipated average rate of 2.2 l/s, the artificial augmentation will be sufficient to preserve the ecological functions.

If Dvorčický Stream were to disappear, the millrace would also lose its function. However, if Dvorčice Pond and Dvorčický Stream were used to discharge part of the stormwater and groundwater from the SMR ETE site, the millrace could be used to supply the fishpond system near Dříteň, particularly when managing higher torrential-rainfall flows.

No data are available on water quality in Dvorčice Pond, Dvorčický Stream, or the millrace in Kočín. Supplementary monitoring was therefore conducted at this location as part of study [73]. The monitoring was limited in both the range of parameters and the monitoring period, so its results must be regarded as indicative. Nevertheless, the data obtained showed that water quality is currently good in terms of the parameters monitored, with the exception of several PAH and O_2 parameters, which is related to the season in which the monitoring was conducted. Groundwater from the SMR ETE site is of suitable quality for augmenting Dvorčice Pond and Dvorčický Stream, and conveying it would not impair surface-water quality parameters. Stormwater, including runoff from the site, may nevertheless have impaired quality with respect to phosphorus, nitrogen, and TOC. Measures are therefore required to prevent any deterioration of water quality in Dvorčice Pond and the connected watercourses, Dvorčický Stream and the millrace through Kočín, caused by any conveyance of stormwater runoff. These may include an upstream retention basin within the SMR ETE site and oil separators. Systematic monitoring of water quantity and quality in the affected watercourses should also be recommended.

The hydrogeologic conditions around the municipality of Kočín are entirely unrelated to those around ETE. Groundwater at Kočín is recharged by inflow from the east to southeast, whereas outflow from the SMR ETE site runs southwest along Dvorčický Stream and passes north of Kočín. Any effect on groundwater, including individual wells, caused by drawdown is therefore entirely excluded [74].

Under the scenario without conveyance of groundwater and stormwater to Dvorčický Stream, the anticipated effects of construction and operation of the SMR ETE project would include a fundamental reduction in surface-water and groundwater runoff, with a significant adverse effect on the function of the local territorial system of ecological stability, which consists of local biocenters and biocorridors in the Dvorčický Stream catchment. Long-term drying of the fishpond and, particularly, the stream would be accompanied by changes in riparian stands and vegetation. The function supporting migration of aquatic organisms would be significantly restricted. Preserving the functions of the biocenter and biocorridors therefore requires controlled augmentation with water from the SMR ETE site by conveying some groundwater and stormwater to the Dvorčický Stream catchment at an average rate of 2.2 l/s. Runoff will consequently not decrease compared with current conditions and the function of the biocorridors and biocenters will be preserved for aquatic organisms during most of the year.

Biocorridors designated along the upper reach of Strouha Stream may also be partially affected by the indirect consequences of groundwater-level drawdown at the SMR ETE site. Augmentation of water inflow to Karlovec Pond is therefore also recommended.

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List of abbreviations

CHMI	Czech Hydrometeorological Institute
DBCN	identifier of the gauging station whose profile is used as the catchment outlet
DOC	documentation
DP	partial deliverable
EIA	environmental impact assessment
ETE	general term for the nuclear power plant at the Temelín site without distinguishing whether it refers to Units 1 and 2, the New NPP ETE, or their concurrent operation; the meaning varies and follows from the context
Units 1 and 2	existing Temelín Nuclear Power Plant (Temelín NPP)HGR hydrogeologic region
LBC	local biocenter
LBK	local biocorridor
LIM-B	permissible pollution – annual average/EQS-AA (public water -supply use)
LIM-C	permissible pollution – annual average/EQS-AA (bathing waters)
LIM-D	permissible pollution – annual average/EQS-AA (salmonid waters)
LIM-E	permissible pollution – annual average/EQS-AA (cyprinid waters)
LIM-F	good ecological potential requirement
MDA	minimum detectable activity
LOQ	limit of quantification
EQS	environmental quality standard
EQS-MAC	environmental quality standard, maximum allowable concentration
EQS-AA	environmental quality standard, annual average
New NPP ETE	New Nuclear Power Plant at the Temelín site
GD	Government Decree of the Czech Republic
PVL	Povodí Vltavy, státní podnik
Q_{355}	flow equaled or exceeded on average for 355 days per year over the long term
Q_a	long-term mean annual flow
Q_{guar}	minimum guaranteed flow
SMR ETE	New SMR Power Plant at the Temelín site
TSES	territorial system of ecological stability
WW	waterworks
Res.	water reservoir
WB	water body
VÚV TGM, v. v. i.	Výzkumný ústav vodohospodářský T. G. Masaryka, veřejná výzkumná instituce

List of parameter symbols and abbreviations

^{137}Cs	cesium-137
^{3}H	tritium
^{90}Sr	strontium-90
AOX	adsorbable organically bound halogens
BOD_5	biochemical oxygen demand
C_{10}-C_{40}	C_{10}–C_{40} hydrocarbons
Ca	calcium
Cl^-	Chlorides
cα	total alpha activity concentration
cβ	total beta activity concentration
cβ-^{40}K	total beta activity concentration after subtraction of the potassium-40 contribution
EDTA	ethylenediaminetetraacetic acid
CODCr	chemical oxygen demand using potassium dichromate
K	potassium
Mg	magnesium
Na	sodium
sat. O_2	water oxygen saturation
N_{total}	total nitrogen
NH_3	free ammonia, calculated
Ni	nickel
SS_{105}	suspended solids
N-NH_4^+	ammoniacal nitrogen
N-NO_3^-	nitrate nitrogen
O_2	dissolved oxygen
PAHs	polycyclic aromatic hydrocarbons
P_{total}	total phosphorus
pH	pH
P-PO_4^{3-}	phosphate phosphorus
DIS	dissolved inorganic salts
DS_{105}	dried dissolved solids
DS_{550}	ignited dissolved solids
SO_4^{2-}	Sulfates
T	water temperature
TOC	total organic carbon

amentum

Annex 5.1 to EIA Documentation for the SMR ETE: Assessment of Radiological Effects of Normal Operation

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List of abbreviations used

AT		Republic of Austria
ČR		Czech Republic
CHMI		Czech Hydrometeorological Institute
DE		Federal Republic of Germany
EIA		Environmental Impact Assessment
ETE		Temelín Nuclear Power Plant site
ETE1,2		Temelín Nuclear Power Plant (in-service Units 1 and 2)
IAEA		International Atomic Energy Agency
ICRP		International Commission on Radiological Protection
IRSN		Institute for Radiation Protection and Nuclear Safety (*French: Institut de radioprotection et de sûreté nucléaire*)
NPP		Nuclear Power Plant
NF		Nuclear Facility
LRKO		Environmental Radiation Monitoring Laboratory
New NPP ETE		New Nuclear Power Plant at the Temelín site
OS		Package
PDE		Ambient Dose Equivalent
SMR ETE		New SMR Power Plant at the Temelín site
SMR		Small Modular Reactors
SR		Slovak Republic
SONS		State Office for Nuclear Safety
SNFS		Spent Nuclear Fuel Storage Facility
US NRC		United States Nuclear Regulatory Commission
ÚVZ		Public Health Authority (Slovak: *Úrad verejného zdravotníctva*)
VK		Ventilation stack
<DL		Below the detection limit

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I. Introduction

The subject of this technical report is the assessment of the acceptability of the radiological effects of normal operation of the planned Small Modular Reactor Power Plant at the Temelín site (hereinafter “SMR ETE”) in the combined effect with the operating Temelín Nuclear Power Plant (hereinafter “ETE1,2”) and the planned New Nuclear Power Plant at the Temelín site (hereinafter “New NPP ETE”). This technical report has been prepared as an annex to the SMR ETE EIA Documentation (5.1 Assessment of Radiological Effects of Normal Operation).

The technical report was prepared using the results and on the basis of analyses performed with the ESTE software by specialists from ABmerit, s. r. o., who developed the relevant calculation models, carried out the calculations themselves, and evaluated the results, which are presented further in this report.

II. Description of the methodological approach

During operation of a nuclear power plant, the effects of ionising radiation may occur through small, managed, and monitored quantities of radioactive substances released into the environment after measurement, in the form of atmospheric discharges from the ventilation stack or cooling towers, and discharges to watercourses from monitoring tanks.

The category of operational states includes normal operation and abnormal operation. Abnormal operation includes single faults and failures that are assumed to be capable of occurring at least once during the operating lifetime of a nuclear unit. Typical cases in this category include loss of off-site electrical power, failures in the reactivity control system, short-term opening of steam generator safety valves, rupture of small-diameter piping (auxiliary piping, instrumentation piping, and sampling piping), etc. In abnormal operation modes, limits and conditions must be met, including limits relating to the activity of individual media inside the nuclear facility and to discharges into the environment.

When assessing the effects of ionising radiation from operation of a nuclear facility, it is assessed whether the specified limits or dose constraints are met. The Atomic Energy Act and the implementing Decree on radiation protection and the security of radionuclide sources [1] set the general exposure limit for the public and the dose constraint as the upper limit for the future determination of authorised limits for the release of radioactive substances from a workplace with a nuclear facility.

The general limit for public exposure from all authorised or registered activities in one calendar year is 1 mSv/year.

The operator of a nuclear facility is obliged to ensure that operation of the nuclear facility does not result in exceedance of the authorised limit, which is set by the State Office for Nuclear Safety (SONS) in the activity permit and is generally lower than the dose constraint for a representative person from the public of 0.25 mSv/year. At the same time, the total individual effective dose, which includes the sum of effective doses from external exposure and committed effective doses from internal exposure, must not exceed 0.2 mSv/year for atmospheric discharges and 0.05 mSv/year for discharges to surface waters. If multiple nuclear facilities are located at the site, which is the assessed case for SMR ETE, the cumulative effects of ionising radiation from all nuclear facilities in relation to the representative person are assessed in order to demonstrate that the dose constraint is not exceeded.

A representative person is a person who receives the highest exposure from the assessed source (in this case, the nuclear power plant). This is a person usually living in a municipality near the power plant, whose habits and lifestyle (consumption of water and local foodstuffs, and time spent outdoors) are defined so as to maximise the dose received. The specification of the representative person was one of the outputs of the assessment.

As part of the assessment of the effects of ionising radiation, the effect of SMR ETE was therefore assessed both separately and, in particular, in combined effect with the currently operating ETE1,2, the future New NPP ETE, and other nuclear facilities at the Temelín site (i.e. SNFS)[1].

The essence of the assessment is the calculation-based determination of the maximum annual and lifetime individual effective dose for the representative person and other members of the public, conservatively (on a bounding basis) for all considered power output options of the new nuclear power plant and the combined effects. These doses are assessed with respect to compliance with the legal limits and dose constraints established for annual exposure, and also for the assessment of lifetime health detriment. The lifetime dose is assessed in Annex 2 – Evaluation of Impacts on Public Health.

In addition to the assessment of doses for persons living in the immediate vicinity of SMR ETE and persons living in the area where the highest doses are expected with regard to the type of discharges implemented (persons living near the Vltava River downstream of the Kořensko water management structure), the study [2] also assessed exposure doses in the border areas of neighbouring countries, as well as collective doses inside and outside the calculation grid, including neighbouring countries.

As the final factor, doses and dose rates were assessed for the most exposed reference representatives of fauna and flora, and these were compared with the recommended reference values according to IAEA GSG-10 [3].

[1] However, no radionuclides are released into the environment from these other nuclear facilities during operational states, and their effect on the dose to the representative person is therefore manifested only through direct exposure, which is very small.

Maintaining the conservative approach was the basic methodological approach to the completed assessment of the effects of ionising radiation in operational states. The main objective of this approach was to ensure that the assessment of the effects of ionising radiation from operational states of SMR ETE in terms of public exposure, as presented in the EIA Documentation, would produce conservatively higher consequences than all future assessments carried out under the Atomic Energy Act for the specific selected reactor type of both SMR ETE and New NPP ETE. The main means to achieve this objective was the choice of conservative input assumptions, which are characterised in detail in the following chapters.

These primarily included a conservative (maximum) period for considering the possible concurrent operation of SMR ETE, ETE1,2, and New NPP ETE units, a conservative method for developing the bounding envelope of possible maximum radionuclide discharges for both SMR ETE and New NPP ETE, conservative assumptions regarding flow rates in the Vltava River, where liquid discharges are and will be made, conservative assumptions regarding the behaviour and habits and lifestyle of the population, and other parameters and input assumptions (height of ventilation stacks, location of discharge structures in the site layout, distance of discharge points from the representative person locations…).

II.1. Basic input assumptions

The basic input assumptions include the number of units considered, the schedule for commissioning SMR ETE, and assumptions regarding concurrent operation of SMR ETE with New NPP ETE and with the operating ETE1,2 units. The subject of the SMR ETE Project is the construction of one SMR unit with a net electrical output of up to 500 MW_e, which represents the power output envelope for SMR ETE. The subject of the New NPP ETE Project is the construction of up to two units with a net electrical output of up to 3,400 MW_e (2× 1,700 MW_e or, alternatively, 2× 1,200 MW_e).

For the purposes of assessing the effect of the concurrence of construction and operation of SMR ETE, construction and operation of New NPP ETE, and operation and decommissioning of ETE1,2, and in accordance with the approach used in the EIA Documentation, the assessment conservatively (on a bounding basis) considered the most influential (conservative) scenario, namely the long-term concurrent operation of all nuclear facilities – SMR ETE, New NPP ETE (2× 1,700 MW_e) and ETE1,2. For all other scenarios, potential discharges will be lower and will result in lower annual exposure of the assessed persons, as well as lower considered lifetime doses.

The radiological effects of discharges from operation are always significantly higher than the radiological effects of discharges from decommissioning; therefore, a bounding approach to the combined effect of all units in operation was considered.

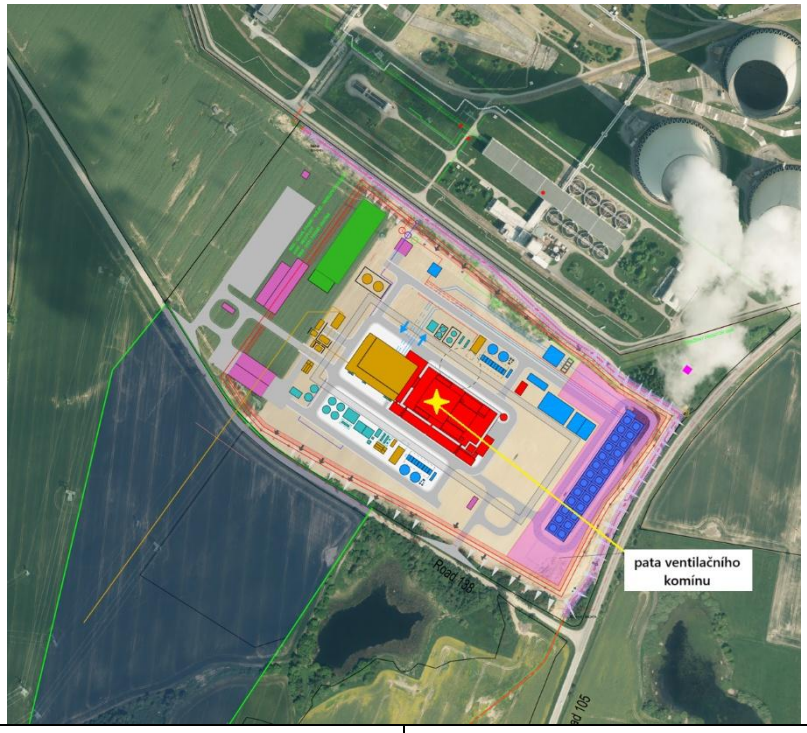
In terms of radiological effects, annual doses to members of the public were primarily evaluated. SONS establishes the exposure limit through SONS Decree No. 422/2016 Coll. [1], and the Atomic Energy Act establishes the dose constraint against which the assessment was carried out. For the evaluation of lifetime risks, which is carried out according to the methodologies of the International Commission on Radiological Protection (ICRP) [4], lifetime doses were determined for the person for whom the highest doses were identified within the annual dose assessment for the selected conservative calculation. The results of the evaluation of the lifetime doses determined in this way are presented in Annex 2 – Evaluation of Impacts on Public Health.

II.2. Description and characteristics of the calculation software

To determine the radiological effects of operation of SMR ETE, the ESTE Annual Impacts, SMR version 1.0 [12] calculation software (hereinafter “ESTE AI”), developed by ABmerit, s. r. o., was used. The ESTE AI calculation code is software for assessing the radiological effects of routine operation of nuclear facilities on the surrounding area. The methodology and algorithms of the software make it possible to find and identify the representative person (critical group of the population) in the vicinity of a nuclear facility from atmospheric discharges, from discharges to watercourses, and cumulatively from all discharges. Pursuant to Section 2 of the Atomic Energy Act, the representative person is defined as “a member of the public representing a model group of natural persons who receive the highest exposure from the given source and via the given pathway”. The software enables the separate assessment of the effect of atmospheric discharges for individual discharge sources at the assessed site (ventilation stacks, or possibly also cooling towers, although this is not applied for SMR ETE) and of discharges to watercourses (discharge outlet into the Kořensko Reservoir).

The ESTE AI software makes it possible to determine and present the effects of discharges from the Temelín site on the nearer and more distant surroundings, as well as the effects on neighbouring countries located within the 200 km × 200 km calculation zone centred on the Temelín site.

The software calculates and displays the calculated effects in a calculation grid covering an area of 200 km × 200 km, with a step of 1 km (calculation square resolution). The centre of the grid was modelled at the base of the SMR ETE ventilation stack.



pata ventilačního komínu	base of the ventilation stack

Fig. 1 Location of the base of the SMR ETE ventilation stack in the centre of the nuclear island.

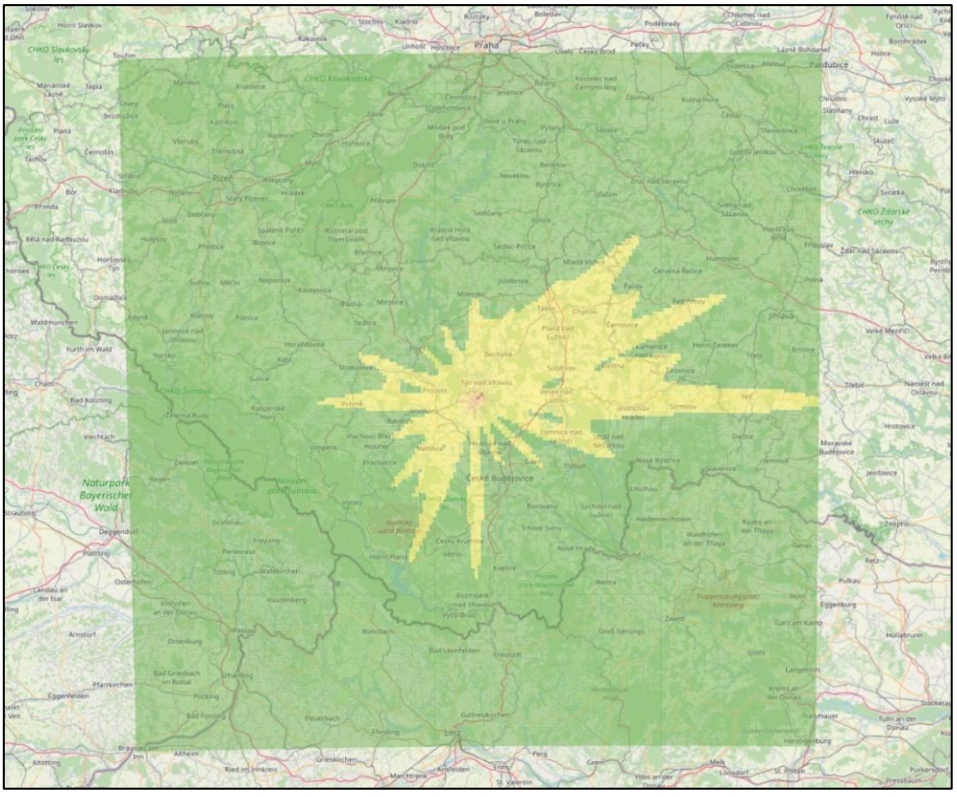


Fig. 2 Schematic arrangement of the calculation grid.

II.2.1 Model for the dispersion of radioactive substances from atmospheric discharges

For the calculation of radionuclide dispersion in the atmosphere and the calculation of long-term average concentrations caused by operational states of a nuclear facility, the ESTE AI software uses the Lagrangian trajectory model PTM (Puff Trajectory Model). Atmospheric diffusion in the horizontal direction is modelled using the Gaussian model of dispersion of substances in the atmosphere, and in the vertical direction the method of numerical solution of the semi-empirical atmospheric diffusion equation is used. The mathematical model takes into account the mechanisms of radioactive transformation, washout by precipitation, dry deposition, and wet deposition. For calculation, input meteorological data over a given period of time are used. The entire annual discharge is evenly divided into individual hours during the year, and the relevant meteorological conditions measured for each hour are applied.

In the calculation sectors where ETE1,2 and SMR ETE are physically located, up to a distance of 2 km from the atmospheric discharge point, the ESTE AI software applies the modelling assumption that the area is built-up, and model parameters for urban development ("urban conditions") are applied for the calculation of dispersion of radioactive substances; the dispersion coefficient depends on the distance from the discharge point and the atmospheric stability category (according to Briggs). If the puff velocity within the site is less than 1.0 m^3/s, the assumption is applied that dispersion of the radioactive cloud depends only on its propagation time (according to Gifford).

Outside the built-up sectors, which consist of the ETE1,2 and SMR ETE sites, model parameters for rural conditions ("rural conditions") are applied for the calculation of dispersion of radioactive substances for a cloud with a path length of L = 2–20 km. The dispersion coefficient depends on the distance from the discharge point and the atmospheric stability category (according to Briggs).

For a cloud path length greater than 40 km, the ESTE AI software applies the assumption that dispersion of the radioactive cloud only depends on its propagation time from the discharge point (Gifford approach). For a cloud path length between 20 km and 40 km, the ESTE AI software applies interpolation between parameters for rural conditions and parameters depending only on propagation time.

When modelling the behaviour of H-3 discharges (to the atmosphere and to watercourses) and its transfer into plants, a model of moisture (water) exchange between the surrounding atmosphere and the plant is applied. The model uses data on absolute air humidity (during the growing season) and data on the water content of individual plants [2].

When modelling C-14 discharges to the atmosphere in the vicinity of the discharge point (up to 100 km), the model considers an organic component (C_nH_{2n}) and an inorganic component (CO, CO_2). For the inorganic component, it is assumed that, during the growing season, inorganic C-14 is exchanged between the plant and the atmosphere, similarly to H-3. The model uses data on the usual concentration of (non-radioactive) carbon in the atmosphere and data on the carbon content of individual plants. Both forms of C-14 (inorganic and organic) are used to calculate the committed effective dose from inhalation in individual age categories. The calculation algorithm assumes that no particular form of organic C-14 in atmospheric discharges is known. The conservatism of this assumption consists in the fact that, although it may be assumed that part of the organic C-14 in atmospheric discharges is in the form of methane (lighter than air) and, in the immediate vicinity of the discharge point, could disperse into higher air layers, i.e. it would not be available for inhalation in the immediate vicinity of the discharge point, from the perspective of exposure (committed dose) by inhalation it is conservatively assumed that organic C-14 disperses in the atmosphere in the same way as inorganic C-14 and is available for inhalation in the same way. For the purposes of calculating C-14 concentrations in plants, C-14 in inorganic form is considered [2].

II.2.2 Model for the dispersion of liquid discharges

Algorithms according to NRC Reg. Guide 1.109 [5] are used to model and calculate the dispersion of liquid discharges in watercourses and to calculate activity concentrations in the water of the Kořensko Reservoir and subsequently in the water of the Vltava River. The model for the Temelín site assumes a constant volume of water in the Kořensko Reservoir and also uses data on the average flow rate in the Vltava River downstream of the Kořensko Reservoir, or at other points along the watercourse.

When modelling C-14 in watercourses, the dynamic specific activity model according to [6] and [7] is applied. The model takes into account the exchange of CO_2 between the water and the surrounding atmosphere (above the reservoir or above the river). The model is used to calculate the specific activity of C-14 in fish and to calculate the concentration of C-14 in plants after irrigation.

II.2.3 Model for exposure pathways

The ESTE AI software model considers all exposure pathways for the population (individuals) in accordance with legislative requirements and the recommendations of the International Atomic Energy Agency (IAEA). At the same time, the model takes into account the age structure of the population and habits and lifestyle. Within the exposure pathways, the model includes external exposure from the cloud, exposure from deposition, inhalation of activity concentrations, and ingestion of locally produced food, taking into account the full chain of possible transport pathways of radioactive substances from discharges into individual components of the environment.

The representative person may therefore be exposed to radionuclides present in the air in their surroundings. Radionuclides in the air may cause a dose from external exposure and internal exposure by inhalation of radionuclides in the inhaled air. This person may also be exposed to radionuclides present in deposition on the ground in their surroundings. Radionuclides in deposition on the ground or in soil may cause a dose from external exposure and internal exposure by ingestion of food into which radionuclides have passed from the surrounding soil through the root system or through the foliar system (plant respiration or deposition of radionuclides on plant leaves). In addition, the representative person may be exposed by intake of radionuclides originally discharged as a result of operation of the nuclear facility to watercourses (to surface waters – the river), namely by intake of this water as drinking water, by ingestion of fish from the river to which discharges to watercourses are directed, by ingestion of other food that was irrigated with water from that river during the growing season, or by ingestion of milk from cows watered with water from that river. A minor source of exposure of the representative person may also be time spent on the riverbank (for example, by a fisherman), swimming, and rowing in the river to which discharges to watercourses are directed.

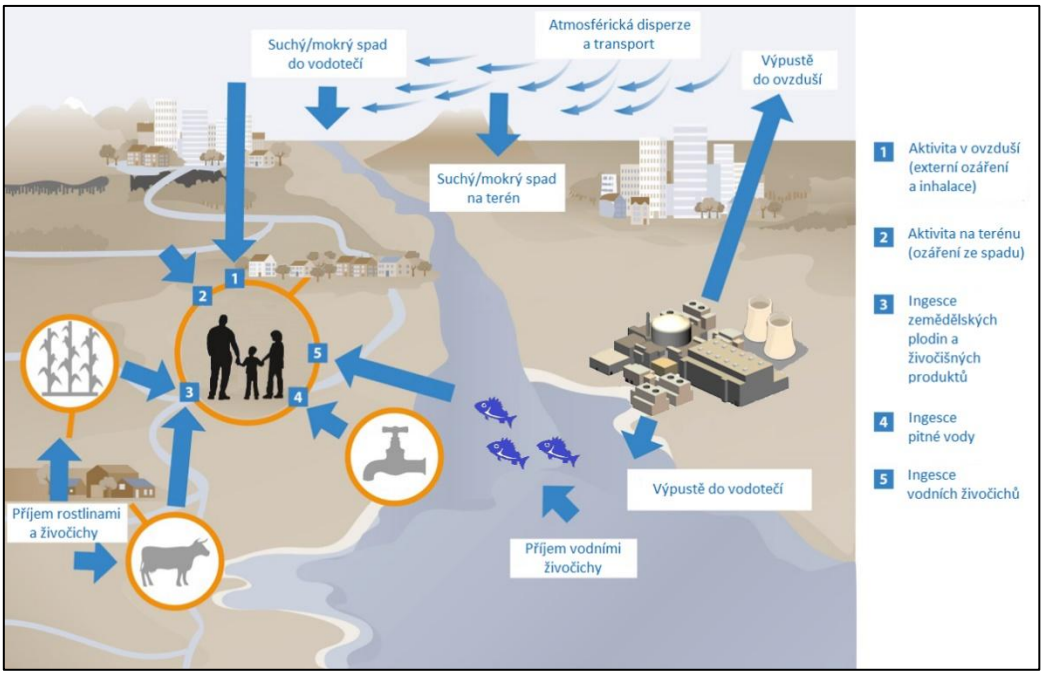
Specifically, the following exposure pathways for the population are created in the ESTE AI software model and specified and evaluated in the calculations [2]:

- external exposure from the cloud / dose,
- external exposure from deposition / dose,
- inhalation of activity concentrations / dose (for individual age categories),
- ingestion (for individual age categories):
  - leafy vegetables – human (direct ingestion),
  - other agricultural products – human (direct ingestion) (cereals, potatoes, fruit, grapevine, hops),
  - fresh pasture – cow – milk – human,
  - stall-feeding – cow – milk – human,
  - fresh pasture – goat – milk – human,
  - stall-feeding – goat – milk – human,
  - fresh pasture – cow – meat – human,
  - stall-feeding – cow – meat – human,
  - drinking water – human (direct ingestion),
  - stall-feeding with cereals – pig – meat – human,
  - stall-feeding with cereals – poultry – meat – human,
  - stall-feeding with cereals – poultry – eggs – human,
  - irrigated leafy vegetables – human (direct ingestion),
  - irrigated other agricultural products – human (direct ingestion) (cereals, potatoes, fruit, grapevine, hops),
  - irrigated fresh pasture – cow – milk – human,
  - irrigated stall-feeding – cow – milk – human,
  - irrigated fresh pasture – goat – milk – human,

- irrigated stall-feeding – goat – milk – human,
- irrigated fresh pasture – cow – meat – human,
- irrigated stall-feeding – cow – meat – human,
- stall-feeding with irrigated cereals – pig – meat – human,
- stall-feeding with irrigated cereals – poultry – meat – human,
- stall-feeding with irrigated cereals – poultry – eggs – human,
- water (river) – fish – meat – human,
- water (river) – drunk by cows – milk – human,
- water (river) – drunk by cows – meat – human,
- water (river) – drunk by pigs – meat – human,
- water (river) – drunk by poultry – meat – human,
- water (river) – drunk by poultry (eggs) – eggs – human,

- swimming in the river,
- boating on the river,
- time spent on the riverbank (fisherman).

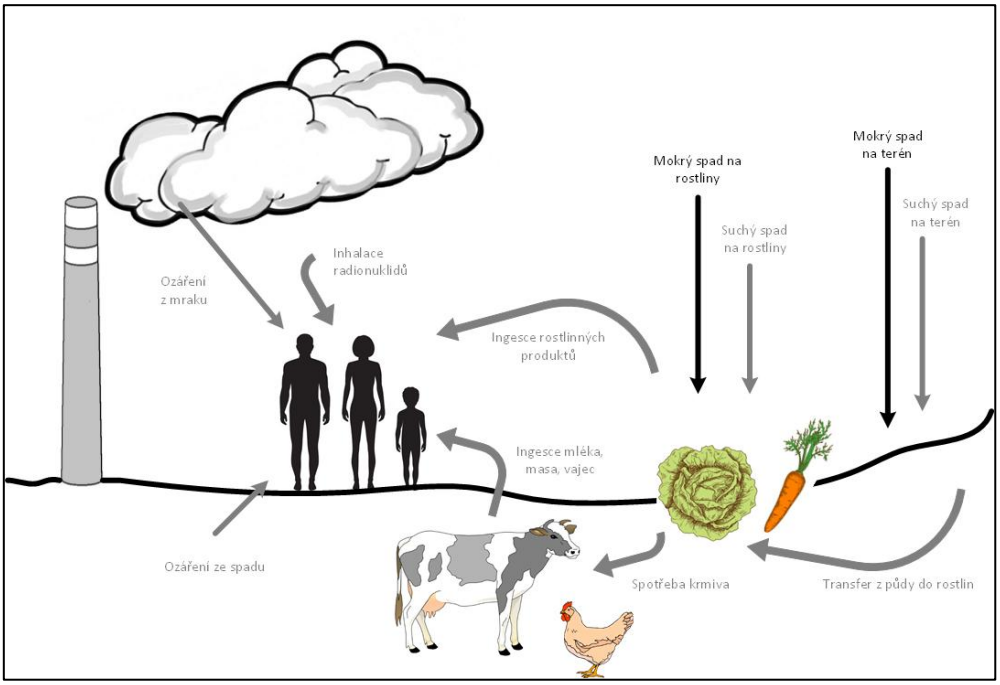
The exposure pathways for humans modelled by the ESTE AI software are shown graphically in the following figure.



	Dry/wet deposition into watercourses
	Atmospheric dispersion and transport
	Atmospheric discharges
	Dry/wet deposition on the ground
	Uptake by plants and animals
	Uptake by aquatic animals
	Discharges to watercourses

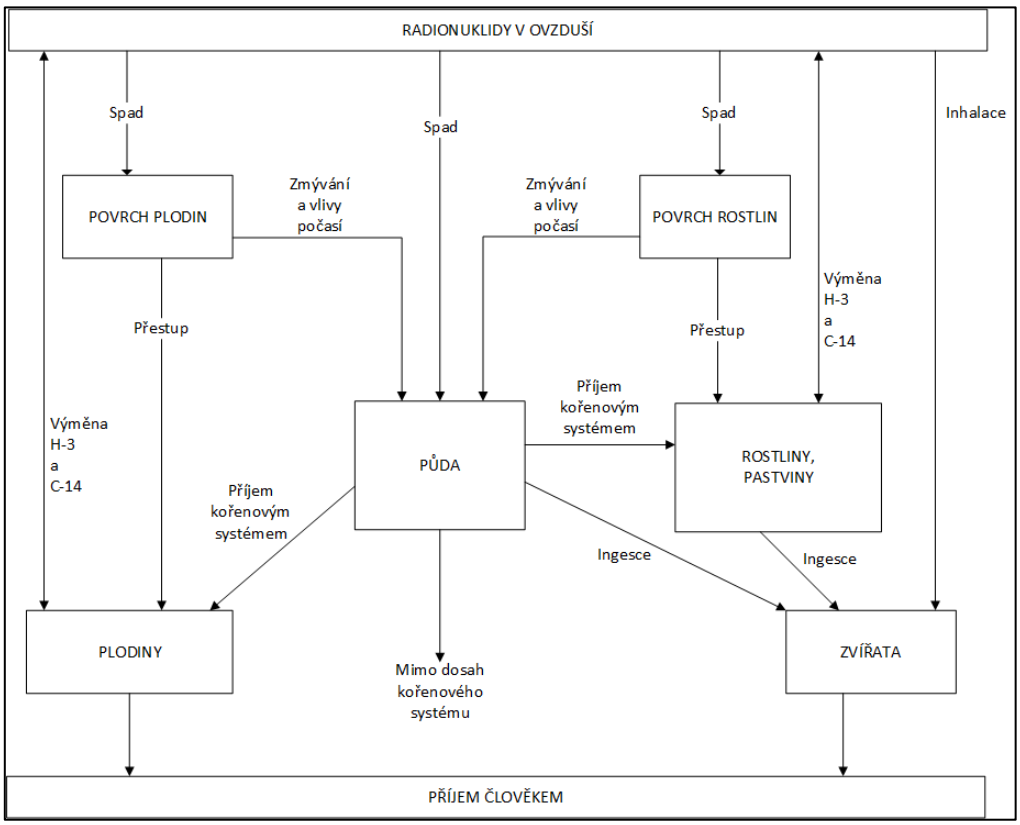
Aktivita v ozvduší (externí ozáření a inhalace)	Atmospheric activity (external exposure and inhalation)
Aktivita na terénu (ozáření ze spadu)	Activity on the ground (exposure from deposition)
Ingesce zemědělských plodin a živočišných produktů	Ingestion of agricultural plants and animal products
Ingesce pitné vody	Ingestion of drinking water
Ingesce vodních živočichů	Ingestion of water animals

Fig. 3 Exposure pathways considered by the ESTE AI software [2].



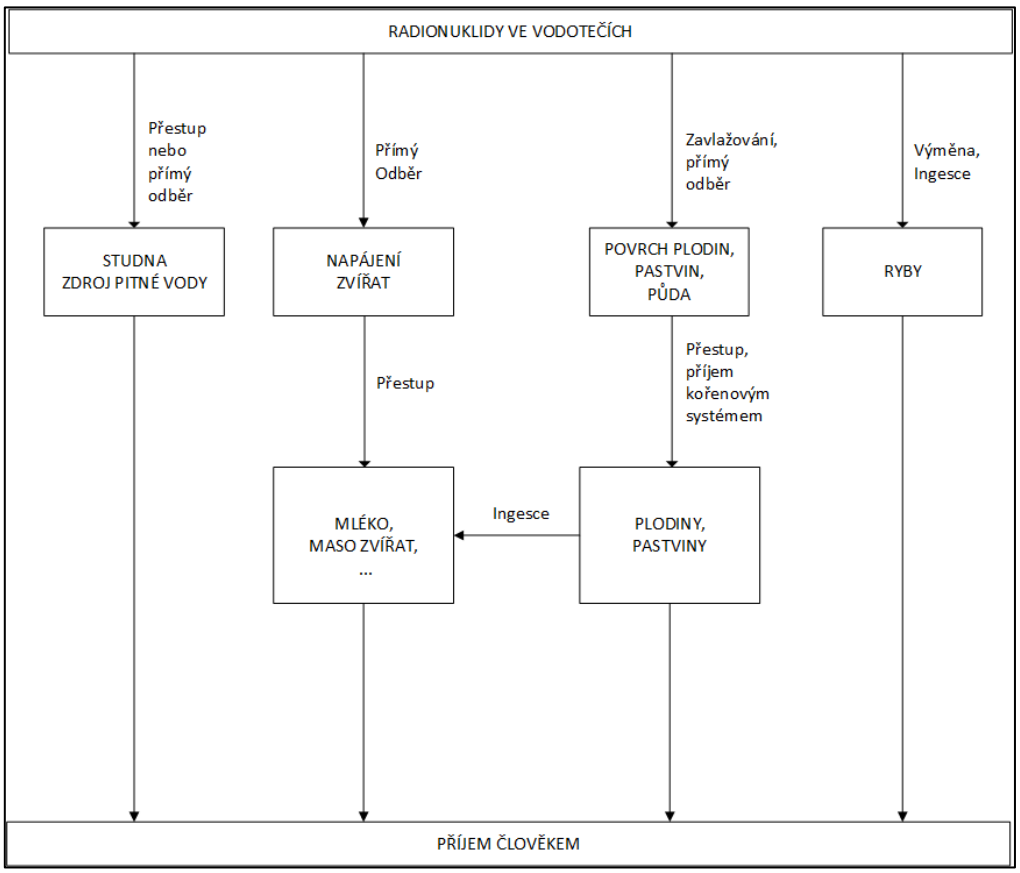
Ozáření z mraku	Exposure from the cloud
Inhalace radionuklidů	Inhalation of radionuclides
Ingesce rostlinných produktů	Ingestion of plant products
Mokrý spad na rostliny	Wet deposition on plants
Suchý spad na rostliny	Dry deposition on plants
Mokrý spad na terén	Wet deposition on the ground
Suchý spad na terén	Dry deposition on the ground
Ozáření ze spadu	Exposure from deposition
Ingesce mléka, masa, vajec	Ingestion of milk, meat, and eggs
Spotřeba krmiva	Feed consumption
Transfer z půdy do rostlin	Soil-to-plant transfer

Fig. 4 Exposure pathways considered by the ESTE AI software (excluding exposure pathways due to discharges to watercourses) [2].



RADIONUKLIDY Z OVZDUŠÍ	RADIONUCLIDES FROM THE ATMOSPHERE
Spad	Deposition
Inhalace	Inhalation
POVRCH PLODIN	CROP SURFACE
Zmývání a vlivy počasí	Wash-off and weathering effects
POVRCH ROSTLIN	PLANT SURFACE
Přestup	Transfer
Výměna H-3 a C-14	Exchange of H-3 and C-14
Příjem kořenovým systémem	Root uptake
PŮDA	SOIL
ROSTLINY, PASTVINY	PLANTS, PASTURES
PLODINY	CROPS
Mimo dosah kořenového systému	Beyond the reach of the root system
Ingesce	Ingestion
ZVÍŘATA	ANIMALS

Fig. 5 Schematic representation of the procedure for calculating the individual dose from ingestion due to atmospheric discharges [2].



RADIONUKLIDY VE VODOTEČÍCH	RADIONUCLIDES IN WATERCOURSES
Přestup nebo přímý odběr	Transfer or direct abstraction
Přímý odběr	Direct abstraction
Zavlažování, přímý odběr	Irrigation, direct abstraction
Výměna, Ingesce	Exchange, ingestion
STUDNA A ZDROJ PITNÉ VODY	WELL AND DRINKING WATER SOURCE
NAPÁJENÍ ZVÍŘAT	WATERING OF ANIMALS
POVRCH PLODIN, PASTVIN, PŮDA	SURFACE OF CROPS, PASTURES, SOIL
RYBY	FISH
Přestup	Transfer
Přestup, příjem kořenovým systémem	Transfer, root uptake
MLÉKO, MASO ZVÍŘAT,…	MILK, ANIMAL MEAT…
Ingesce	Ingestion
PLODINY, PASTVINY	CROPS, PASTURES
PŘÍJEM ČLOVĚKEM	HUMAN INTAKE

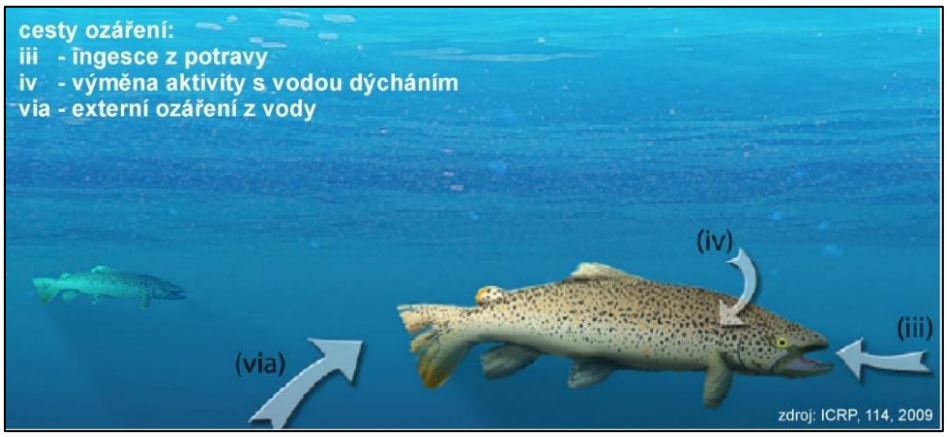
Fig. 6 Schematic representation of the procedure for calculating the individual dose from ingestion due to discharges to watercourses [2].

Exposure pathways for the biota (wild fauna and flora), both terrestrial and aquatic, are also modelled in the ESTE AI software. The concepts and procedures of the ESTE AI software are applied in accordance with the methodology and recommendations of ICRP 108 [17], ICRP 114 [8], and IAEA General Safety Guide GSG-10

[3]. The concept for analysing radiological effects on biota uses the term “reference animal or plant”. A reference animal or plant is a hypothetical entity with the assumed basic biological characteristics of a particular type of animal or plant, as described at the taxonomic family level, with defined anatomical, physiological, and life-history properties that can be used for the purposes of relating exposure to dose and dose to effects for the given type of living organism.

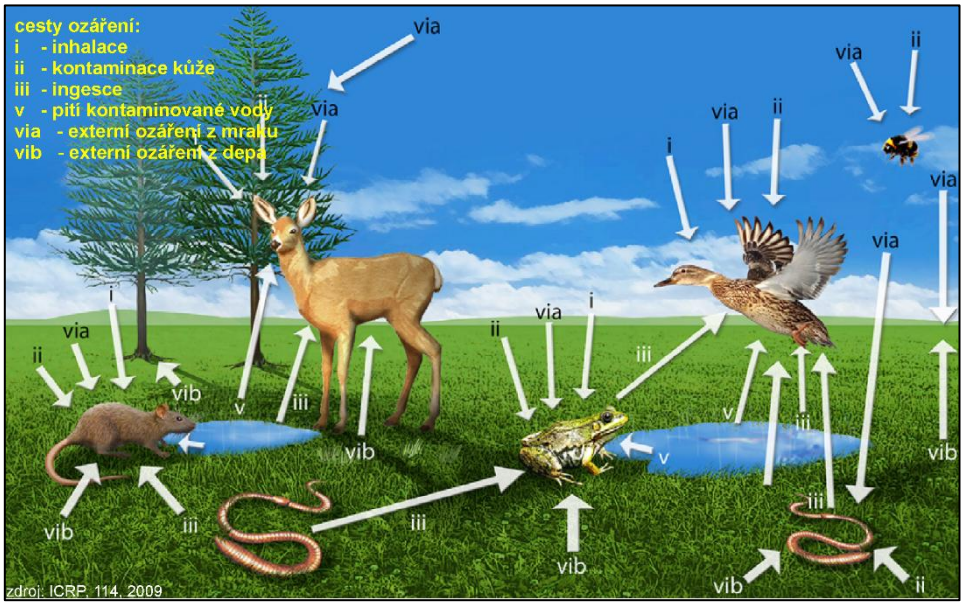
For terrestrial reference animals and plants, external exposure from deposition on the ground and internal exposure are considered, particularly as a result of ingestion of food that is in contact with deposition on the ground, or as a result of inhalation of airborne CO_2 and H_2O (for tritium and C-14). The terrestrial reference animals and plants considered are: deer, rat, duck, frog, bee, earthworm, pine tree, and grass. For aquatic reference animals, the following are considered: external exposure from contaminated water (time spent on the surface or in the water) and internal exposure as a result of water intake. The aquatic reference organisms considered are: trout (entire life in water), duck (half of its life in water and half on land), and frog (half of its life in water and half on land).

The exposure pathways for biota modelled in the ESTE AI software are shown schematically in the following figures. At the same time, some species (duck, frog) are considered by the software as both terrestrial and aquatic animals.



cesty ozáření:	exposure pathways:
iii - ingesce z potravy	iii – food ingestion
iv - výměna aktivity s vodou dýcháním	iv – activity exchange with water by breathing
via - externí ozáření vody	via – external exposure from water

Fig. 7 Exposure pathways for aquatic biota representatives.



cesty ozáření:	exposure pathways:
i - inhalace	i – inhalation
ii - kontaminace kůže	ii – skin contamination
iii - ingesce	iii – ingestion
v - pití kontaminované vody	v – drinking contaminated water
via - externí ozáření z mraku	via – external exposure from the cloud
vib - externí ozáření z depa	vib – external exposure from deposition

Fig. 8 Exposure pathways for terrestrial biota representatives.

II.2.4 Verification of the ESTE AI software

The ESTE AI software has been approved by the Public Health Authority of the Slovak Republic (ÚVZ SR) as a certified tool for calculating the effect of operation of nuclear facilities at the Jaslovské Bohunice site. For this purpose, it is used by Slovenské elektrárne, a. s., Bohunice plant, and JAVYS, a. s.

ÚVZ SR uses the ESTE AI software for verification calculations of the radiological effects of operation of nuclear facilities at the Bohunice and Mochovce sites.

SONS uses the ESTE AI software for verification calculations of the radiological effects of operation of nuclear facilities at the Dukovany and Temelín sites.

The ESTE AI software has been implemented, on the basis of an IAEA project, at the Jožef Stefan Institute, Ljubljana, Slovenia.

The ESTE AI software has been implemented, on the basis of an IAEA project, at Aramar Centro Tecnológico da Marinha in São Paulo, Brazil.

In accordance with IAEA recommendations on the validation and benchmarking of software used to assess the radiological effects of operation of nuclear facilities on the surrounding area, the ESTE AI software was compared and verified within benchmark calculations under the IAEA MODARIA project. The ESTE AI software was also validated using the US NRC Dose code, which is used by the U.S. Nuclear Regulatory Commission (US NRC) to assess the radiological effects of atmospheric discharges and discharges to watercourses. The validation was performed at the level of assessment of individual doses and collective doses from inhalation, ingestion, and external exposure from the cloud, and also at the level of assessment of doses from discharges of a nuclear facility to a watercourse (doses from ingestion of drinking water and water-

irrigated food, and from external exposure during swimming, rowing, and time spent on the riverbank). Further validation of the ESTE AI software was performed by comparison with the results of the PC Cosyma software. The validation was performed at the level of comparison of calculated activity concentrations in the ground-level air layer and surface activities of deposition (deposition on the ground).

II.3. Geographical, meteorological, and hydrological conditions

II.3.1 Geographical conditions

Geographical characteristics relevant to the calculation of radiological effects are modelled in the ESTE AI calculation software using geodata describing the land cover of the analysed area (surface type: whether it is settled/built-up, forest surface, water surface, agricultural land, etc.).

In terms of land use and current vegetation cover, a wide variety of types occur within the broader area of interest. Forest stands are predominantly associated with the valleys of the Vltava and Malše Rivers, higher elevations in the area of the Vysoký Kamýk ridges, hilly parts around Litoradlice, and areas further south. The deforested undulating plateaus are dominated by arable land, with numerous small woodland patches. The ETE site itself is located in a deforested enclave in a slightly elevated position.

For the purposes of the software, data on surface types are prepared and processed into a form suitable for calculation using satellite image classification methods (remote sensing methods). When calculating radiological effects, the ESTE AI models use information on land cover types that are either static in nature or change annually (crops sown on agricultural land). In the ESTE AI software, Corine Land Cover data (a European database of static land cover types created on the basis of satellite survey data) are used as the source of underlying data for forest areas, water reservoirs, and settlement areas (urban and rural development).

For the purposes of calculating radiological effects, the data used also included data on the distribution of agricultural crops (wheat, barley, potatoes, maize, oilseed rape, and alfalfa) sown on the analysed areas around the Temelín site. For the purposes of the ESTE AI software, the distribution of agricultural crops around the Temelín site is determined using satellite data classification methods.

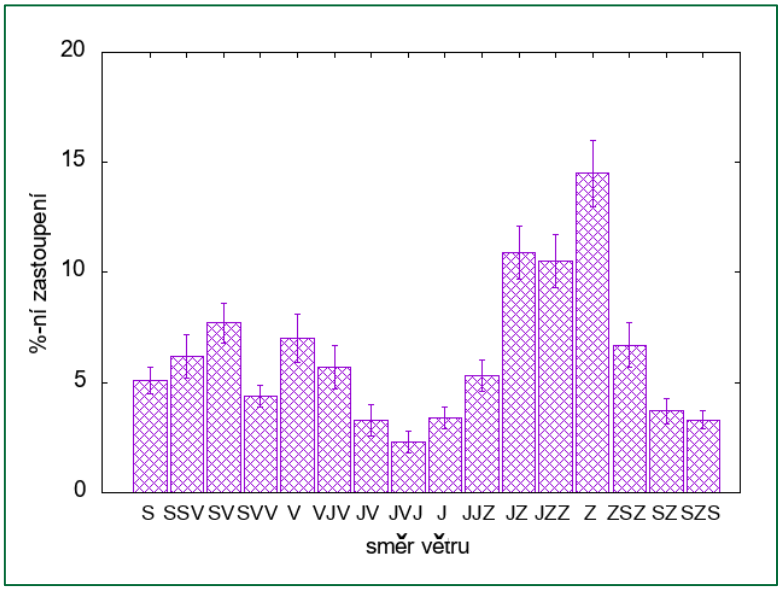
Knowledge of the land cover type is used in the ESTE AI software when calculating the dispersion of radioactive gases and aerosols in the ambient atmosphere and calculating deposition on the ground. Different land cover types are characterised by different values of the “terrain roughness” parameter, which has a substantial effect on the calculation of radioactive aerosol deposition on the ground. The basic land cover types whose knowledge is essential for calculation using the ESTE AI software are forests, agricultural crops, water surfaces, and built-up areas.

II.3.2 Meteorological conditions for the analysis of SMR ETE effects

Hourly data on basic meteorological parameters from measurements carried out at the meteorological station of the Czech Hydrometeorological Institute (CHMI), located in the immediate vicinity of the operating Temelín power plant, were used as the source of meteorological data. The meteorological parameters that enter the ESTE AI calculation model are wind direction and wind speed at 10 m above ground level, precipitation intensity, and atmospheric stability category. Hourly data were processed for the years 2018 to 2024.

The ESTE AI software works with hourly data for a specific year. For the selection of the reference year, an expert analysis of meteorological data in individual years and a calculation sensitivity analysis using the ESTE AI software were prepared to evaluate the effect of meteorological conditions in individual years on the annual individual dose at a constant annual atmospheric discharge.

An expert analysis of meteorological data showed that, of the analysed years, 2018 deviated most from average behaviour, with a low proportion of westerly winds. Based on the seven-year average occurrence of wind directions, 2019 showed the best agreement (16 out of 16 directions within the interval of the average +/- standard deviation), followed by 2020 and 2022 (14 out of 16 directions). In 2018, the frequency of north-easterly or south-easterly wind directions increased at the expense of westerly winds. Overall, there was also a lower number of occurrences of the higher atmospheric stability categories E and F, a higher number of highly unstable categories A, B, and C, and a higher occurrence of stability category D. The years 2022, 2023, and 2024 were closest to average behaviour.



%-ní zastoupení	percentage representation
směr větru	wind direction

Fig. 9 Average distribution of wind direction at a height of 10 m at the Temelín site, in aggregate for the years 2018 to 2024.

For the average wind speed and the median (taking into account the standard deviation), all years are similar to the overall seven-year behaviour. All three quantities – average speed, median, and standard deviation – show low variability over the seven years (2018 to 2024). The 95% interval has slightly larger deviations (from 6.2 to 7.0 m/s), but these are not significant. Only for maximum speed are the differences more significant, but they do not play an important role in the overall effects for the whole year.

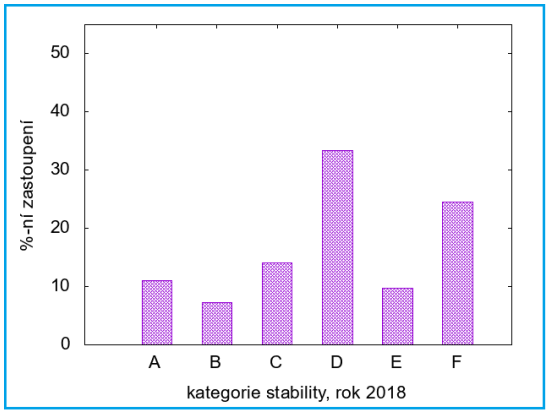
In the analysis of average precipitation and the median, the years 2018, 2021, and 2022 are close to the overall seven-year behaviour.

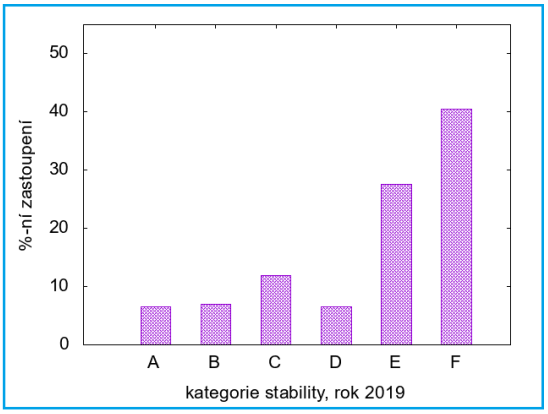
Total precipitation in the vicinity of SMR ETE in the analysed years was:

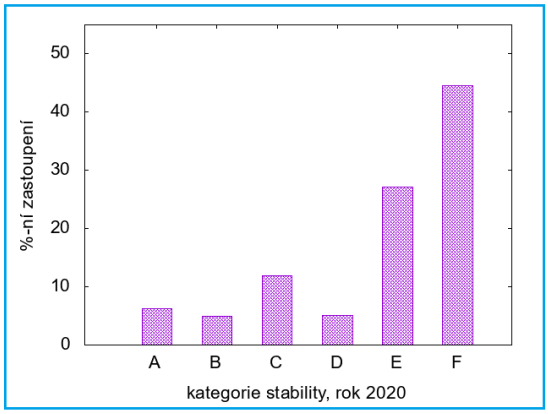
- year 2018: 502 mm,
- year 2019: 486 mm,
- year 2020: 690 mm,
- year 2021: 558 mm,
- year 2022: 623 mm,
- year 2023: 568 mm,
- year 2024: 715 mm.

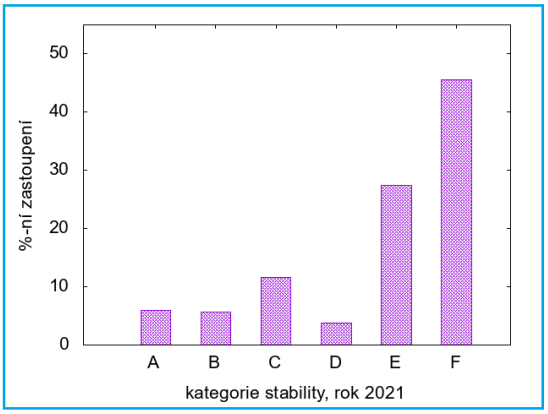
Average for 2018–2024: 592 mm +/- 82 mm. The years 2021, 2022, and 2023 fall within this interval. The years 2020 and 2024 had above-average precipitation, and the years 2018 and 2019 had below-average precipitation.

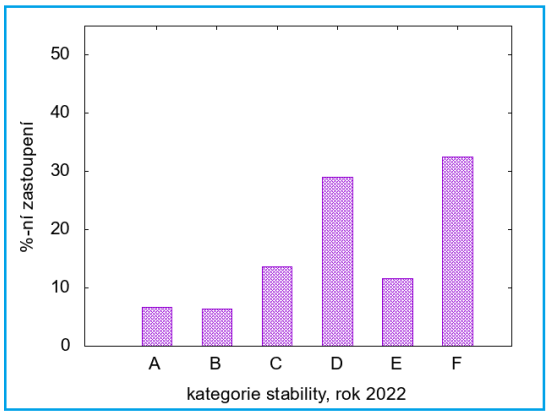
The years 2022, 2023, and 2024 show the most average behaviour in terms of the occurrence of atmospheric stability categories in the vicinity of SMR ETE. In these years, the representation of almost all weather categories falls within the interval defined by the seven-year average and the corresponding standard deviation. For the years 2018 to 2021, the representation of most weather categories is outside this interval.

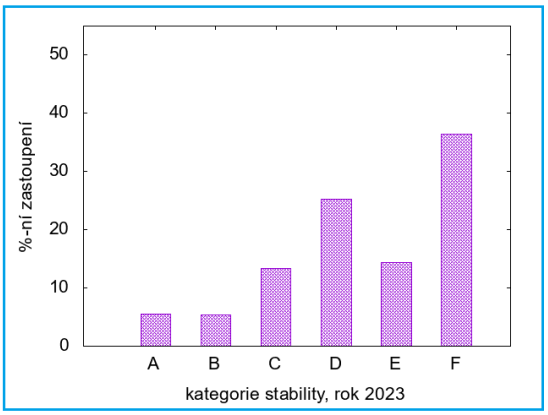


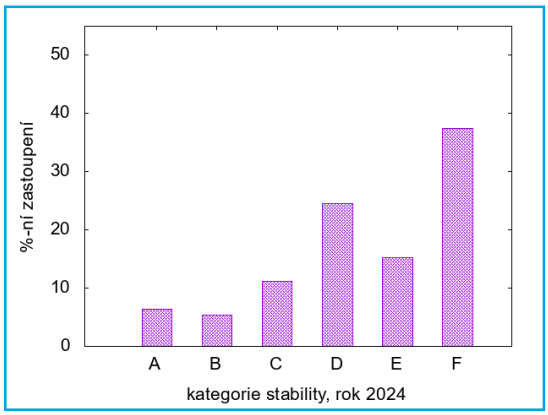


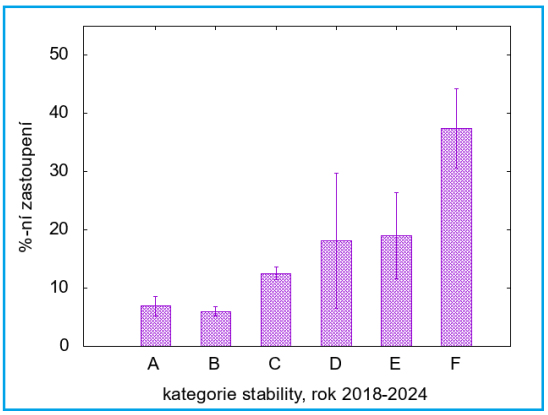












%-ní zastoupení	percentage representation
kategorie stability, rok 2018	stability category, year 2018

kategorie stability, rok 2019	stability category, year 2019
kategorie stability, rok 2020	stability category, year 2020
kategorie stability, rok 2021	stability category, year 2021
kategorie stability, rok 2022	stability category, year 2022
kategorie stability, rok 2023	stability category, year 2023
kategorie stability, rok 2024	stability category, year 2024
kategorie stability, rok 2018–2024	stability category, year 2018–2024

Fig. 10 Percentage representation of atmospheric stability categories at the Temelín site in individual years and overall for the period 2018 to 2024.

II.3.3 Hydrological conditions

The receiving water body for liquid discharges from the operating ETE1,2, as well as future liquid discharges from New NPP ETE and SMR ETE, is the Kořensko Reservoir on the Vltava River. The flow rate in the Vltava River and its ability to dilute discharged radioactive substances are influenced by the amount of evaporation from the cooling towers of ETE1,2, New NPP ETE, and SMR ETE, as well as by the effects of projected climate change. The determination of the calculation flow rate in the Vltava River downstream of the Kořensko Reservoir was based on statistical data and measured meteorological parameters. For the study of the effect of normal operation of SMR ETE, a methodological classification of year types into a dry year, an average year, and a wet year was selected.

Tab. 1 Flow in the Vltava River at the "Kořensko" profile, applied in the analysis of the radiological effect of SMR ETE, 2018–2024.

	Average flow rate, Kořensko [m³/s]							
month/year	**2018 dry year**	2019	2020	2021	2022	2023	**2024 wet year**	**2004–2024 average**
January	39.7	52.20	14.46	41.66	36.86	55.50	124.89	46.7
February	45.6	60.84	36.35	116.73	46.27	76.60	62.57	55.7
March	38.0	125.38	43.74	54.57	35.06	61.24	43.99	74.2
April	30.7	40.44	21.24	27.98	29.15	141.04	31.22	60.3
May	15.8	27.83	14.75	72.33	22.56	63.78	26.81	40.1
June	20.0	21.44	83.87	30.30	33.66	31.09	35.21	57.1
July	16.7	13.30	70.05	51.66	53.57	14.60	36.39	41.8
August	7.4	13.87	56.09	45.36	33.60	26.94	16.64	36.3
September	14.9	17.13	43.00	35.11	43.10	22.66	196.40	41.5
October	24.1	28.01	79.44	36.82	40.42	31.03	83.17	43.4
November	18.7	18.48	67.98	30.99	34.18	33.52	45.50	33.5

December	21.2	13.89	37.91	35.55	60.68	122.73	56.87	38.1
average	24.4	36.1	47.4	48.3	39.1	56.7	63.3	**47.4**

For the analysis of the effects of normal operation of SMR ETE, three categories were selected on the basis of meteorological and hydrological data:

The year 2018 was selected as a **dry year** on the basis of meteorological data and water flow measurements at the "Kořensko" profile – it was a below-average year in terms of atmospheric precipitation and, at the same time, the year with the lowest annual flow in the Vltava River at the Kořensko profile. Other measured parameters (occurrence of stability categories, frequency of wind direction, and wind speed) in 2018 were consistent with expected values based on long-term measurements. The flow rate was set at 24.4 m³/s.

The year 2023 was selected as an **average year** on the basis of meteorological data and the average flow rate for the years 2004–2024 – it is an average year in terms of atmospheric precipitation and, at the same time, the long-term average flow rate in the Vltava River at the Kořensko profile was applied. Other meteorological parameters in 2023 (occurrence of stability categories, frequency of wind direction, and wind speed) were consistent with expected values based on long-term measurements. The long-term average flow rate in the Vltava River at the Kořensko profile for the years 2004–2024 was set at 47.4 m³/s.

The year 2024 was selected as a **wet year** on the basis of meteorological data, particularly total atmospheric precipitation, and hydrological data. The highest annual flow rate in the Vltava River at the Kořensko profile was recorded in 2024. The flow rate for the wet year was therefore set at 63.3 m³/s.

II.3.4 Concept of the representative person and assumptions regarding the behaviour and habits of the population

When calculating annual individual effective doses for the representative person and other persons living in individual calculation sectors, the assumptions set out below are applied; these are based on the requirements of SONS Decrees [1] and [13], IAEA documents [3], ICRP documents [4], and US NRC RG 1.109 [5].

The representative person is determined on the basis of the calculation of individual doses in the vicinity of a nuclear facility (NF), taking into account all considered exposure pathways, atmospheric and hydrospheric discharges, and all nuclides declared in the discharges. The assumptions used for the calculation are decisive for determining individual doses in individual age categories. The representative person may differ for different atmospheric and hydrospheric discharges and for different conditions under which the discharges are made.

The representative person is exposed as a result of the presence of radionuclides in the atmosphere in their surroundings. Radionuclides in the atmosphere may cause a dose from external exposure and internal exposure through inhalation of radionuclides in the inhaled air.

The representative person is also exposed to radionuclides present in deposition on the ground in their surroundings. Radionuclides in deposition on the ground or in soil may cause a dose from external exposure and internal exposure by ingestion of food into which radionuclides have passed from the surrounding soil through the root system or through the foliar system (plant respiration or deposition of radionuclides on plant leaves/the plant surface).

In addition, the representative person may be exposed by intake of radionuclides that were originally discharged to the hydrosphere (to surface waters) as a result of operation of the nuclear facility – through intake of drinking water penetrated by radionuclides discharged from operation of the nuclear facility to the hydrosphere, ingestion of fish from water into which hydrospheric discharges are directed, ingestion of other foodstuffs that were irrigated with river water during the growing season, or ingestion of milk from cows watered with river water.

A minor source of exposure of the representative person may also be time spent on the riverbank (for example, by a fisherman), swimming, and rowing in the river into which hydrospheric discharges are directed.

The following parameters are applied when calculating doses for the representative person:

- Inhalation of radionuclides present in the atmosphere: the representative person is assumed to inhale all air at the given location (at their place of residence). The breathing rate is average and typical for the given age category.

- Exposure from the cloud and from deposition on the ground: when calculating doses for the representative person, no shielding is applied (shielding factor = 1), i.e. as if the representative person were outdoors the entire time.
- When calculating doses from external exposure from deposition, it is assumed that deposition on the ground caused by a discharge during the monitored period (e.g. a discharge over 1 year) causes external exposure from the ground for a further 15 years. That is, the dose from deposition of the given nuclide in the given year includes the total dose (as if “committed”) for the next 15 years (the given nuclide remains deposited on the ground for another 15 years and causes exposure, which is included in the effects in the year in which the discharge occurred, while taking into account the radioactive transformation of that nuclide).
- When calculating doses from food ingestion or inhalation of air by the representative person, a 50-year or 70-year committed effective dose is calculated (depending on the age category). In the case of ingestion pathways, it is assumed that deposition of the given nuclide occurring in the given year continues to be taken up by the root system of plants for another 15 years, i.e. the effects for the given year also include the contribution of already deposited activity for the next 15 years, taking into account the radioactive transformation of that radionuclide, the so-called effective half-life for removal of the nuclide from the plant, the effective areal soil density, the time between harvest and ingestion, and the period during which the plant grows.
- Vegetables: The representative person obtains all (100%) of their leafy vegetable consumption from foodstuffs produced (even hypothetically) in the given sector.
- For other agricultural products (other vegetables, meat, eggs, and cereals), it is assumed that the representative person consumes 75% of their consumption from that sector; the remainder is a “clean”, uncontaminated product.
- Milk: In calculating the dose to the representative person, it is assumed that 75% of the representative person’s total annual milk consumption is from drinking cow’s milk from a cow that grazes in that sector and that, outside the growing season, is fed in a stall with feed grown (even hypothetically) in that sector. The software also calculates radionuclide concentrations in goat’s milk and the committed effective dose from drinking goat’s milk for individual age categories.
- Irrigation: In the case of ingestion of individual “irrigated” foodstuffs, it is assumed that the representative person consumes at most 50% of their consumption of the given foodstuff from “irrigated” sources. This means that, if the given sector is located in a cadastral area bordering a river into which liquid discharges from a nuclear facility are released, it is assumed that agricultural products in that sector are irrigated and that irrigation causes additional contamination of plants and soil (in addition to contamination caused by atmospheric discharges).
- Drinking water: The representative person obtains all (100%) of their drinking water consumption from a well or water source into which river water seeps. The ESTE AI software evaluates whether the built-up area of the municipality, including isolated buildings, is located near the bank of the river/reservoir (approximately within 100 m of the bank). If so, the model assumes that a representative person may live in the built-up area of the municipality and obtain their entire annual drinking water consumption from a well into which water from the watercourse seeps. Water from the river fully replenishes the well. The transfer of individual radionuclides from the river water to the well water is expressed by the “river/well” transfer factor, which differs for individual nuclides.
- When calculating the collective dose for the given municipality, it is also assumed that 100% of the population of the given municipality (for a municipality with fewer than 2,000 inhabitants) drinks water from a well (or from a water supply system fed by a well) into which water from the watercourse seeps.
- Fish: The representative person obtains all (100%) of their fish consumption from fish that spend their entire lives in the river in the vicinity of the village/town (only if the cadastral area of the village/town lies on the riverbank).
- Swimming in the river: The representative person (older than 5 years) swims for 100 hours per year in the river in the vicinity of the village/town (only if the cadastral area of the village/town lies on the riverbank).
- Time spent on the riverbank (fisherman): The representative person (older than 5 years) spends 200 hours per year on the riverbank by the river in the vicinity of the village/town (only if the cadastral area of the village/town lies on the riverbank).
- Rowing: The representative person (older than 5 years) spends 100 hours per year in a boat on the river in the vicinity of the village/town (only if the cadastral area of the village/town lies on the riverbank).

II.3.4.1 Sources of statistical data for analyses and calculations

Data on the habits and lifestyle of the population in inhabited places where the highest radionuclide contents in environmental components are measured or calculated by the model (hereinafter the "selected group of persons") must be examined in terms of information on the location, dietary habits, and lifestyle, taking into account physiological factors, particularly age. Data on individuals with extreme habits must be excluded from the data on the habits and lifestyle of the selected group of persons. Data on the habits and lifestyle of the selected group of persons must be valid over the long term. If data on the habits and lifestyle of the local population cannot be obtained, data from the relevant regional or national statistics must be used and, for the amount of inhaled air and ingested water, data pursuant to Section 67(2) and (3) of Decree No. 422/2016 Coll. (Annex No. 5 to the Decree) [1] or [13].

Statistical data obtained from the statistical offices of the Czech Republic (ČR), the Federal Republic of Germany (DE), specifically the federal state of Bavaria, and the Republic of Austria (AT) were used to calculate ingestion doses. On this basis, food consumption baskets were prepared and then used to calculate ingestion doses.

Tab. 2 Food consumption basket based on statistical data for the Czech Republic (ČR), Austria (AT), and Germany (Bavaria, DE) for 2018 [2].

Food		0–5 years			6–15 years			over 17 years		
		ČR	AT	DE	ČR	AT	DE	ČR	AT	DE
milk and dairy products	[l/year]	194	96	70	332	165	119	247	123	88
beef	[kg/year]	4	8	4	9	19	11	8	18	10
pork	[kg/year]	5	6	4	21	27	18	42	54	36
poultry	[kg/year]	9	4	4	33	15	16	27	13	13
Fish	[kg/year]	2	2	4	4	5	9	5	8	14
eggs	[kg/year]	9	8	9	25	22	23	14	14	14
grain	[kg/year]	35	22	31	129	82	114	144	92	102
potatoes	[kg/year]	18	13	10	66	50	36	69	52	37
other vegetable	[kg/year]	39	50	45	82	104	93	88	113	103
leaf vegetable	[kg/year]	11	8	11	12	16	22	12	18	24
fruit	[kg/year]	23	34	37	58	88	96	47	71	70

Tab. 3 Food consumption basket based on statistical data for the Czech Republic (ČR), Austria (AT), and Germany (Bavaria, DE) for 2023 [2].

Food		0–5 years			6–15 years			over 17 years		
		ČR	AT	DE	ČR	AT	DE	ČR	AT	DE
milk and dairy products	[l/year]	200	90	62	343	154	107	255	115	79
beef	[kg/year]	4	12	4	10	20	10	9	15	9
pork	[kg/year]	5	5	3	21	23	15	42	46	28
poultry	[kg/year]	9	4	4	35	16	17	30	13	14
Fish	[kg/year]	2	2	4	4	5	8	6	8	12
eggs	[kg/year]	9	8	10	24	22	25	13	14	15
grain	[kg/year]	33	71	31	125	122	116	137	91	104
potatoes	[kg/year]	18	13	10	66	47	37	70	49	38
other vegetable	[kg/year]	39	95	46	83	162	95	88	121	105
leaf vegetable	[kg/year]	7	8	9	16	16	18	16	17	20
fruit	[kg/year]	24	38	36	62	97	92	49	78	67

Food		0–5 years			6–15 years			over 17 years		
		ČR	AT	DE	ČR	AT	DE	ČR	AT	DE
	r]									

Tab. 4 Food consumption basket based on statistical data for the Czech Republic (ČR), Austria (AT), and Germany (Bavaria, DE) for 2024 [2].

Food		0–5 years			6–15 years			over 17 years		
		ČR	AT	DE	ČR	AT	DE	ČR	AT	DE
milk and dairy products	[l/year]	200	90	62	343	154	107	255	115	79
beef	[kg/year]	4	12	4	10	20	10	9	15	9
pork	[kg/year]	5	5	3	21	23	15	42	46	28
poultry	[kg/year]	9	4	4	35	16	17	30	13	14
Fish	[kg/year]	2	2	4	4	5	8	6	8	12
eggs	[kg/year]	9	8	10	24	22	25	13	14	15
grain	[kg/year]	33	71	31	125	122	116	137	91	104
potatoes	[kg/year]	18	13	10	66	47	37	70	49	38
other vegetable	[kg/year]	39	95	46	83	162	95	88	121	105
leaf vegetable	[kg/year]	7	8	9	16	16	18	16	17	20
fruit	[kg/year]	24	38	36	62	97	92	49	78	67

Detailed data on the number and age composition of inhabitants in the assessed sectors, the sown areas for agricultural production, harvest data, and cattle and poultry farming results were also obtained from statistical data for the Czech Republic, Austria, and Germany and implemented in the ESTE AI calculation model.

II.4. Determination of bounding discharges for the assessment of the radiological consequences of operational states

When determining bounding discharges for the assessment of the radiological consequences of operational states of SMR ETE, bounding discharges from SMR ETE to the atmosphere and to watercourses were first determined according to data on reference SMR units. The data for ETE1,2 were selected conservatively according to the EIA Documentation for New NPP ETE [10] as the maximum measured values of discharges to the atmosphere measured between 2004 and 2008; for discharges to watercourses, measured values from 2006 to 2008 were used. The data for New NPP ETE were taken from the environmental impact assessment documentation for the New NPP ETE Project [10]. Data for the 2× 1,700 MW_e power output option were adopted as the maximum conservative values.

II.4.1 Maximum specified design and operating discharges to the atmosphere and to watercourses for the reference units SMR ETE, New NPP ETE, and ETE1,2

The basic input for assessing the effects of ionising radiation is the conservative determination of the so-called source term, i.e. the maximum magnitude of discharges from SMR ETE, New NPP ETE, and ETE1,2.

In the case of the source term for SMR ETE and New NPP ETE, discharge values for individual radionuclides corresponding to current knowledge of discharges from the reference units were used. For practical reasons (to account for concurrent power output), the bounding discharges from New NPP ETE to the atmosphere and to watercourses are determined on a bounding basis for the power output option up to 2× 1,700 MW_e, which also covers the 2× 1,200 MW_e power output option.

The anticipated maximum discharges include both normal operation and abnormal operation conditions, during which discharges may be higher, for example due to a higher operating leak rate of the fuel cladding. Abnormal operation is included in the conservative envelope of operating discharges. For this reason, the projected bounding annual discharges from SMR ETE and New NPP ETE are, in most cases, higher than or comparable

to the maximum operating discharges from ETE1,2 with comparable power output. However, this is not specific to New NPP ETE or SMR ETE. This is due to the consideration of maximum values of individual radionuclide discharges from various reference units.

The source term for discharges to the atmosphere and to watercourses from the operation of ETE1,2 is determined as the annual measured maximum of discharges of individual radionuclides from ETE1,2 over the above-mentioned periods. Although, in the period after preparation of the EIA Documentation, higher values for individual radionuclides were recorded in some years according to annual monitoring reports, these were isolated fluctuations, and the average annual discharges of the key radionuclides remain below, or at most at, the level considered in the EIA Documentation for New NPP ETE [10].

The input source term for discharges to the atmosphere and to watercourses was determined for SMR ETE and New NPP ETE according to bounding data for the reference units. The radionuclide vector for the individual power plants, broken down into individual radionuclides, is presented in the following tables.

From the perspective of the methodology for preparing EIA studies, the most conservative possible scenario is considered – concurrent operation of all nuclear facilities for a period of 50 or 70 years.

For the purposes of the assessment, these values are used as a conservative bounding source term and will be updated in subsequent proceedings according to the selected SMR ETE or New NPP ETE project, as applicable.

The source term values presented in the following tables were used for the assessment.

Tab. 5 Maximum annual discharges to the atmosphere from the two ETE1,2 units, based on measurements [10].

Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]
H-3	3.70E+12	Kr-88	4.30E+11	Xe-135m	7.30E+10
C-14	5.60E+11	Sr-89	3.80E+05	Xe-135	1.70E+12
Ar-41	1.40E+12	Sr-90	1.70E+05	Xe-138	3.30E+10
Cr-51	6.00E+06	Zr-95	6.90E+05	Cs-134	6.10E+05
Mn-54	2.70E+05	Nb-95	1.10E+06	Cs-137	6.20E+05
Fe-59	9.80E+04	Ag-110m	6.70E+05	Ba-140	1.90E+05
Co-58	1.60E+06	Sb-124	1.50E+06	Ce-141	6.80E+04
Co-60	5.00E+05	Sb-125	2.50E+05	Ce-144	2.70E+05
Zn-65	8.80E+04	I-131	2.40E+08	Pu-238	5.20E+04
Kr-85m	2.40E+11	Te-132	4.20E+05	Pu-239	3.30E+04
Kr-85	2.50E+11	I-133	6.70E+06	Am-241	2.10E+04
Kr-87	1.70E+11	Xe-133	5.70E+12		

Tab. 6 Anticipated maximum annual discharges to the atmosphere from the two New NPP ETE units, power output option 2× 1,700 MW_e [10].

Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]
H-3	1.33E+13	Kr-88	1.33E+13	Xe-133m	1.33E+13
C-14	5.40E+11	Sr-89	1.18E+07	Xe-133	6.36E+14
Ar-41	2.52E+12	Sr-90	4.66E+06	Xe-135m	1.04E+12
Cr-51	7.18E+06	Zr-95	7.40E+05	Xe-135	8.88E+13
Mn-54	4.22E+06	Nb-95	3.11E+06	Xe-137	0
Fe-59	2.08E+06	Ru-103	1.26E+06	Xe-138	8.88E+11
Co-58	3.55E+07	Ru-106	5.77E+04	Cs-134	3.55E+06
Co-60	8.14E+06	Sb-125	4.51E+04	Cs-136	2.44E+06
Kr-85m	1.11E+13	I-131	6.51E+08	Cs-137	6.66E+06
Kr-85	2.52E+15	I-133	2.37E+09	Ba-140	3.11E+05
Kr-87	3.92E+12	Xe-131m	2.59E+14	Ce-141	9.62E+05

Tab. 7 Bounding maximum annual operating discharges to the atmosphere from SMR ETE, 1× up to 500 MW_e.

Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]
H-3	1.00E+12	Y-91	1.49E+03	Xe-133	3.67E+11
C-14org	3.50E+10	Sr-92	2.30E+05	Cs-134	2.48E+04
C-14inorg	8.76E+09	Y-92	2.14E+05	Te-134	3.47E+05
Na-24	2.84E+05	Nb-95	1.88E+04	Xe-135	3.02E+11
Cl-36	1.48E+03	Zr-95	2.21E+04	Cs-136	3.95E+04
Ar-41	2.40E+12	Nb-97	1.68E+04	Cs-137	1.87E+04
K-42	1.40E+07	Zr-97	2.30E+06	Cs-138	2.83E+05
Cr-51	1.48E+05	Mo-99	3.98E+04	Xe-138	2.67E+11
Mn-54	4.94E+04	Ru-103	1.15E+03	Ba-140	7.16E+03
Fe-55	5.04E+04	Ru-105	3.14E+04	La-140	4.74E+04

Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]
Mn-56	1.27E+05	Ru-106	1.63E+01	Ce-141	2.68E+03
Co-58	1.83E+06	Sb-122	5.71E+04	Ce-143	5.37E+04
Fe-59	2.14E+04	Sb-124	1.32E+05	Pr-143	6.45E+03
Ni-59	2.74E+01	Sb-125	5.99E+03	Ce-144	2.90E+02
Co-60	5.03E+04	I-131gas	3.07E+07	Np-239	1.97E+04
Ni-63	3.80E+03	I-131aer	3.07E+07	Ag-108m	6.91E+00
Zn-65	1.16E+04	I-132 gas	2.45E+07	Ag-110m	5.37E+04
Br-84	2.43E+08	I-132aer	2.45E+07	Xe-131m	2.28E+09
Kr-85	4.13E+13	I-133 gas	1.32E+07	Te-133m	1.93E+05
Kr-87	5.33E+10	I-133aer	1.32E+07	Xe-133m	5.76E+10
Kr-88	7.43E+10	I-134 gas	4.36E+07	Xe-135m	1.71E+11
Rb-88	1.31E+05	I-134aer	4.36E+07	Kr-85m	2.79E+10
Rb-89	8.06E+04	I-135 gas	2.49E+07	Y-91m	1.65E+05
Sr-89	1.40E+03	I-135aer	2.49E+07	Tc-99m	6.44E+04
Sr-90	8.27E+00	Te-131	1.32E+05		
Sr-91	1.29E+05	Te-132	1.83E+04		

For SMR ETE, the bounding discharge of C-14 to the atmosphere was divided as follows: for the purposes of the analyses, it was assumed that 80% of C-14 in atmospheric discharges is in organic form and 20% in inorganic form. A general assumption for PWR-type reactors according to the French Institute for Radiation Protection and Nuclear Safety (IRSN) [11] was applied.

The bounding discharge of iodine (I-131 to I-135) to the atmosphere was divided for SMR ETE as follows: for the purposes of the analyses, it was assumed that 50% of iodine in atmospheric discharges is in elemental form and 50% in aerosol form. The assumption regarding the 50% split of iodine forms is supported by the results of discharge balance analyses at operating PWR-type nuclear power plants [12].

For New NPP ETE and ETE1,2, conservative (higher) values for the elemental form of iodine and the aerosol form of other radionuclides were used in the EIA Documentation [10] for the calculation of deposition, including dry deposition. The EIA Documentation [10]does not specify the distribution of organic and inorganic forms of C-14 in atmospheric discharges.

According to current ETE1,2 monitoring reports, the organic form of C-14 predominates in atmospheric discharges of C-14 (similarly to the assumption for SMR ETE). In iodine discharges, the organic form of iodine predominates over the elemental and aerosol fractions.

II.4.2 Maximum specified operating discharges to watercourses

Tab. 8 Maximum annual discharges to watercourses from the two ETE1,2 units, based on measurements [10].

Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]
Cr-51	3.5E+05	Nb-95	1.9E+07	Ce-141	<DL
Mn-54	3.8E+06	Ru-103	3.4E+04	Ce-144	<DL
Fe-55	<DL	Ru-106	<DL	Pu-238	7.4E+05
Fe-59	<DL	Ag-110m	1.9E+07	Pu-239+Pu-240	5.0E+05
Co-58	9.0E+05	Sb-124	3.7E+07	Am-241	4.0E+05
Co-60	2.2E+06	Sb-125	<DL	Cm-242	<DL
Ni-63	<DL	I-131	1.8E+07	Cm-243	<DL
Zn-65	<DL	Cs-134	1.2E+08	Cm-244	<DL
Sr-89	1.5E+06	Cs-137	1.3E+08	Total discharges (excluding tritium)	3.1E+08
Sr-90	3.7E+05	Ba-140	<DL	Tritium (H-3)	5.4E+13
Zr-95	7.5E+06	La-140	<DL		

Tab. 9 Anticipated maximum annual discharges to watercourses from the two New NPP ETE units, power output option 2× 1,700 MW_e [10].

Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]
Na-24	3.5E+08	Tc-99m	1.3E+08	Cs-137	1.3E+09
P-32	1.3E+07	Ru-103	2.5E+08	Ba-137m	3.4E+07
Cr-51	4.4E+08	Rh-103m	2.3E+08	Ba-140	4.3E+08
Mn-54	3.3E+08	Ru-106	3.5E+09	La-140	5.9E+08
Fe-55	5.7E+08	Rh-106	2.9E+09	Ce-141	2.1E+07
Fe-59	1.7E+08	Ag-110m	1.3E+08	Ce-143	3.7E+07
Co-58	7.3E+08	Ag-110	5.3E+06	Pr-143	5.8E+06
Co-60	1.0E+09	Sb-124	3.2E+07	Ce-144	4.1E+08

Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]
Ni-63	1.3E+08	Te-129m	5.8E+06	Pr-144	1.3E+08
Zn-65	1.6E+07	Te-129	2.3E+07	W-187	2.6E+07
Rb-88	2.1E+09	Te-131m	1.9E+07	Np-239	3.9E+07
Sr-89	1.1E+07	Te-131	5.6E+06	Other, total	8.9E+05
Sr-90	1.3E+06	I-131	1.5E+08	Total discharges (excluding tritium)	1.9E+10
Sr-91	5.0E+06	Te-132	3.5E+07	Tritium (H-3)	1.2E+14
Y-91m	3.3E+06	I-132	2.3E+07		
Y-91	6.7E+06	I-133	6.0E+07		
Y-93	2.1E+07	I-134	6.6E+06		
Zr-95	9.6E+07	Cs-134	8.9E+08		
Nb-95	1.5E+08	I-135	5.8E+07		
Mo-99	1.3E+08	Cs-136	1.6E+09		

Tab. 10 Bounding maximum annual operating discharges to watercourses from SMR ETE, 1× up to 500 MW_e.

Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]	Radionuclide	Activity [Bq/year]
H-3	5.00E+12	Kr-85	3.56E+01	Xe-131m	1.31E+07
C-14inorg	1.39E+03	Sr-89	2.33E+02	Xe-133	4.80E+07
Na-24	2.96E+03	Sr-90	2.11E+01	Xe-133m	2.81E+09
K-42	3.11E+05	Y-91	7.93E+00	Xe-135	9.81E+05
Mn-54	3.04E+02	Nb-94	3.76E+00	Cs-134	6.67E+05
Fe-55	1.68E+03	Nb-95	4.43E+02	Cs-136	7.90E+04
Co-58	7.78E+02	Zr-95	5.20E+02	Cs-137	4.26E+05
Fe-59	6.59E+01	Zr-97	1.57E+01	Ba-140	1.85E+04
Ni-59	4.36E+00	Mo-99	2.70E+01	La-140	7.95E+03
Co-60	1.15E+02	Ru-103	1.12E+04	Ce-141	2.20E+02
Ni-63	5.77E+02	I-131aer	6.79E+02	Ce-143	6.22E+02
Zn-65	4.19E+02	I-133aer	1.62E+02	Pr-143	6.35E+02
Kr-85m	1.56E+07	Te-132	1.17E+03	Ce-144	6.18E+03

The bounding discharge of C-14 to watercourses was conservatively assumed for SMR ETE to be entirely in inorganic form. The bounding discharge of iodine to watercourses was assumed for SMR ETE to be entirely in aerosol form.

The EIA Documentation [10] does not specify the distribution of the forms of iodine and C-14 in discharges to watercourses.

According to the current ETE1,2 monitoring reports, the levels of iodine and C-14 discharges to watercourses are below the detection limit and, therefore, their form is not determined.

III. Determination and evaluation of the radiological effects of SMR ETE, New NPP ETE, and ETE1,2 for the SMR ETE EIA Documentation

III.1. Radiological effect of SMR ETE

The radiological effect of SMR ETE was analysed in a report prepared as part of the EIA Documentation – Study of Radiological Effects of Normal Operation of SMR ETE [2]. The study [2] was prepared using conversion factors pursuant to the amendment to Decree No. 422/2016 Coll. [13]. For comparison, results were also determined using conversion factors according to the original wording of Decree No. 422/2016 Coll. [1]. Unless stated otherwise, the results presented below apply to the updated wording of Decree No. 422/2016 Coll. [13].

The calculation of the radiological consequences of normal operation of SMR ETE was performed using the ESTE AI software, which makes it possible to identify representative persons for different exposure pathways, determines individual effective doses and 50-year (adults) or 70-year (children) committed individual effective doses, determines doses to the average inhabitant, and calculates collective doses from them.

The software calculates the effects of discharges to the atmosphere and to watercourses; in the case of discharges to the atmosphere, it makes it possible to enter a discharge and calculate the dispersion of radionuclides from different points at the site (ventilation stacks or cooling towers). The methodological procedures and algorithms of the software take into account all potential exposure pathways and a large number of radionuclides in a potential discharge. The methodology and calculation model are described in greater detail in chapter II.2.

In the study [2], the results were analysed in the form of six scenarios for exposure from atmospheric discharges and three scenarios for exposure from discharges to watercourses.

Based on meteorological data from 2018 to 2024, an analysis of wind direction at the selected SMR ETE site and an analysis of the flow rate in the Vltava River were performed. Weather conditions did not change significantly during the selected period; see Fig. 6. Based on meteorological data, the years 2018, 2023, and 2024 were selected as representative years, with 2018 considered a **dry year** with a lower flow rate in the Vltava River at the Kořensko profile and 2023 selected as an **average year** with the long-term annual average at the Kořensko profile. The year 2024 was selected as a **wet year**. Another subject of the analysis was the effect of the height of the SMR ETE ventilation stack (VK) on radiological effects on the population.

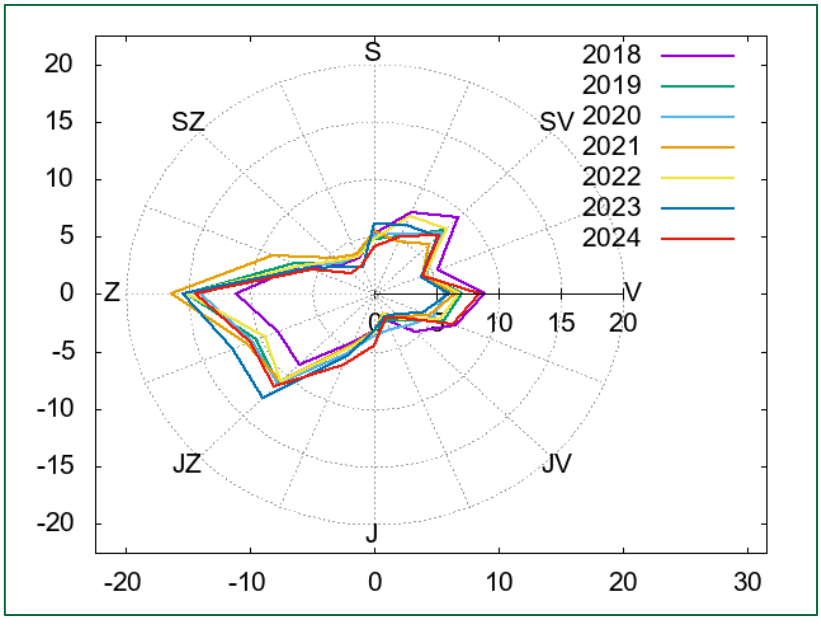


Fig. 11 Wind rose for the period from 2018 to 2024.

The study [2] identified inhabited locations in the vicinity of SMR ETE where the highest effective dose values for the representative person were found. In terms of atmospheric discharges, three locations were identified in this way – Kočín, Litoradlice, and Zvěrkovice. In terms of liquid discharges, this was the location of Neznašov, including Újezd and Chaty Pašovice. The effective doses determined for bounding discharges from SMR ETE to the atmosphere and hydrosphere are presented in Tab. 11 and Tab. 12.

The following quantities were determined for the individual locations of interest:

Discharges to the atmosphere

- committed effective dose (50 or 70 years) from inhalation for the (given) age category (sum over all nuclides) [Sv],
- committed effective dose (50 or 70 years) from ingestion for the (given) age category (sum over all nuclides) [Sv],
- effective dose from external exposure from deposition (sum over all nuclides) [Sv],
- effective dose from external exposure from the cloud (sum over all nuclides) [Sv],
- atmosphere: total effective dose and committed effective dose via all considered pathways [Sv].

Discharges to the hydrosphere

- committed effective dose (50 or 70 years) from ingestion (sum over all nuclides) [Sv],
- drinking water, committed effective dose (50 or 70 years) from ingestion for the (given) age category (sum over all nuclides) [Sv],
- irrigation, watering of animals, and fish, committed effective dose (50 or 70 years) from ingestion for the (given) age category (sum over all nuclides) [Sv],
- effective dose from external exposure during swimming [Sv],
- effective dose from external exposure during boating [Sv],
- effective dose from external exposure during time spent on the riverbank [Sv],
- hydrosphere: total effective dose and committed effective dose via all considered pathways for the (given) age category [Sv].

atmosphere + hydrosphere: Total effective dose and committed effective dose via all considered pathways for the (given) age category [Sv]:

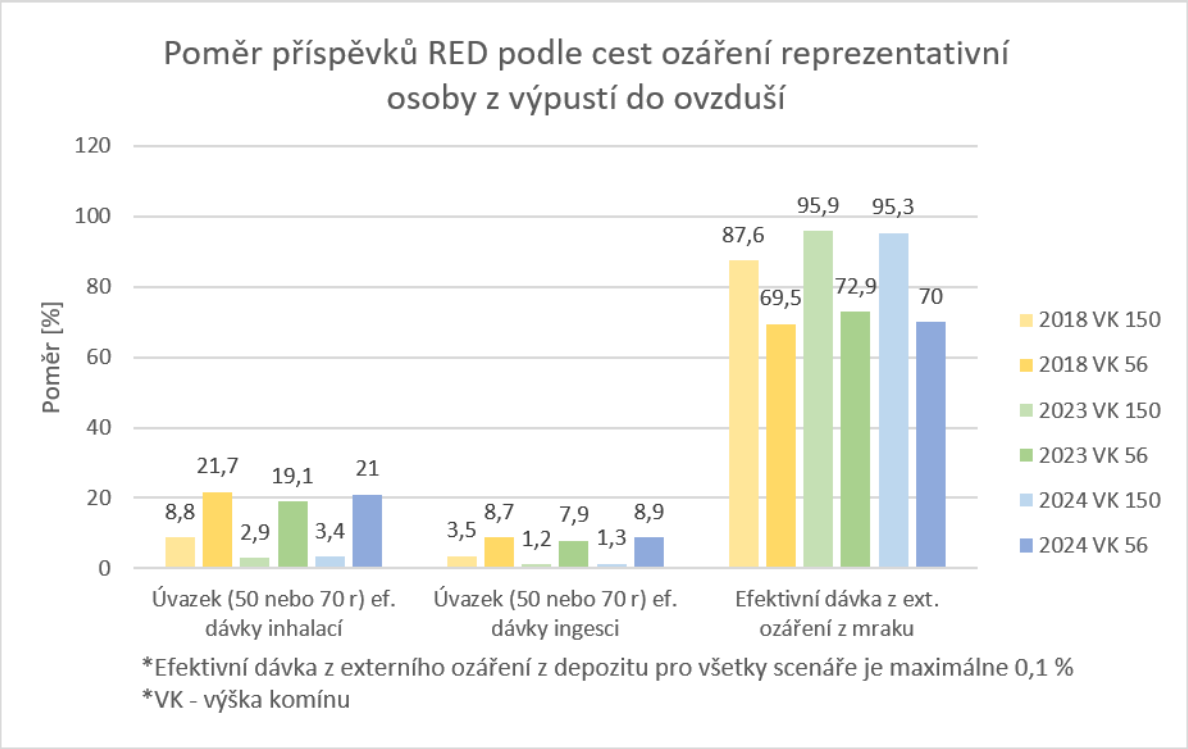
Study [2] identified two age groups of the population as those for which the maximum annual effective dose values from atmospheric discharges apply, namely the 6–15 years and 16+ years age groups. For hydrospheric discharges, the age groups of interest were identified as the foetus and children aged 0–5 years, for whom the maximum annual doses from discharges to the hydrosphere apply.

Tab. 11 Summary results, dose including the committed dose to the representative person as a result of bounding discharges from SMR ETE – atmosphere.

Radiological effect of discharges to the atmosphere						
Year	**2018**		**2023**		**2024**	
Height of VK [m]	150	56	150	56	150	56
Location	Kočín	Kočín	Zvěrkovice	Zvěrkovice	Litoradlice	Zvěrkovice
Age group [years]	16+ (6–15)	16+ (6–15)	16+ (6–15)	16+ (6–15)	16+ (6–15)	16+ (6–15)
Total annual effective dose and committed effective dose via all considered pathways [Sv/year]	8.9E-08 (8.8E-08)	1.4E-07 (1.3E-07)	1.04E-07 (1.03E-07)	1.78E-07 (1.73E-07)	9.66E-08 (9.61E-08)	1.57E-07 (1.52E-07)

According to study [2], the defined exposure effects of discharges to the atmosphere on the representative person are broken down into the following pathways:

- committed effective dose (50 or 70 years) from inhalation,
- committed effective dose (50 or 70 years) from ingestion,
- effective dose from external exposure from deposition,
- effective dose from external exposure from the cloud.



Poměr příspěvků RED podle cest ozáření reprezentativní osoby z výpustí do ovzduší	Ratio of annual effective dose contributions by exposure pathway for the representative person from discharges to the atmosphere
Poměr [%]	Ratio [%]
Úvazek (50 nebo 70 r) ef. dávky inhalací	Committed effective dose (50 or 70 years) from inhalation
Úvazek (50 nebo 70 r) ef. dávky ingesci	Committed effective dose (50 or 70 years) from ingestion
Efektivní dávka z ext. ozáření z mraku	Effective dose from external exposure from the cloud
*Efektivní dávka z externího ozáření z depozitu pro všetky scénáře je maximálne 0,1 %	*The effective dose from external exposure from deposition is at most 0.1% for all scenarios
*VK – výška komínu	*VK – ventilation stack height

Fig. 12 Ratio of annual effective dose contributions by exposure pathway from discharges to the atmosphere.

The graph above shows the ratio of annual effective dose contributions for the individual scenarios. The graph shows that exposure from the cloud is the dominant contributor to the effective dose to the representative person. For a stack height of 150 m, the effect of exposure from inhalation and ingestion accounts for at most 12.3% of the annual effective dose. For scenarios with a stack height of 56 m, the contribution of the effective dose from the cloud decreases and the committed doses from inhalation and ingestion increase to

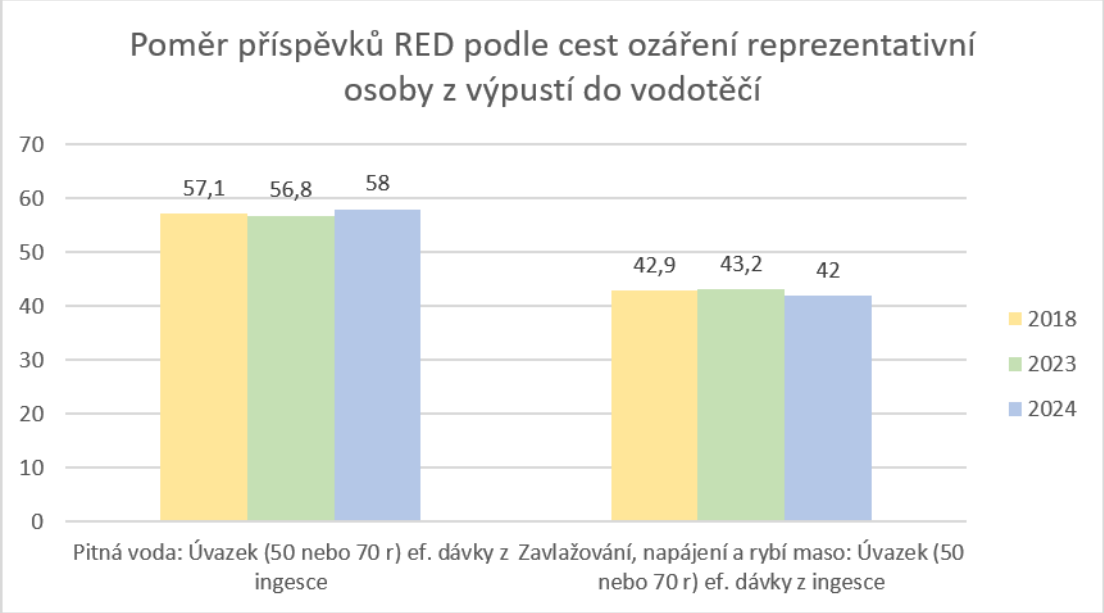
approximately 30%. For both stack heights considered, the effect of exposure from radionuclide deposition is practically negligible.

Tab. 12 Summary results, dose including the committed dose to the representative person as a result of bounding discharges from SMR ETE – hydrosphere.

Radiological effect of discharges to the hydrosphere			
Year	**2018 (dry)**	**2023 (average)**	**2024 (wet)**
Location	Újezd and Chaty Pašovice location		
Age group [years]	0–5 (foetus)	0–5 (foetus)	0–5 (foetus)
Total annual effective dose and committed effective dose via all considered pathways [Sv/year]	2.80E-07 (2.05E-07)	1.48E-07 (1.09E-07)	1.31E-07 (9.60E-08)

According to study [2], the main exposure pathways from discharges to watercourses are as follows (sum over all radionuclides):

- committed effective dose (50 or 70 years) from ingestion of drinking water,
- committed effective dose (50 or 70 years) from ingestion due to irrigation (e.g. vegetables), watering of animals (animal meat), and fish.



Poměr příspěvků RED podle cest ozáření reprezentativní osoby z výpusti do vodotečí	Ratio of annual effective dose contributions by exposure pathway for the representative person from discharges to watercourses
Pitná voda: Úvazek (50 nebo 70 r) ef. dávky z Zavlažování, napájení a rybí maso: Úvazek (50 ingesce nebo 70 r) ef. dávky z ingesce	Drinking water: Committed effective dose (50 or 70 years) from ingestion Irrigation, watering of animals, and fish: Committed effective dose (50 or 70 years) from ingestion

Fig. 13 Ratio of annual effective dose contributions by exposure pathway from discharges to watercourses.

In terms of effects, the main factor influencing annual effective doses from atmospheric discharges is the height of the SMR ETE ventilation stack. According to the study, meteorological conditions, which differ for the selected representative years 2018, 2023, and 2024, have a smaller effect on the resulting annual effective dose value than the height of the ventilation stack, but a significant (directional) effect on the determination of the representative person.

In terms of discharges to the hydrosphere, the height of the ventilation stack has no direct effect, since discharges to the hydrosphere do not occur through the stack, nor does it have an indirect effect in terms of total exposure, because at the locations with the highest doses from exposure due to discharges to the hydrosphere, the effect of exposure due to discharges to the atmosphere is practically negligible. A key factor for discharges to the hydrosphere is the flow rate of the Vltava River (Kořensko). For the selected representative dry year 2018 (24.4 m³/s), the annual effective dose values from discharges to the hydrosphere for the representative person are almost double those for 2023 (an average year in terms of flow rate, 47.4 m³/s) and more than double those for the wet year 2024 (with a flow rate of 63.3 m³/s).

III.1.1 Radiological effect of SMR ETE on biota

In addition to the radiological effect of SMR ETE on the population, the radiological effect of SMR ETE on biota (terrestrial and aquatic animals, plants, and trees) must also be determined as part of the preparation of the SMR ETE EIA Documentation.

The exposure pathways for terrestrial and aquatic animals, plants, and trees are described in chapter II.2.3. For terrestrial reference organisms, external exposure from deposition on the ground and internal exposure are considered, particularly as a result of food ingestion or inhalation of airborne CO_2 and H_2O (for H-3 and C-14). The terrestrial reference fauna and flora considered comprise deer, rat, duck, frog, bee, earthworm, pine tree, and grass. The aquatic reference fauna considered comprise trout (entire life in water), duck (half of its life in water), and frog (half of its life in water).

The IAEA GSG-10 [3] document specifies reference values for daily doses for the selected representative fauna and flora species, which are presented in Tab. 13.

Tab. 13 Reference values of daily doses for representative fauna and flora species from the IAEA GSG-10 [3] document.

Derived reference value according to the IAEA [Gy/day]	
Deer	1E-04 to 1E-03
Norway rat	1E-04 to 1E-03
Duck	1E-04 to 1E-03
Frog	1E-03 to 1E-02
Bee	1E-02 to 1E-01
Earthworm	1E-02 to 1E-01
Pine	1E-04 to 1E-03
Grass	1E-03 to 1E-02
Trout	1E-03 to 1E-02

The IAEA SSG-10 [3] document describes the general assessment approach based on the above reference values, according to which the assessment results are acceptable if the resulting daily doses for the representative fauna and flora species are at or below the lower end of the reference value interval.

The analysis of the radiological effect of SMR ETE [2] determined the maximum dose rate values for biota (representative fauna and flora species), together with identification of the sectors with the highest dose for the individual years/scenarios. The results are summarised in the following tables.

Tab. 14 Effect of annual bounding discharges to the atmosphere and watercourses from SMR ETE for comparison with reference values, dry year 2018 – highest doses [2].

Reference animal or plant (RAP)	Sector (cadastral area)	Dose rate [Gy/day]
Deer	Temelín	1.70E-10
Norway rat	Temelín	1.70E-10
Duck	Chrášťany, Všemyslice	3.50E-10
Frog	Chrášťany, Všemyslice	3.40E-10
Bee	Temelín	1.20E-10
Earthworm	Temelín	1.20E-10
Pine	Temelín	1.70E-10
Grass	Temelín	1.50E-10
Trout	Albrechtice nad Vltavou, Chrášťany, Všemyslice	6.80E-10

Tab. 15 Effect of annual bounding discharges to the atmosphere and watercourses from SMR ETE for comparison with reference values, average year 2023 – highest doses [2].

Reference animal or plant (RAP)	Sector (cadastral area)	Dose rate [Gy/day]
Deer	Temelín, Týn nad Vltavou	1.30E-10
Norway rat	Temelín, Týn nad Vltavou	1.30E-10
Duck	Chrášťany, Všemyslice	1.90E-10
Frog	Chrášťany, Všemyslice	1.90E-10
Bee	Temelín, Týn nad Vltavou	9.80E-11
Earthworm	Temelín, Týn nad Vltavou	9.80E-11
Pine	Temelín, Týn nad Vltavou	1.30E-10
Grass	Temelín, Týn nad Vltavou	1.20E-10
Trout	Albrechtice nad Vltavou, Chrášťany, Všemyslice	3.50E-10

Tab. 16 Effect of annual bounding discharges to the atmosphere and watercourses from SMR ETE for comparison with reference values, wet year 2024 – highest doses [2].

Reference animal or plant (RAP)	Sector (cadastral area)	Dose rate [Gy/day]
Deer	Temelín	1.50E-10
Norway rat	Temelín	1.50E-10
Duck	Chrášťany, Všemyslice	1.80E-10
Frog	Chrášťany, Všemyslice	1.80E-10
Bee	Temelín	1.10E-10
Earthworm	Temelín	1.10E-10
Pine	Temelín	1.50E-10
Grass	Temelín	1.30E-10

Trout	Albrechtice nad Vltavou, Chrášťany, Všemyslice	3.10E-10

Daily dose values for terrestrial and aquatic representatives of fauna and flora from SMR ETE discharges are at the level of 1E-10 Gy, which is at least 6 orders of magnitude lower than the reference values in IAEA GSG-10 [3]. The highest values are reached in the event of a dry year (reference year 2018) for aquatic animals (fish). This is due to the reduced dilution capacity of the river in dry years.

III.2. Radiological effect of ETE1,2 and New NPP ETE

As part of the New NPP ETE EIA Documentation [10], the effect of the two ETE1,2 units and New NPP ETE on the population and the environment was assessed. From the perspective of the original concept of the Temelín Nuclear Power Plant (4× 1,000 MW_e), New NPP ETE represents the completion of the power plant with two new modern units.

The radiological effect of ETE1,2 and New NPP ETE is analysed in chapter D.I.3.3. Effects of ionising radiation in the report New Nuclear Power Plant at the Temelín site, including power evacuation to the Kočín substation, environmental impact assessment documentation [10]. This document comprehensively addresses all essential aspects relating to the effect of the New NPP ETE Project on the environment and the population, including radiological effects. The effects are assessed both separately for New NPP ETE and in terms of their cumulative effect with the operating ETE1,2.

The calculation of the radiological consequences of normal operation in the atmosphere for ETE1,2 (2 units) and New NPP ETE (2× 1,700 MW_e) was performed using the NORMAL software, version 02, which had at that time been approved for use by the SONS evaluation commission. The calculations of the radiological consequences of New NPP ETE and ETE1,2 were performed by dividing the surroundings of the ETE site into 16 directional and 20 distance zones. The software took into account elevations, terrain roughness, and land surface types according to the actual situation at the Temelín site. Conservative assumptions [10] were used to calculate and determine ground-level activity concentrations, deposition on the ground surface, and deposition rates.

In report [10], the radiological effects (annual effective doses and committed effective doses) of discharges from ETE1,2 and New NPP ETE to watercourses (hydrosphere) were determined using the RDETE software, which was also, and still remains, approved for use by the SONS evaluation commission. The software includes the dispersion of radioactive substances and their decay products in the aquatic environment, estimates of the effect of swimming in contaminated water, boating, time spent on sediment, time spent on irrigated soil, ingestion of drinking water, ingestion of fish living in contaminated water, ingestion of meat and milk from animals watered with contaminated water, and ingestion of agricultural products irrigated with contaminated water. Exposure pathways are considered for all age groups.

In report [10], annual effective doses are determined as the sum of the annual dose from the cloud, the annual dose from deposition in the given year, the committed effective dose from inhalation and ingestion, and committed effective doses from inhalation due to resuspension.

III.2.1 Effect of radioactive discharges from ETE1,2 and New NPP ETE to the atmosphere

In the study of the radiological effect of New NPP ETE and ETE1,2, annual dose values for the population were determined, with the maximum annual dose being determined for direction 3 in Fig. 14, which represents north-east. In report [10], the quantified values are given for this direction as the most unfavourable ones.

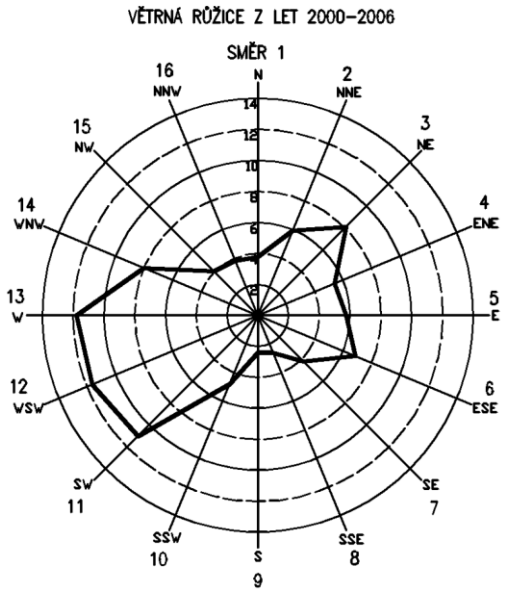
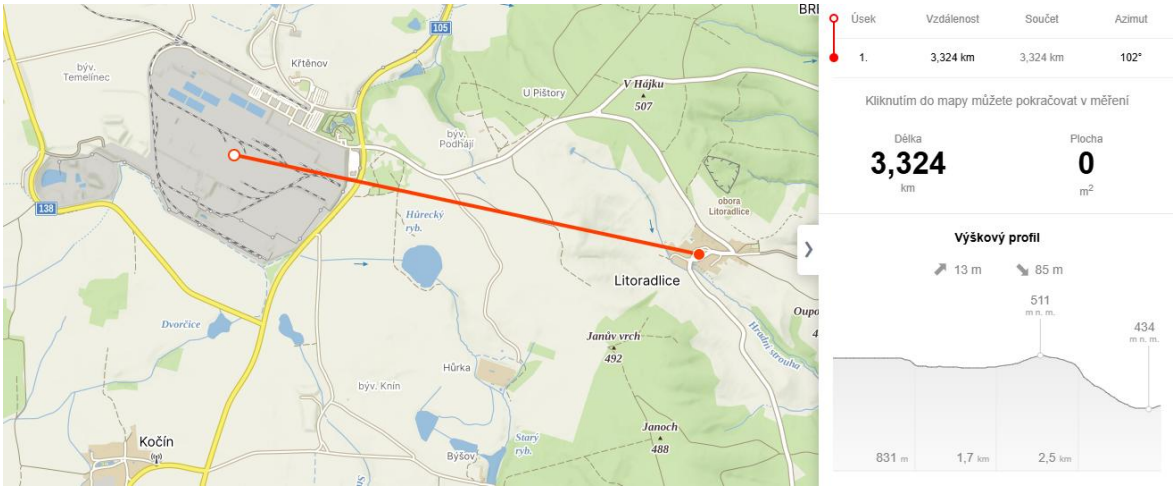


Fig. 14 Wind rose with sectors and cardinal directions marked [10].

In report [10], the values of the total effective dose and committed effective doses via all considered pathways for public exposure are presented separately for New NPP ETE (2 units of 1,200/1,700 MW_e) and ETE1,2 (2 units). The calculated values of the total effective dose and committed effective doses via all considered pathways for the population are divided into 6 age categories:

- children aged 0–1 year,
- children aged 1–2 years,
- children aged 2–7 years,
- children aged 7–12 years,
- children aged 12–17 years,
- adults.

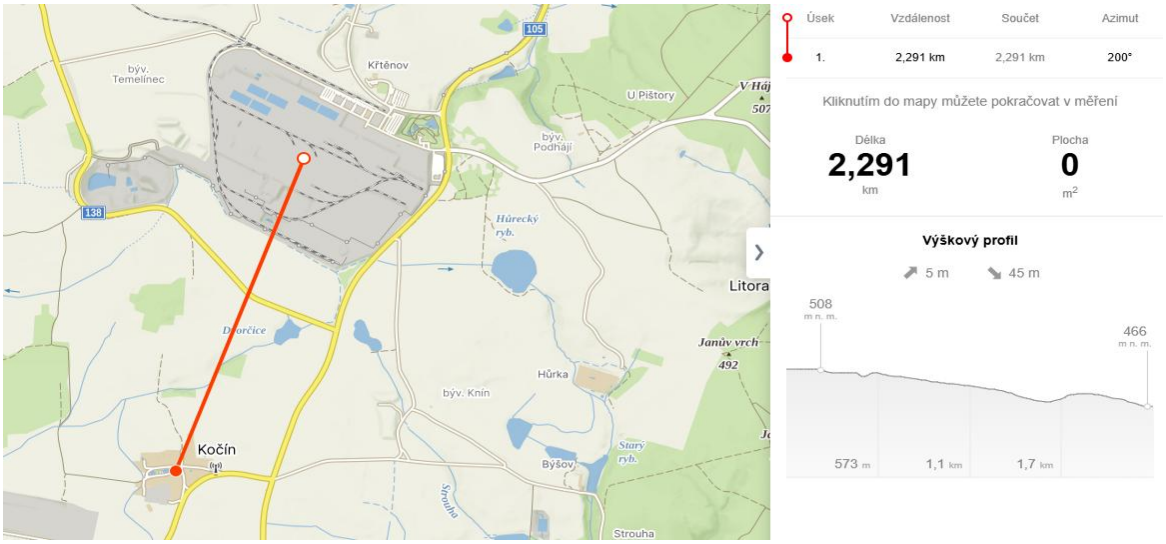
Given the distances of the locations determined in the study of radiological effects of normal operation of SMR ETE [2] from the Kočín, Zvěrkovice, and Litoradlice locations in terms of atmospheric discharges, the distances of interest are 2,333 m and 3,333 m from ETE1,2; see Tab. 17 and Tab. 18.



Úsek	Section
Vzdálenost	Distance
Součet	Total
Azimut	Azimuth

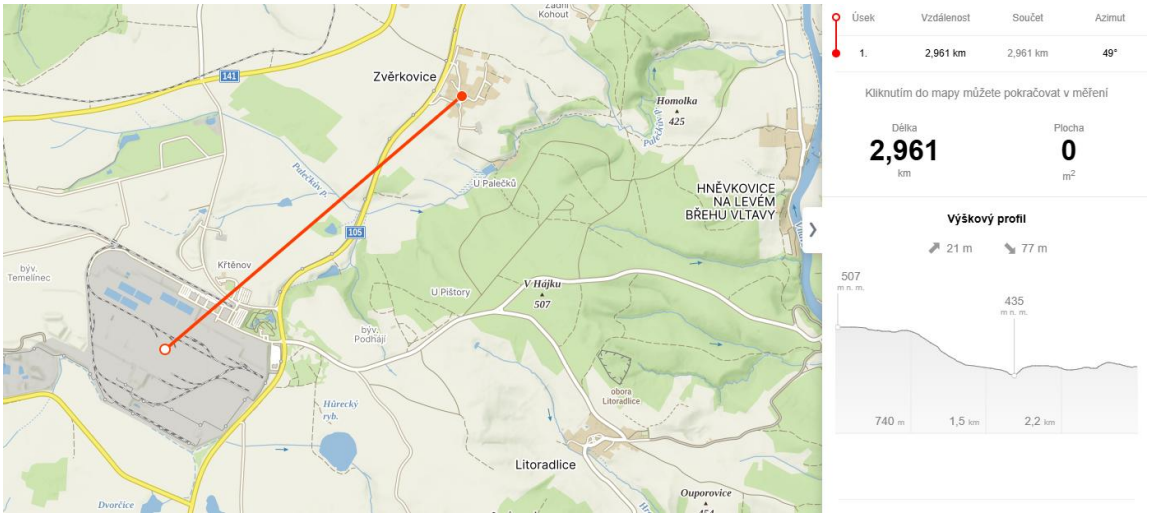
Klepnutím do mapy můžete pokračovat v měření	Tap on the map to continue measuring
Délka	Length
Výškový profil	Elevation profile
Plocha	Area

Fig. 15 ETE1,2 site with distance to the municipality of Litoradlice.



Úsek	Section
Vzdálenost	Distance
Součet	Total
Klepnutím do mapy můžete pokračovat v měření	Tap on the map to continue measuring
Délka	Length
Výškový profil	Elevation profile
Plocha	Area

Fig. 16 ETE1,2 site with distance to the municipality of Kočín.



Úsek	Section
Vzdálenost	Distance
Součet	Total
Klepnutím do mapy můžete pokračovat v měření	Tap on the map to continue measuring
Délka	Length
Výškový profil	Elevation profile
Plocha	Area

Fig. 17 ETE1,2 site with distance to the municipality of Zvěrkovice.

The following tables present the maximum annual effective doses and committed effective doses from atmospheric discharges for ETE1,2 and New NPP ETE (2× 1,700 MW_e). The selected distances of interest of the locations where the representative person affected by these discharges is located are highlighted in blue. The nearest listed zones are not permanently inhabited.

Following the issue of the amendment to Decree No. 422/2016 Coll. [13], report [2] determined the values of annual effective dose and committed effective dose from atmospheric discharges from SMR ETE for all age groups. Since these values for atmospheric discharges are lower than those determined under the original wording of the decree [1], the dose values from atmospheric discharges for contributions from ETE1,2 and New NPP ETE in the analysis of cumulative effects [16] were conservatively not adjusted for ETE1,2 and New NPP ETE compared with the way they were used in the EIA Documentation for New NPP ETE [10]. The higher values were therefore retained. If the proportional coefficient for annual doses were applied to the values of annual individual effective doses from ETE1,2 and New NPP ETE according to the amendment to the decree [13], these values would be lower, but by approximately 10% at the maximum. At the same time, however, it should also be noted that the doses determined from atmospheric discharges for ETE1,2 in the EIA Documentation for New NPP ETE [10] were determined very conservatively, at the level of 1E-07 Sv/year, whereas the actually determined maximum doses from ETE1,2 due to atmospheric discharges according to the annual monitoring reports of the ETE Environmental Radiation Monitoring Laboratory (LRKO) are approximately 5 to 10 times lower. This further confirms the conservatism of the approach of using the original values from the EIA Documentation for New NPP ETE.

Tab. 17 ETE1,2 – Highest annual effective dose and committed effective dose via all considered pathways for individual age categories, determined from the maximum operating measured values of atmospheric discharges[2].

Distance	Total annual effective dose and committed effective dose via all considered pathways					
	Children aged 0–1 years	Children aged 1–2 years	Children aged 2–7 years	Children aged 7–12 years	Children aged 12–17 years	Adults
[m]	[Sv/year]	[Sv/year]	[Sv/year]	[Sv/year]	[Sv/year]	[Sv/year]
667	3.75E-07	6.41E-07	4.56E-07	4.27E-07	3.89E-07	3.85E-07
1,333	2.16E-07	4.21E-07	2.77E-07	2.55E-07	2.27E-07	2.24E-07
2,333	1.61E-07	3.19E-07	2.08E-07	1.91E-07	1.69E-07	1.67E-07
3,333	1.14E-07	2.29E-07	1.48E-07	1.36E-07	1.20E-07	1.18E-07
4,333	8.75E-08	1.80E-07	1.15E-07	1.05E-07	9.22E-08	9.10E-08
5,333	7.12E-08	1.45E-07	9.30E-08	8.54E-08	7.50E-08	7.42E-08
6,333	6.09E-08	1.25E-07	7.98E-08	7.32E-08	6.41E-08	6.34E-08
7,333	5.35E-08	1.10E-07	7.03E-08	6.44E-08	5.64E-08	5.58E-08
8,667	4.65E-08	9.63E-08	6.11E-08	5.60E-08	4.90E-08	4.84E-08
10,667	3.92E-08	8.26E-08	5.22E-08	4.75E-08	4.14E-08	4.08E-08
12,667	3.37E-08	7.02E-08	4.43E-08	4.07E-08	3.55E-08	3.51E-08
14,667	2.97E-08	6.29E-08	3.96E-08	3.61E-08	3.14E-08	3.10E-08
17,333	2.56E-08	5.44E-08	3.42E-08	3.11E-08	2.71E-08	2.67E-08
21,667	2.67E-08	5.64E-08	3.54E-08	3.24E-08	2.82E-08	2.79E-08

Tab. 18 New NPP ETE (2× 1,700 MW_e) – Annual effective dose and committed effective dose via all considered pathways for individual age categories, determined for the units from the bounding design values of atmospheric discharges from New NPP ETE (2× 1,700 MW_e).

Distance	Total annual effective dose and committed effective dose via all considered pathways					
	Children aged 0–1 years	Children aged 1–2 years	Children aged 2–7 years	Children aged 7–12 years	Children aged 12–17 years	Adults
[m]	[Sv/year]	[Sv/year]	[Sv/year]	[Sv/year]	[Sv/year]	[Sv/year]
667	4.29E-06	4.62E-06	4.40E-06	4.35E-06	4.32E-06	4.32E-06
1,333	1.35E-06	1.61E-06	1.44E-06	1.40E-06	1.37E-06	1.38E-06
2,333	8.43E-07	1.03E-06	9.03E-07	8.75E-07	8.57E-07	8.59E-07
3,333	5.17E-07	6.56E-07	5.62E-07	5.41E-07	5.28E-07	5.29E-07
4,333	3.63E-07	4.76E-07	4.00E-07	3.82E-07	3.71E-07	3.71E-07
5,333	2.74E-07	3.61E-07	3.01E-07	2.88E-07	2.80E-07	2.81E-07

[2] For the period up to the preparation of the EIA Documentation for New NPP ETE [10]. However, operating discharges in the subsequent period do not differ significantly, and the values used remain valid.

Distance	Total annual effective dose and committed effective dose via all considered pathways					
	Children aged 0–1 years	Children aged 1–2 years	Children aged 2–7 years	Children aged 7–12 years	Children aged 12–17 years	Adults
6,333	2.19E-07	2.95E-07	2.43E-07	2.31E-07	2.24E-07	2.25E-07
7,333	1.81E-07	2.48E-07	2.02E-07	1.92E-07	1.86E-07	1.87E-07
8,667	1.47E-07	2.06E-07	1.65E-07	1.57E-07	1.51E-07	1.52E-07
10,667	1.14E-07	1.67E-07	1.31E-07	1.23E-07	1.18E-07	1.18E-07
12,667	9.18E-08	1.34E-07	1.05E-07	9.89E-08	9.49E-08	9.54E-08
14,667	7.73E-08	1.17E-07	9.01E-08	8.41E-08	8.03E-08	8.05E-08
17,333	6.33E-08	9.82E-08	7.45E-08	6.92E-08	6.59E-08	6.60E-08
21,667	5.71E-08	9.18E-08	6.79E-08	6.29E-08	5.97E-08	6.01E-08

Tab. 19 Sum of annual effective doses and committed effective doses via all considered pathways for individual age categories from one year of operation of the ETE1,2 and New NPP ETE (2× 1,700 MW_e) units, for selected distances of interest, from atmospheric discharges.

Distance	Total annual effective dose and committed effective dose via all considered pathways					
	Children aged 0–1 years	Children aged 1–2 years	Children aged 2–7 years	Children aged 7–12 years	Children aged 12–17 years	Adults
[m]	[Sv/year]	[Sv/year]	[Sv/year]	[Sv/year]	[Sv/year]	[Sv/year]
2,333	1.00E-06	1.35E-06	1.11E-06	1.07E-06	1.03E-06	1.03E-06
3,333	6.31E-07	8.85E-07	7.10E-07	6.77E-07	6.48E-07	6.47E-07

According to the New NPP ETE Project, the two new units are to be located north-west of the existing ETE1,2 site. This shifts the distance of the municipality of Litoradlice from New NPP ETE to 4.3 km; for the purposes of further analysis, however, a distance of 3.3 km continues to be considered conservatively.

Following the amendment of Decree No. 422/2016 Coll. [1] by Decree No. 13/2026 Coll. [13], the newly determined values of annual effective doses and committed effective doses from atmospheric discharges from ETE1,2 and New NPP ETE, using the same approach as in the EIA Documentation for New NPP ETE [10], would be lower or, at most, the same. For this reason, for the purposes of assessing the combined radiological effects in the EIA Documentation for SMR ETE, the dose values from atmospheric discharges from ETE1,2 and New NPP ETE according to report [10] were retained as the combined effect, i.e. without considering the reducing effect of applying the new conversion factors.

III.2.2 Radiological effect of radioactive discharges from ETE1,2 and New NPP ETE to the hydrosphere

Information on the anticipated discharges from ETE1,2 and New NPP ETE to the hydrosphere (watercourses) is provided in report [10]. The volume of discharged radioactive water from ETE1,2 is diluted with the entire quantity of non-radioactive wastewater from the ETE1,2 power plant, primarily blowdown from the cooling towers, and the water is subsequently discharged to the receiving water body (the Vltava River, Kořensko profile). The average flow rate of the Vltava River at the profile of wastewater discharge from ETE1,2 and the planned New NPP ETE was considered in the EIA Documentation for New NPP ETE to be 50 m^3/s.

The values from report [10] were adjusted in the following table by a proportional coefficient of the increase in annual effective doses for individual age groups, based on the change resulting from Decree No. 13/2026 Coll. [13], as an amendment to Decree No. 422/2016 Coll. [1]. Since the values of annual effective doses for ETE1,2 and New NPP ETE after the update introduced by Decree No. 13/2026 Coll. are not directly known, the proportional coefficients for annual effective doses were determined from data for SMR ETE, on the basis of

the update of the report Study of the Effect of Normal Operation of SMR ETE [2] and a comparison of the results before and after applying the new conversion factors. The values of annual individual doses and committed doses from liquid discharges from SMR ETE are higher when the conversion factors pursuant to the amendment to Decree No. 422/2016 Coll. [13] are applied than when the conversion factors pursuant to the original wording of the decree [1] are applied; therefore, the proportional increase coefficient was also conservatively applied to the values of individual doses and commitments from discharges from ETE1,2 and New NPP ETE according to Tab. 20.

Tab. 20 Proportional coefficients for annual effective dose and committed effective dose for an average year, based on SMR ETE data for the hydrosphere.

Age group [years]	Total annual effective dose and committed effective dose via all considered pathways from discharges to the hydrosphere from SMR ETE [Sv/year] After the update to Decree No. 422/2016 Coll.	Total annual effective dose and committed effective dose via all considered pathways from discharges to the hydrosphere from SMR ETE [Sv/year] Before the update to Decree No. 422/2016 Coll.	Proportional coefficient for annual effective dose and committed effective dose for an average year [-]
foetus	1.09E-07	1.10E-07	1
0–5	1.48E-07	9.90E-08	1.49
6–15	8.90E-08	7.60E-08	1.17
16+	8.70E-08	8.30E-08	1.05

The proportional increase coefficient was conservatively applied to the ETE1,2 and New NPP ETE values from report [10]. Where several groups overlapped, the higher proportional coefficient was considered. For the age groups 0–1 year, 1–2 years, and 2–7 years, the SMR ETE coefficient for the 0–5 years age group was applied. For the age groups 7–12 years and 12–16 years, the SMR ETE coefficient for the 6–15 years age group was applied, and for adults the SMR coefficient from the 16+ age group was applied.

Tab. 21 Annual effective dose and committed effective dose via all considered pathways from the use of water affected by discharges to the hydrosphere from ETE1,2 and New NPP ETE, with the increase coefficient applied.

Age group [years]	Total annual effective dose and committed effective dose via all considered pathways from operational discharges to the hydrosphere from the two ETE1,2 units (2× 1,000 MW_e) [Sv/year]	Total annual effective dose and committed effective dose via all considered pathways from design values of discharges to the hydrosphere from the two New NPP ETE units (2× 1,700 MW_e) [Sv/year]	Sum of the total annual effective dose and committed effective doses via all considered pathways from discharges to the hydrosphere from ETE1,2 (2× 1,000 MW_e) and New NPP ETE (2× 1,700 MW_e) [Sv/year]
0–1	1.03E-06	2.71E-06	3.74E-06
1–2	8.17E-07	2.24E-06	3.05E-06
2–7	9.30E-07	2.49E-06	3.42E-06
7–12	5.71E-07	1.59E-06	2.16E-06
12–17	4.66E-07	1.38E-06	1.85E-06
Adults	6.03E-07	1.84E-06	2.45E-06

The discharges from ETE1,2 are discharged into the Vltava River at the Kořensko site. The planned New NPP ETE and SMR ETE are also designed to discharge all liquid discharges into the Vltava River at the same Kořensko profile.

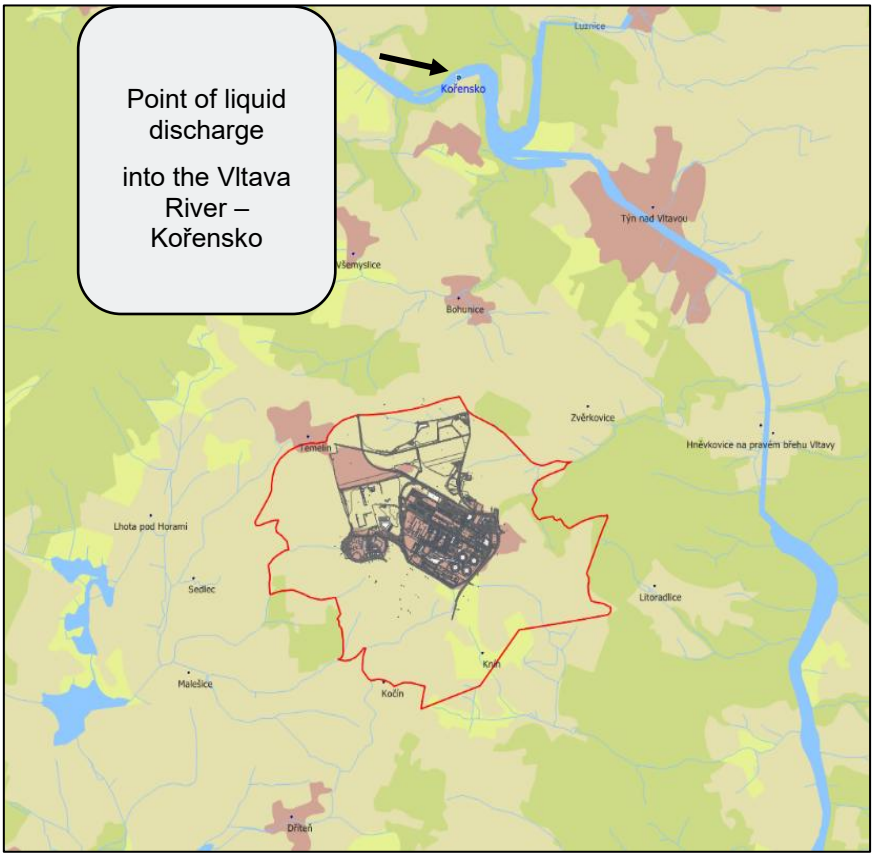


Fig. 18 Discharge of liquid wastewater into the Vltava River.

IV. Analysis of the combined radiological effect of ETE1,2, New NPP ETE, SNFS ETE, and SMR ETE

When assessing the combined effect of ETE1,2, the ETE1,2 spent nuclear fuel storage facility (SNFS ETE), including consideration of its planned future expansion, and the New NPP ETE and SMR ETE projects, the area of interest for atmospheric discharges was determined first, including the municipalities of Kočín, Zvěrkovice, and Litoradlice.

The cumulative assessment is performed for the New NPP ETE 2× 1,700 MW_e bounding case, whose overall consequences exceed those of the 2× 1,200 MW_e power output option. For data on effective doses from ETE1,2 and New NPP ETE, the value for distances of 2,333 and 3,333 m was conservatively adopted for atmospheric discharges. For the hydrosphere, the Neznašov location, including Újezd and Chaty Pašovice, was selected. The cumulative assessment was performed in the background report [16].

Representative data on the maximum annual effective doses from atmospheric discharges from ETE1,2 and New NPP ETE were determined in the north-east direction. Hydrospheric discharges from all assessed power plants are discharged into the Vltava River – Kořensko profile. Within the selected area of interest for atmospheric discharges, the municipality of Kočín is situated south-south-west of ETE1,2, Litoradlice is situated east to east-south-east of ETE1,2, and Zvěrkovice is situated north-east of ETE1,2. Given the locations of the municipalities, the actual contributions to annual effective doses from ETE1,2 and New NPP ETE in these locations will be lower (and, for Zvěrkovice, the same at most) than the data conservatively selected for the north-east direction in the EIA Documentation for New NPP ETE [1].

The study of the radiological effect of SMR ETE considered several parameters – a dry, average, and wet year, and ventilation stack heights of 150 m and 56 m [2].

The effect of SNFS ETE is characterised by ambient dose equivalent rates in open space according to report [14]. SNFS ETE does not produce any discharges during normal operation; therefore, its effect is not applied when assessing compliance with the dose constraint. However, it is included here for information purposes in order to determine the total maximum radiological effect of the ETE site.

In determining the effect of individual nuclear facilities, different age categories of representative persons were selected, corresponding to the legislation in force at the time and the legislation currently in force. Therefore, when comparing the values, the overlap of the given age groups was considered, and the highest value of the annual effective dose from ETE1,2 and New NPP ETE discharges was conservatively selected. Subsequently, the contribution from SMR ETE and the contribution from ETE1,2 and New NPP ETE were determined at the same location, or distance, as the identified maximum contribution from SMR ETE. For the purposes of assessing the cumulative effect of SMR ETE, the sum of the annual effective dose values from ETE1,2 and New NPP ETE is considered to be the background contribution to public exposure.

IV.1. Contributions to annual effective doses and committed effective doses via all considered pathways for the representative person from atmospheric discharges

The contributions to the annual effective dose and committed effective doses via all considered pathways from atmospheric discharges from SMR ETE are significantly lower than the contributions from ETE1,2 and New NPP ETE for all analysed scenarios (a total of six scenarios for atmospheric discharges, designated below as 1A to 6A).

Based on the data analysis, the average year 2023 with a ventilation stack height of 56 m was selected as the most conservative in terms of height and the annual effective dose to the representative person from SMR ETE. Weather conditions (wind rose) have the dominant influence on determining the location of the representative person.

IV.1.1 Scenario 1A – dry year (2018), SMR ETE stack height 150 m

Location of interest Kočín:

Tab. 22 Comparison of annual effective doses from atmospheric discharges from SMR ETE and ETE1,2 + New NPP ETE – scenario 1A.

Atmospheric discharges	SMR ETE	ETE1,2 + New NPP ETE
Equivalent distance [m]	Kočín	2,333
Age group [years]	16+ (0–5)	1–2
Total annual effective dose and committed effective dose via all considered pathways [Sv/year]	8.9E-08 (8.50E-08)	1.35E-06

IV.1.2 Scenario 2A – dry year (2018), SMR ETE stack height 56 m

Location of interest Kočín:

Tab. 23 Comparison of annual effective doses from atmospheric discharges from SMR ETE and ETE1,2 + New NPP ETE – scenario 2A.

Atmospheric discharges	SMR ETE	ETE1,2 + New NPP ETE
Equivalent distance [m]	Kočín	2,333
Age group [years]	16+ (0–5)	1–2
Total annual effective dose and committed effective dose via all considered pathways [Sv/year]	1.40E-07 (1.30E-07)	1.35E-06

IV.1.3 Scenario 3A – average year (2023), SMR ETE stack height 150 m

Location of interest Zvěrkovice:

Tab. 24 Comparison of annual effective doses from atmospheric discharges from SMR ETE and ETE1,2 + New NPP ETE – scenario 3A.

Atmospheric discharges	SMR ETE	ETE1,2 + New NPP ETE
Equivalent distance [m]	Zvěrkovice	3,333
Age group [years]	16+ (0–5)	1–2
Total annual effective dose and committed effective dose via all considered pathways [Sv/year]	1.04E-07 (1.02E-07)	8.85E-07

IV.1.4 Scenario 4A – average year (2023), SMR ETE stack height 56 m

Location of interest Zvěrkovice:

Tab. 25 Comparison of annual effective doses from atmospheric discharges from SMR ETE and ETE1,2 + New NPP ETE – scenario 4A.

Atmospheric discharges	SMR ETE	ETE1,2 + New NPP ETE
Equivalent distance [m]	Zvěrkovice	3,333
Age group [years]	16+ (0–5)	1–2

Total annual effective dose and committed effective dose via all considered pathways [Sv/year]	1.78E-07 (1.60E-07)	8.85E-07

IV.1.5 Scenario 5A – wet year (2024), SMR ETE stack height 150 m

Location of interest Litoradlice.

Tab. 26 Comparison of annual effective doses from atmospheric discharges from SMR ETE and ETE1,2 + New NPP ETE – scenario 5A.

Atmospheric discharges	SMR ETE	ETE1,2 + New NPP ETE
Equivalent distance [m]	Litoradlice	3,333
Age group [years]	16+ (0–5)	1–2
Total annual effective dose and committed effective dose via all considered pathways [Sv/year]	9.66E-08 (9.40E-08)	8.85E-07

IV.1.6 Scenario 6A – wet year (2024), SMR ETE stack height 56 m

Location of interest Zvěrkovice:

Tab. 27 Comparison of annual effective doses from atmospheric discharges from SMR ETE and ETE1,2 + New NPP ETE – scenario 6A.

Atmospheric discharges	SMR ETE	ETE1,2 + New NPP ETE
Equivalent distance [m]	Zvěrkovice	3,333
Age group [years]	16+ (0–5)	1–2
Total annual effective dose and committed effective dose via all considered pathways [Sv/year]	1.57E-07 (1.40E-07)	8.85E-07

The total annual effective doses and committed effective doses via all considered pathways from exposure due to SMR ETE atmospheric discharges are, in all cases, significantly lower than the exposure caused by discharges from ETE1,2 + New NPP ETE.

The wind rose and the distance of the representative location from ETE1,2 and New NPP ETE have a significant influence. In the dry year 2018, the municipality of Kočín, located approximately 2.3 km from ETE1,2, was identified as the place where the representative person lives (in other years, the location was 3.3 km away). Therefore, in that year, the effective doses from ETE1,2 and New NPP ETE are the highest when considered conservatively. The representative age group is also set at 0–5 years on the basis of the predominant effect of ETE1,2 and New NPP ETE.

For the considered SMR ETE ventilation stack height of 56 m, the maximum share of the annual effective dose to the representative person from atmospheric discharges from the entire ETE site is 18% at most. For a ventilation stack height of 150 m, the share is 11% at most.

In terms of the total annual effective dose from atmospheric discharges from all nuclear facilities at the ETE site, the values are highest for the dry year represented by 2018 at the Kočín location; however, this is due to the dose contributions from ETE1,2 and New NPP ETE, not SMR ETE (see scenario 2A). The highest dose contributions from SMR ETE atmospheric discharges were identified at the Zvěrkovice location for the average year (2023) and the SMR ETE stack height of 56 m (see scenario 4A).

Radionuclides from SMR ETE discharges that contribute significantly were determined on the basis of the study of the radiological effects of normal operation of SMR ETE [2]. In the process of identifying the primary

radionuclides, the primary and secondary radionuclides contributing most to the annual effective doses of the representative person were determined.

All radionuclides that contribute at least 2% to the annual effective dose are considered primary radionuclides.

Tab. 28 Primary and secondary radionuclides contributing to the annual effective dose of the representative person from SMR ETE (atmosphere).

Stack height (m)	150	56
Primary radionuclides contributing to the annual effective dose from atmospheric discharges	Ar-41 (77.79%), Xe-138 (6.15%), Kr-88 (3.27%), Kr-85 (2.98%), Xe-135 (2.21%)	Ar-41 (67.5%), C-14 (12.58%), H-3 (5.34%), Xe-138 (4.48%), Kr-88 (2.64%), Kr-85 (2.39%)
Secondary radionuclides contributing to the annual effective dose from atmospheric discharges	Xe-135m, C-14, H-3, Kr-87, Kr-85m, Xe-133m, I-131gas, I-131aer	Xe-135, Xe-135m, I-131gas, Kr-87, I-131aer, Kr-85m, Xe133, Xe-133m, Co-60

For ETE1,2 and New NPP ETE, the primary exposure pathways are the committed effective dose from ingestion and the effective dose from the cloud [10].

From the perspective of the SMR ETE contribution, the ventilation stack height is a key parameter for the considered exposure pathways. In the scenario with VK = 150 m, the primary source of exposure of the representative person is the annual effective dose from the cloud (>96%). In the scenario with VK = 56 m, the primary source of exposure is also exposure from the cloud (73.0%), while the committed effective doses from ingestion and inhalation together account for 27.0%. The effect of exposure from deposition is negligible.

The results show that, for scenarios with VK = 56 m, the total annual individual effective doses and committed effective doses from SMR ETE atmospheric discharges via all exposure pathways are significantly higher (almost double). Reducing the stack height increases the relative share of the committed effective dose from ingestion and inhalation (by one order of magnitude). However, effective doses from exposure from the cloud remain predominant.

For the sake of completeness, however, it should be noted that, for SMR ETE, these are still very small doses, up to 0.2 µSv/year, and the difference in annual individual doses between the large and small ventilation stacks is up to 0.1 µSv/year.

When the annual individual dose from discharges to the atmosphere is converted per 1 MW_e of installed capacity, the SMR ETE contribution is approximately 73% of that of ETE1,2 and New NPP ETE.

IV.2. Contributions to the annual effective doses of the representative person from hydrospheric discharges

The contribution to the annual effective dose is significantly lower for SMR ETE than the combined contribution from ETE1,2 and New NPP ETE. In the study of the radiological effects of normal operation of SMR ETE [2], annual effective dose values were determined for the dry year 2018, the average year 2023, and the wet year 2024, i.e. for a total of three scenarios.

For ETE1,2 and New NPP ETE, values were only determined in the source report [10] for an average year with the average flow rate of the Vltava River. Therefore, the cumulative annual effective dose was only determined for the average year 2023.

IV.2.1 Highest annual individual doses from discharges to the hydrosphere – average year 2023

Tab. 29 Comparison of annual individual effective doses from hydrospheric discharges from SMR ETE and ETE1,2 + New NPP ETE.

Discharges to the hydrosphere	**SMR ETE**	**ETE1,2 + New NPP ETE**
Calculated average annual flow rate of the Vltava River – Kořensko [m³/s]	47.4	50

Age group [years]	0–5, foetus	0–1
Total annual effective dose and committed effective dose via all considered pathways [Sv/year]	1.48E-07 (1.09E-07)	3.74E-06

The annual individual effective dose values from hydrospheric discharges from ETE1,2 and New NPP ETE were increased by applying a proportional coefficient determined from SMR ETE data (Tab. 20).

The total annual effective doses and committed effective doses via all considered pathways from exposure due to SMR ETE hydrospheric discharges do not exceed 5% of the contribution from hydrospheric discharges from the ETE site, consisting of ETE1,2 and New NPP ETE. In the process of identifying the primary radionuclides, the primary and secondary radionuclides contributing most to the annual effective doses of the representative person were determined. From SMR ETE discharges, tritium (H-3) accounts for approximately 99.9% of the total annual effective dose from discharges to the hydrosphere.

Tab. 30 Primary and secondary radionuclides contributing to the annual effective dose of the representative person from SMR ETE (hydrosphere).

Primary radionuclides contributing to the annual effective dose from discharges to the hydrosphere	H-3 (99.92%)
Secondary radionuclides contributing to the annual effective dose from discharges to the hydrosphere	Cs-134 (0.05%), Cs-137 (0.03%),

In terms of the contribution of SMR ETE to the annual effective dose and committed effective dose from discharges to the hydrosphere, the primary exposure pathways for representative persons are the contribution from ingestion of drinking water (56.8%) and the contribution from ingestion of foodstuffs (irrigation, watering of animals, and fish) (43.2%).

The exposure pathways for ETE1,2 and New NPP ETE from hydrospheric discharges are not explicitly quantified in the EIA study for New NPP ETE [10], but physically they correspond to the contributions determined for SMR ETE, and tritium (H-3) also has a decisive effect.

It should be noted that, during dry years, the annual effective dose to the representative person from SMR ETE is approximately twice as high as in average or wet years. For ETE1,2 and New NPP ETE, annual effective doses were determined only for the average flow rate of the Vltava River (50 m³/s). Therefore, in terms of cumulative effects from the hydrosphere, the annual effective dose is only determined for an average year.

When the annual individual dose from discharges to the hydrosphere is converted per 1 MW_e of installed capacity, the SMR ETE contribution is approximately 47% of that of ETE1,2 and New NPP ETE, and is therefore approximately a half of that value.

IV.3. Contribution of the annual ambient dose equivalent at the Kočín location from SNFS

As part of the preparation of the EIA Documentation for the SNFS expansion, the radiation exposure from gamma radiation and neutrons from filled packages in the SNFS after expansion was assessed [14].

The maximum expected values of dose equivalent rates at a distance of 2 m from the outer shell of the OS ŠKODA 1000/19 package, adopted for the model calculation, are presented in Tab. 31.

Tab. 31 Maximum expected values of dose equivalent rates at a distance of 2 m from the outer shell of the OS ŠKODA 1000/19 package, adopted for the model calculation.

	Neutrons	Gamma radiation	Total
	[µSv/h]	[µSv/h]	[µSv/h]
2 m from the middle part of the shell	61.4	33.0	94.4

For the conservative target scenario, the ambient dose equivalent rate in open space + building shielding was determined for 38 packages (OS) located in the first row along the wall of the storage facility. The effect on the immediate vicinity and the nearest permanently inhabited area, the municipality of Temelín, Kočín part, located approximately 1,600 m from the SNFS, was evaluated. The results are presented in Tab. 32.

Tab. 32 Ambient dose equivalent rates in open space + shielding provided by the SNFS building for 38 packages – conservative target scenario.

			Distance from package [m]				
			2	7	100	1,000	1,600
	Ambient dose equivalent rate [Sv/h] at 2 m	Number of packages	Ambient dose equivalent rate in open space, taking into account building shielding [nSv/h]				
gamma radiation	3.30E-05	38	1.96E+04	1.60E+03	7.84E+00	7.84E-02	3.06E-02
neutrons	6.14E-05	38	2.30E+04	1.87E+03	9.19E+00	9.19E-02	3.59E-02
gamma radiation + neutrons	**9.44E-05**	**38**	**4.26E+04**	**3.47E+03**	**1.70E+01**	**1.70E-01**	**6.65E-02**
Share of the ambient dose equivalent from neutrons in the total ambient dose equivalent	65.0%		54.0%	54.0%	54.0%	54.0%	54.0%

The following conclusions follow from the table:

Under the conservative target scenario, in which the maximum number of 38 packages in the first row was considered, the contribution to the existing radiation exposure at the nearest settlement, i.e. the municipality

of Temelín (Kočín part), represented by the annual ambient dose equivalent caused by the SNFS after expansion, is 5.83E-07 Sv, which only constitutes a small fraction of the radiation exposure from natural background, which at this location is approximately 5.65E-03 Sv per year [14].

At the same time, for an annual stay in the municipality of Kočín, the anticipated annual ambient dose equivalent caused by the SNFS after expansion, 5.83E-07 Sv, corresponds to 0.058% of the annual effective dose limit for the public.

V. Cumulative annual effective dose and committed effective dose via all considered pathways for the representative person from ETE1,2, New NPP ETE, SMR ETE, and SNFS ETE

The preceding chapters addressed the individual contributions from SMR ETE, ETE1,2, New NPP ETE, and the SNFS. Together, these contributions constitute the total public exposure in the vicinity of the ETE site. The preceding chapters presented the locations of representative persons with the maximum annual effective dose level for the individual scenarios from study [2] – Kočín, Litoradlice, and Zvěrkovice for exposure from atmospheric discharges; in terms of exposure from hydrospheric discharges, the locations of Újezd and Chaty Pašovice were identified. To determine the cumulative maximum annual effective doses to the representative person, the maximum public exposure values from the individual facilities were summed.

In reality, these values will be lower (for Zvěrkovice, at most the same), because the maximum radiological effect of ETE1,2 and New NPP ETE [1] is determined for the north-east direction (Zvěrkovice). The locations of Kočín (south-south-west) and Litoradlice (east-south-east), where the highest doses from atmospheric discharges from SMR ETE [2] are obtained, are located in different directions. In reality, the doses in Zvěrkovice will also be lower, because a conservative distance from ETE1,2 was also considered for the planned New NPP ETE, which will be located farther away.

Tab. 33 Cumulative maximum annual effective doses to the representative person from ETE1,2, New NPP ETE, and SMR ETE.

Scenario	Location, age group of representative persons	Maximum cumulative annual effective dose (ETE1,2, New NPP ETE, SMR ETE) [Sv/year]
Exposure scenarios for atmospheric discharges		
Scenario 1A, VK 150 m	Kočín, children aged 0–5	1.43E-06
Scenario 2A, VK 56 m	Kočín, children aged 0–5	1.47E-06
Scenario 3A, VK 150 m	Zvěrkovice, children ages 0–5	9.87E-07
Scenario 4A, VK 56 m	Zvěrkovice, children ages 0–5	1.05E-06
Scenario 5A, VK 150 m	Litoradlice, children ages 0–5	9.79E-07
Scenario 6A, VK 56 m	Zvěrkovice, children ages 0–5	1.03E-06
Exposure scenarios for hydrospheric discharges		
Average-year scenario (2023)	Újezd and Chaty Pašovice, foetus/children aged 0–5 years	3.89E-06

In terms of atmospheric discharges, the maximum cumulative annual effective dose, including the committed effective dose, to the representative person in the vicinity of the ETE site, will be **1.47 µSv/year** at most, with an SMR ETE ventilation stack height of 56 m. For a ventilation stack height of 150 m, the maximum cumulative annual effective dose, including the committed effective dose, is **1.43 µSv/year**. Including the contribution of

the ambient dose equivalent rate due to radiation from the expanded SNFS, the maximum exposure values for the representative person will be **2.05 µSv/year** and **2.01 µSv/year**, respectively.

The resulting exposure value for the representative person is for information only, because the SNFS contribution is not included in the dose constraint, as it does not involve discharges to the atmosphere.

In terms of the cumulative doses to the representative person from hydrospheric discharges, the maximum annual cumulative effective dose to the representative person, including the committed effective dose, is **3.89 µSv/year**, assuming the average annual flow rate in the Vltava River. Given the location of the representative person, the SNFS contribution does not apply to them. For a dry year, the maximum value reached would be approximately twice as much.

Act No. 263/2016 Coll., as amended, establishes a dose constraint of 250 µSv per year and, for nuclear power facilities, at the same time 200 µSv per year for discharges to the atmosphere and 50 µSv per year for discharges to surface waters. In the case of a nuclear power facility, this dose constraint applies collectively to all nuclear facilities within the given area for the siting of a nuclear facility.

For cumulative hydrospheric discharges at the monitored site, the dose constraint (50 µSv/year) is met with a margin, both for the average year (3.89 µSv/year), for which it was explicitly determined, and for the dry year, when it reaches approximately twice the value for the average year.

In the case of cumulative discharges to the atmosphere, the dose constraint (200 µSv) is met with a wide margin, because the annual cumulative effective doses from operation of ETE1,2, New NPP ETE, and SMR ETE for the representative person amount to 1.47 µSv/year at most.

The following tables present the values of annual bounding discharges [Bq] for the identified primary radionuclides contributing to public exposure from atmospheric and hydrospheric discharges, determined from SMR ETE data.

Tab. 34 Atmospheric discharges of radionuclides making primary and secondary contributions to the annual effective dose to the representative person.

Radionuclides		SMR ETE atmospheric discharges [Bq/year]	ETE1,2 + New NPP ETE atmospheric discharges [Bq/year]	Ratio of SMR ETE discharges to ETE1,2 + New NPP ETE discharges
Primary contributing radionuclides	H-3	1.00E+12	1.70E+13	0.06
	C-14	4.38E+10	1.10E+12	0.04
	Ar-41	2.40E+12	3.92E+12	0.61
	Kr-85	4.13E+13	2.52E+15	0.02
	Kr-88	7.41E+10	1.37E+13	0.01
	Xe-138	2.67E+11	9.21E+11	0.29
	Xe-135	3.02E+11	9.05E+13	<0.01
Secondary contributing radionuclides	Kr-85m	2.79E+10	1.13E+13	<0.01
	Kr-87	5.33E+10	4.09E+12	0.01
	I-131gas	3.07E+07	8.91E+08	0.03
	Xe-133	3.67E+11	6.42E+14	<0.01
	Xe-133m	5.76E+10	1.33E+13	<0.01
	Xe-135m	1.71E+11	1.11E+12	0.15

Note: Measured discharge values for ETE1,2 used.

Tab. 35 Hydrospheric discharges of radionuclides making primary and secondary contributions to the annual effective dose to the representative person.

Radionuclides		SMR ETE hydrospheric discharges [Bq/year]	ETE1,2 + New NPP ETE hydrospheric discharges [Bq/year]	Ratio of SMR ETE discharges to ETE1,2 + New NPP ETE discharges
Primary contributing radionuclide	H-3	5.00E+12	1.74E+14	0.03
Secondary contributing radionuclides	Cs-134	6.67E+05	1.01E+09	<0.01
	Cs-137	4.26E+05	1.43E+09	<0.01

Note: Measured discharge values for ETE1,2 used.

The underlying study by ABmerit s.r.o. [2] assessed the effect of SMR ETE discharges to the atmosphere and to watercourses on biota (terrestrial and aquatic animals and plants). This effect is expressed as a daily dose rate for comparison with the reference values according to IAEA GSG-10 [3]. The study shows that the radiological effect of SMR ETE is highest for aquatic animals (trout) during dry years. This is due to the reduced dilution capacity of the Vltava River (lower flow rate) in dry years. However, even during dry years, the maximum daily dose rate in the Vltava River at the maximum values is far below the IAEA reference values. At the level of the cadastral areas of Albrechtice nad Vltavou, Chrášťany, and Všemyslice, the maximum dose rates reached for trout in the Vltava River in a dry year are 6.8E-10 Gy/day, whereas the IAEA reference value for trout is in the range of 1E-03 to 1E-02 Gy/day. The maximum value reached is therefore more than 6 orders of magnitude lower than the IAEA GSG-10 [3] reference values. In terms of the contributions of individual radionuclides, tritium (H-3) has the decisive effect on trout exposure at the relevant location and under the relevant conditions. Its contribution is 6.5E-10 Gy/day out of the total of 6.8E-10 Gy/day, i.e. approximately 96%.

The radiological effect on biota was not assessed by calculation in the EIA Documentation for New NPP ETE [10], but a comparison of the effects of SMR ETE and the other nuclear facilities at the site on humans, together with the decisive role of tritium in doses and dose rates, shows that, for an average year, doses and dose rates from tritium in discharges from ETE1,2 and New NPP ETE are approximately 25 times higher than those from SMR ETE discharges. In principle, the same ratio would also be maintained for a dry year. The total dose rate from all facilities at the site could therefore reach 26 times the SMR ETE maximum for trout in the Vltava River, which is 1.7E-08 Gy/day. This value is still approximately five orders of magnitude below the IAEA reference value. Given that the trout represents the most exposed species among the reference animals in the vicinity of the ETE site, it can be concluded that the cumulative effects of future operation of all nuclear facilities at the Temelín site on biota will be entirely negligible.

VI. Transboundary cumulative effects of ETE1,2, New NPP ETE, and SMR ETE

The study of the radiological effects of normal operation of SMR ETE [2] identified several locations and representative persons in the neighbouring countries closest to the ETE site, i.e. the Federal Republic of Germany and the Republic of Austria.

Information on the transboundary effect of normal operation of ETE1,2 and New NPP ETE is provided in the EIA Documentation for New NPP ETE [10]. However, the data do not explicitly specify the power output of New NPP ETE (1,200/1,700 MW_e) and the corresponding bounding discharges used for the calculation, nor the age group of the representative person. Effective doses from ETE1,2 and New NPP ETE were determined for 20 distance groups and 16 direction groups. From the perspective of effects on neighbouring countries (AT, DE), information from the wind rose is important. In terms of distance and the wind rose, the following representative locations are identified as closest to the ETE site: Rottal (51 km, east (E) to south-east (SE) direction) in Austria and Schnellenzipf (57.5 km, south-west (SW) direction) in Germany. These locations correspond to the highest annual effective doses for Austria and Germany.

Austria

The representative person for Austria as a result of annual bounding discharges from SMR ETE was identified by calculation at the Rottal location, in the cadastral area of the municipality of Haugschlag, in the “child aged 6–15 years” age group. The highest annual dose to the representative person as a result of annual bounding discharges from SMR ETE in Austria will not exceed **3.3 nSv** (3.3E-09 Sv). This value corresponds to scenario 6A, a wet year with a ventilation stack height of 56 m. The main exposure pathways were identified as the committed effective dose from ingestion (47%) and inhalation (29%). The effective dose from external exposure from the cloud accounts for 24%.

Tab. 36 Effect of ETE1,2 and New NPP ETE in representative locations in Austria and Germany [10].

	Annual effective dose to the representative person [Sv/year]	
Distance [m]	**Austria – E–SE** direction	**Germany – SW direction**
43,333	4.49E-08	
53,333	3.37E-08	6.17E-08
66,667	2.48E-08	4.49E-08

The annual effective dose values corresponding to the direction and representative location (the location in which the representative person for the respective country is located) are marked in green. The actual distance of the relevant nearest locations in Austria and Germany is in each case several kilometres greater than the distance given in Tab. 36, taken from [10], and the values presented are therefore determined conservatively.

For the following considerations, the values for the nearest shorter distance in Tab. 36 are considered.

For the cumulative effect on Austria, the representative person was determined at the Rottal location in the 6–15 years age category. The maximum annual effective dose from discharges from SMR ETE, ETE1,2, and New NPP ETE for this representative person will not exceed **50 nSv**. The contribution of SMR ETE to this value is less than 10%. Due to the distance, SNFS does not contribute to the exposure of the person at this location.

Germany

The representative person for Germany due to SMR ETE was identified by calculation at the Schnellenzipf location, in the cadastral area of the municipality of Haidmühle, in the “child aged 6–15 years” age group. The highest annual dose to the representative person as a result of annual bounding discharges from SMR ETE in Germany will not exceed **2.3 nSv** (2.3E-09 Sv). This value corresponds to scenario 6A, a wet year with a ventilation stack height of 56 m. In terms of exposure pathways, the committed effective dose from ingestion

(48%) and inhalation (31%) is the most significant. The effective dose from external exposure from the cloud accounts for 21%.

For the cumulative effect on Germany, the representative person was determined at the Schnellenzipf location in the 6–15 years age category. The maximum annual effective dose from discharges from SMR ETE, ETE1,2, and New NPP ETE for this representative person will not exceed **65 nSv**. The contribution of SMR ETE to this value is less than 5%.

The annual effective doses for Germany are higher due to the doses from ETE1,2 and New NPP ETE [10], which are determined on the basis of older weather data, when the wind direction and meteorological effect on Germany were more significant. Due to the distance, SNFS does not contribute to the exposure of the person at this location.

The values of the highest annual individual effective doses for Austria and Germany, both from operation of SMR ETE and cumulatively from operation of SMR ETE, ETE1,2, and New NPP ETE, are negligibly small and do not pose any health risk.

VII. Conclusion

In the process of assessing the radiological effect of normal operation of SMR ETE on the population, the maximum annual effective doses to the representative person from atmospheric and hydrospheric discharges were determined. The main exposure pathways for representative persons and the radionuclides making the greatest contribution to the annual effective dose were identified. In terms of atmospheric discharges and annual effective doses to the representative person, the key parameter is the height of the ventilation stack. In scenarios with an SMR ETE ventilation stack height of 150 m, the primary source of exposure of the representative person is exposure from the cloud, whereas in scenarios with an SMR ETE ventilation stack height of 56 m, the share of exposure of the representative person due to the committed effective dose from ingestion and inhalation increases. The annual effective dose from deposition is negligible in both cases. In scenarios with an SMR ETE ventilation stack height of 56 m, the total annual doses from exposure of the representative person via all pathways are approximately twice as high as in scenarios with a stack height of 150 m. In absolute values, however, in both cases these are very small doses, up to 0.2 μSv/year, and the difference in annual individual doses between the large and small SMR ETE ventilation stack is up to 0.1 μSv/year.

Following the analysis for SMR ETE, the radiological effect of SMR ETE was compared with the effect of ETE1,2 and New NPP ETE. Based on the comparison, it was shown that the annual effective doses from atmospheric bounding discharges from SMR ETE are significantly lower in general than the total annual effective doses from ETE1,2 and New NPP ETE.

The assessment of the radiological effects of SMR ETE from discharges to the hydrosphere determined the main exposure pathways to be the committed effective dose from ingestion of food and drinking water. In the case of hydrospheric discharges, the annual effective doses from SMR ETE were at the level of 4% of the total contribution from the ETE site, and therefore the doses from discharges to watercourses from ETE1,2 and New NPP ETE clearly predominate.

The maximum contribution values of atmospheric and hydrospheric discharges from SMR ETE to public exposure are at the level of up to **0.30 μSv/year**. The largest contribution to the dose from SMR ETE atmospheric discharges is made by Ar-41 (a share of approximately 70%), followed by C-14 (approximately 12%) and Kr and Xe isotopes, with shares of a few percent.

The annual effective dose values for the representative person from SMR ETE hydrospheric discharges are at the level of **0.15 μSv/year** for an average year. The contribution of H-3 from SMR ETE to the annual effective dose to the representative person from hydrospheric discharges is more than 99%.

As part of the assessment of the radiological effects of operation of SMR ETE, the underlying study by ABmerit s.r.o. [2] evaluated the effect of discharges from SMR ETE to the atmosphere and to watercourses on biota (terrestrial and aquatic animals and plants). This effect is expressed as a daily dose rate for comparison with the reference values according to IAEA GSG-10 [3]. The study shows that the radiological effect of SMR ETE is highest for aquatic animals (trout) during dry years. However, even during dry years, the maximum daily dose rate is more than 6 orders of magnitude lower than the reference values according to IAEA GSG-10 [3], and the effect is therefore negligible. A similar conclusion also applies to the cumulative effect of all existing and planned nuclear facilities at the Temelín site. The highest cumulative dose rate reached for the reference animal (trout in the Vltava River at the location downstream of the liquid discharge outlet) is approximately 1.7E-08 Gy/day, which is still approximately five orders of magnitude below the IAEA reference value. The cumulative effects of all existing and planned nuclear facilities at the Temelín site on biota therefore remain entirely insignificant.

The conservatively determined cumulative contributions from atmospheric discharges from ETE1,2, New NPP ETE, and SMR ETE reach maximum values of **1.43 μSv/year** (SMR ETE VK 150 m) and **1.47 μSv/year** (SMR ETE VK 56 m). Of these doses, SMR ETE contributes at most **11%** (VK 150 m) and **18%** (VK 56 m).

Including the contribution of the ambient dose equivalent rate due to radiation from the expanded SNFS, the values will be at most **2.05 μSv/year** and **2.01 μSv/year**, respectively.

Note: The contribution from SNFS is not included in the dose constraint because it does not involve discharges to the atmosphere. The resulting exposure value for the representative person is therefore for information only.

The conservatively determined cumulative contributions from hydrospheric discharges from ETE1,2, New NPP ETE, and SMR ETE reach maximum values of **3.89 μSv/year** for average hydrological years and approximately twice this value for dry years. SMR ETE contributes **4.2%** at most to this dose.

These cumulative contributions are safely below the dose constraint established by the Atomic Energy Act (Act No. 263/2016 Coll., as amended), for discharges to the hydrosphere (50 μSv/year) and the atmosphere (200 μSv/year) for all nuclear facilities at the site.

The conservatively determined cumulative contributions will remain valid even after the transition to the extended ETE1,2 campaign. The values of annual individual effective doses and committed effective doses for the representative person determined in the LRKO annual reports from operation of ETE1,2 are, both for doses from atmospheric discharges and for doses from discharges to the hydrosphere, significantly lower (by at least tens of percent) than the annual individual effective doses from operation of ETE1,2 determined conservatively in [10], which are used for the purposes of this report to evaluate the cumulative radiological effects of ETE1,2, New NPP ETE, and SMR ETE.

The existing ETE1,2 must comply with the authorised limits set in the valid SONS decision [15] at the level of 4 μSv from discharges to the hydrosphere for the representative person per calendar year. Historically, annual individual doses from discharges to the hydrosphere from ETE1,2 have long remained below the level of 1 μSv per calendar year. The value of the authorised limit will therefore safely not be exceeded even after the transition to the extended ETE1,2 campaign, and the modelling performed also indicates compliance with it when the cumulative effect of ETE1,2, New NPP ETE, and SMR ETE is included. However, SONS sets authorised limits individually for each nuclear facility.

The same applies to the authorised limit for discharges to the atmosphere, which, according to the valid SONS permit for ETE1,2, is 10 μSv per calendar year.

The above values ensure reliable compliance with the dose constraint established by the Atomic Energy Act (Act No. 263/2016 Coll., as amended) also for the cumulative effect of SMR ETE, New NPP ETE, and ETE1,2. The dose constraint for the representative member of the public is set at 250 μSv (0.25 mSv) per year. At the same time, the total individual effective dose, which includes the sum of effective doses from external exposure and committed effective doses from internal exposure, must not exceed 200 μSv (0.2 mSv) per year for discharges to the atmosphere and 50 μSv (0.05 mSv) per year for discharges to surface waters.

The cumulative effects of SMR ETE, ETE1,2, and New NPP ETE abroad are described in chapter VI. The maximum annual individual effective dose from discharges from SMR ETE, ETE1,2, and New NPP ETE for the representative person in Austria will not exceed **50 nSv**, and the maximum annual effective dose from discharges from SMR ETE, ETE1,2, and New NPP ETE for the representative person in Germany will not exceed **65 nSv**. These values are negligibly small. Given the distance, SNFS does not contribute to the exposure of persons beyond the border.

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TEST REPORT
ACCREDITED LABORATORIES

13092/26

Revision 0

CUSTOMER	Amentum Clean Energy s.r.o. Křenová 184 602 00 Brno
TEST ITEM	Area beneath the 400 kV overhead line and above the 110 kV cable line
TYPE SPECIFICATION	Power evacuation and auxiliary power supply for SMR ETE
TEST SPECIFICATIONS	IP5 (Government Decree No. 291/2015 Coll.; Bulletin of the Ministry of Health of the Czech Republic, Vol. 2017, No. 8; ČSN 33 2040)
TEST RESULTS	A summary of the test results is provided on page 5
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REAL INDEPENDENT TESTING

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TEST DETAILS

TEST ITEM	Area beneath the 400 kV overhead line and above the 110 kV cable line
TYPE SPECIFICATION	Power evacuation and auxiliary power supply for SMR ETE
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The issue with the highest revision number is always binding and supersedes all previous issues.

THE ACCREDITED LABORATORY TEST REPORT covers test procedures within the scope of accreditation of the EGU HV LABORATORY high-voltage laboratory, which forms an integral part of the Certificate of Accreditation. The test procedures comply with international, regional, or national standards. Any deviations from these normative procedures are clearly identified.

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1 IDENTIFICATION OF THE TEST ITEM

The purpose of the assessment is to verify compliance with the applicable public-health limits for electric and magnetic fields (non-ionizing radiation) under Government Decree No. 291/2015 Coll. and ČSN 33 2040 for the planned construction of a new 1 × 400 kV overhead line and a new 110 kV underground cable line as part of the SMR ETE project. The project comprises a new 110 kV cable line for auxiliary power supply and a new 400 kV single-circuit overhead line for power evacuation as part of the SMR ETE project. The assessment evaluates the effects of electric and magnetic fields where the newly designed lines run in parallel with or cross the existing transmission and distribution systems, particularly the 400 kV and 110 kV lines at the Temelín site.

The assessment method consists of calculating the 50 Hz electromagnetic-field parameters (electric field strength E (kV/m) and magnetic flux density B (μT)). These quantities are used to calculate the modified electric field strength E_{mod} induced in human tissue at a height of 1.8 m above ground for overhead lines and 0.1 m above ground for cable lines (persons lying on the ground are considered). Under Government Decree No. 291/2015 Coll., exposure in the head region must be used as the determining factor. When configuring the circuits for the simulations, the phase sequence resulting in the highest electromagnetic-field levels is normally used. All electromagnetic-field calculations were performed using OVERHEAD software, version 3.1.0.31.

The electromagnetic-field impact assessment complies with the applicable legislation, in particular Act No. 258/2000 Coll., as amended, and Government Decree No. 291/2015 Coll., as amended, as well as the applicable technical standards, such as ČSN 33 2040 and PNE 33 3300, Ed. 3. The calculations were performed in accordance with the Ministry of Health methodology dated July 11, 2017.

2 OVERALL ASSESSMENT (TEST) RESULTS

Tab. 1 Assessment (test) results

Name of the assessed line configuration (cross-section)	Test specification	Result (Statement of conformity)
Parallel routing of the 110 kV underground cable lines (auxiliary power supply for SMR ETE) and the 400 kV single-circuit overhead line (power evacuation from SMR ETE)	ČSN 33 2040, Government Decree No. 291/2015 Coll.	PASS
Parallel routing of the 400 kV single-circuit overhead line (power evacuation from SMR ETE) and two 400 kV single-circuit overhead lines (Units 1 and 2)	ČSN 33 2040, Government Decree No. 291/2015 Coll.	PASS
Crossing of the 110 kV underground cable lines (auxiliary power supply for SMR ETE) with the 400 kV and 110 kV overhead lines of the existing units	ČSN 33 2040, Government Decree No. 291/2015 Coll.	PASS

Explanatory notes on the superscripts used for test procedures and standards:

1) *The test was performed by an external accredited laboratory.*
2) *The test was performed within the flexible scope of accreditation.*
3) *The test is outside the scope of accreditation of EGU HV Laboratory.*
4) *The test procedure or assessment criteria include normative and customer requirements.*

EGU - HV Laboratory applies a binary decision rule:

PASS - the measurement result is declared satisfactory (conforming) if the measured value falls within the tolerance band (specification)

FAIL - the measurement result is declared unsatisfactory (nonconforming) if the measured value falls outside the tolerance band (specification)

Tab. 2 Summary of numerical results for electric field strength and magnetic flux density (the maximum permissible value specified in ČSN 33 2040 is E_{max} = 10 kV/m and B_{max} = 500 μT)

Assessed configuration	Maximum electric field strength E_{max}	Maximum magnetic flux density B_{max}
Parallel routing of the 110 kV underground cable lines (auxiliary power supply for SMR ETE) and the 400 kV single-circuit overhead line (power evacuation from SMR ETE), at a height of 1.8 m above ground	5.31 kV/m	26.9 μT
Parallel routing of the 110 kV underground cable lines (auxiliary power supply for SMR ETE) and the 400 kV single-circuit overhead line (power evacuation from SMR ETE), at a height of 0.1 m above ground	5.13 kV/m	51.6 μT
Parallel routing of the 400 kV single-circuit overhead line (power evacuation from SMR ETE) and two 400 kV single-circuit overhead lines (Units 1 and 2), at a height of 1.8 m above ground	5.36 kV/m	25.4 μT
Crossing of the 110 kV underground cable lines (auxiliary power supply for SMR ETE) with the 400 kV and 110 kV overhead lines of the existing units, at a height of 1.8 m above ground	5.36 kV/m	35.1 μT
Crossing of the 110 kV underground cable lines (auxiliary power supply for SMR ETE) with the 400 kV and 110 kV overhead lines of the existing units, at a height of 0.1 m above ground	5.18 kV/m	63.3 μT

Tab. 3 Summary of numerical results for modified electric field strength (the maximum permissible value specified in Government Decree No. 291/2015 Coll. is E_{mod} = 0.2 V/m)

Name of the assessed line configuration (cross-section)	Minimum height of the lower phase conductors above ground h_{min} used in the assessment	Maximum modified electric field strength E_{mod}
Parallel routing of the 110 kV underground cable lines (auxiliary power supply for SMR ETE) and the 400 kV single-circuit overhead line (power evacuation from SMR ETE), at a height of 1.8 m above ground	12.5 m (400 kV) -1.3 m (110 kV cable)	0.047 V/m
Parallel routing of the 110 kV underground cable lines (auxiliary power supply for SMR ETE) and the 400 kV single-circuit overhead line (power evacuation from SMR ETE), at a height of 0.1 m above ground	12.5 m (400 kV) -1.3 m (110 kV cable)	0.045 V/m
Parallel routing of the 400 kV single-circuit overhead line (power evacuation from SMR ETE) and two 400 kV single-circuit overhead lines (Units 1 and 2), at a height of 1.8 m above ground	12.5 m	0.048 V/m
Crossing of the 110 kV underground cable lines (auxiliary power supply for SMR ETE) with the 400 kV and 110 kV overhead lines of the existing units, at a height of 1.8 m above ground	12.5 m (400 kV) 7.1 m (110 kV) -1.3 m (110 kV cable)	0.049 V/m
Crossing of the 110 kV underground cable lines (auxiliary power supply for SMR ETE) with the 400 kV and 110 kV overhead lines of the existing units, at a height of 0.1 m above ground	12.5 m (400 kV) 7.1 m (110 kV) -1.3 m (110 kV cable)	0.052 V/m

3 REQUIREMENTS OF GOVERNMENT DECREE NO. 291/2015 COLL.

Government Decree No. 291/2015 Coll. (hereinafter "GD 2015") specifies the maximum permissible values of modified electric field strength E_{mod} in human tissue for electromagnetic-field frequencies from 0 Hz to 10 MHz (and therefore also for 50 Hz):

- E_{mod} = 1.0 V/m for employees
- E_{mod} = 0.2 V/m for members of the general public in a non-occupational environment

For the purposes of GD 2015, an employee is a person who has undertaken to perform dependent work within a basic employment relationship and is performing that work. For the purposes of GD 2015, a member of the general public is any person who is not an employee.

To determine the modified electric field strength E_{mod}, the electric field strength E induced in tissue by the external electromagnetic field must first be determined. The external electromagnetic field is expressed by the magnetic flux density B^{ext} and electric field strength E^{ext}, and the following relationship applies:

$$E_1 = K_B \cdot \frac{dB^{ext}}{dt} \tag{1}$$

$$E_2 = \frac{\varepsilon_0}{\sigma} \cdot K_E \cdot \frac{dE^{ext}}{dt} \tag{2}$$

ε_0 = 8.854·10^{-12} F·m^{-1}, vacuum permittivity

σ = 0.20 S·m^{-1}, tissue conductivity

K_B, K_E, exposure coefficients (field distribution, orientation relative to the body, and location on the body)

Under GD 2015, exposure in the head region must be used as the determining factor. To represent the most conservative public-health case, the person's feet are also assumed to be electrically connected to the ground (bare feet on damp ground). The most conservative situation is therefore considered, with the body exposed to a homogeneous magnetic field perpendicular to the chest and a homogeneous electric field directed from the head toward the feet. For the selection of constants, the more conservative filter representing head exposure is used, specifically exposure of the eyes and middle ear (K_B = 0.05 m and K_E = 66).

Although electric field strength and magnetic flux density are both vector quantities, they are expressed as scalars in the equations. In the general case, vector orientation can be highly complex and depends on the particular distribution of the inducing electric and magnetic fields. The situation can be simplified by considering the most conservative case, in which the contributions from concurrent exposure to electric and magnetic fields are added together.

Exposure assessment is straightforward for a sinusoidal signal. The initial quantity for the magnetic component of the field is the root-mean-square magnetic flux density B_{ef}^{ext}. The magnetic flux density amplitude is then $B_a^{ext} = \sqrt{2} \cdot B_{ef}^{ext}$, and its time derivative, required for substitution into Eq. (1), is:

$$\frac{dB^{ext}}{dt} = 2 \cdot \pi \cdot f \cdot {B_a}^{ext} \tag{3}$$

where f is the frequency. According to Eq. (1), the electric field strength induced by this magnetic field is (K_B = 0.05 m):

$$E_1 = 2 \cdot \sqrt{2} \cdot K_B \cdot \pi \cdot f \cdot {B_{ef}}^{ext} \tag{4}$$

Similarly, the initial quantity for the electric component of the field is the root-mean-square electric field strength E_{ef}^{ext}. According to Eq. (2), the electric field strength induced by this electric field is derived in the same manner (K_E = 66):

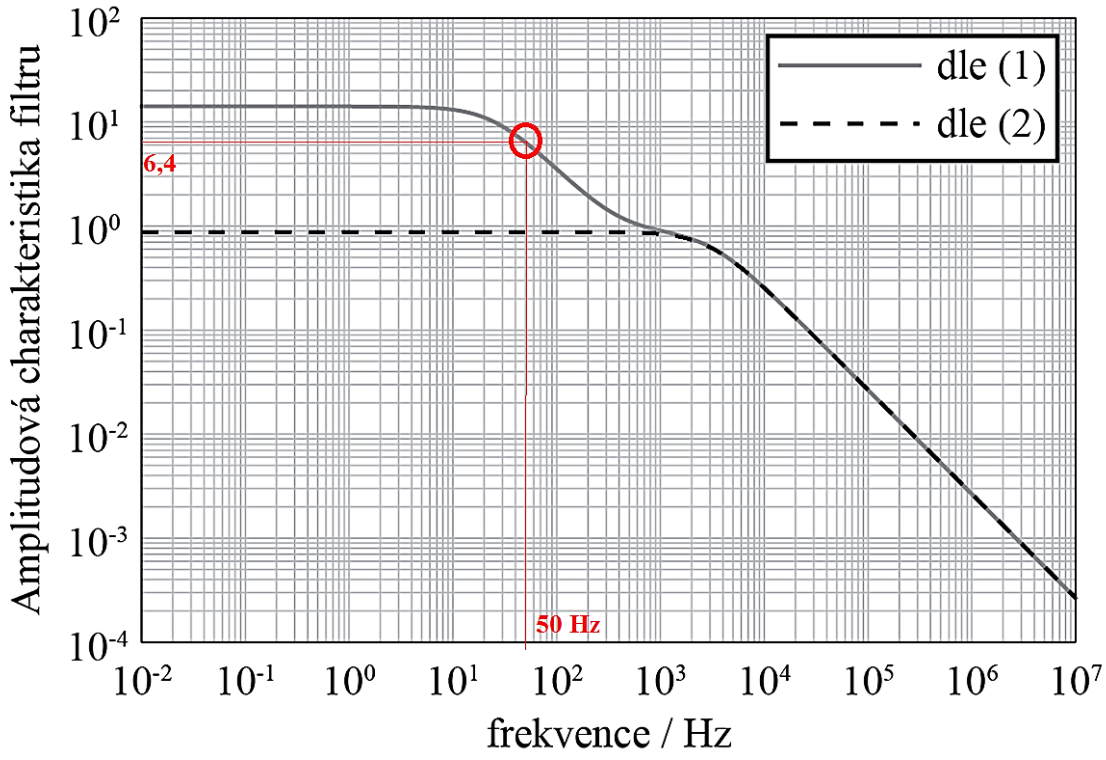
$$E_2 = \frac{\varepsilon_0}{\sigma} \cdot 2 \cdot \sqrt{2} \cdot K_E \cdot \pi \cdot f \cdot {E_{ef}}^{ext} \tag{5}$$

The combined electric- and magnetic-field exposure then determines the resulting induced electric field strength:

$$E = E_1 + E_2 = 2 \cdot \sqrt{2} \cdot \pi \cdot f \cdot \left(K_B \cdot {B_{ef}}^{ext} + \frac{\varepsilon_0}{\sigma} \cdot K_E \cdot {E_{ef}}^{ext} \right) \tag{6}$$

The modified electric field strength E_{mod} is then determined by the induced electric field strength E after it passes through a filter with the frequency response specified in Fig. 1. At 50 Hz, $G(50)$ = 6.4, and E_{mod} is therefore determined using the following equation:

$$E_{mod} = 6{,}4 \cdot E \tag{7}$$



Amplitudová charakteristika filtru	Filter amplitude response
dle (1)	according to (1)
dle (2)	according to (2)
frekvence / Hz	frequency / Hz

Fig. 1 Amplitude-frequency response of the filters used to determine modified electric field strength

At the same time, GD 2015 specifies reference levels for electric field strength *E* and magnetic flux density *B* to simplify the assessment of the exposure situation. The reference levels are defined using the quantities E_{ef}^{Limit} and B_{ef}^{Limit}, which, according to the table in GD 2015, have the following values at a frequency of 50 Hz:

- E_{ef}^{Limit} *(50 Hz)* = 10 kV/m
- B_{ef}^{Limit} *(50 Hz)* = 1 mT

Compliance with the reference level requires the following criterion to be met using the root-mean-square values of the spatial maxima of electric field strength and magnetic flux density at 50 Hz; the criterion is derived from the more general criterion specified in GD 2015:

$$\frac{{E_{ef}}^{ext}{}_{max}}{{E_{ef}}^{Limit}} + \frac{{B_{ef}}^{ext}{}_{max}}{{B_{ef}}^{Limit}} \leq H_{lim} \qquad (8)$$

The following value applies to the criterion limit coefficient:

- H_{lim} = 1.0 for employees
- H_{lim} = 0.2 for members of the general public in a non-occupational environment

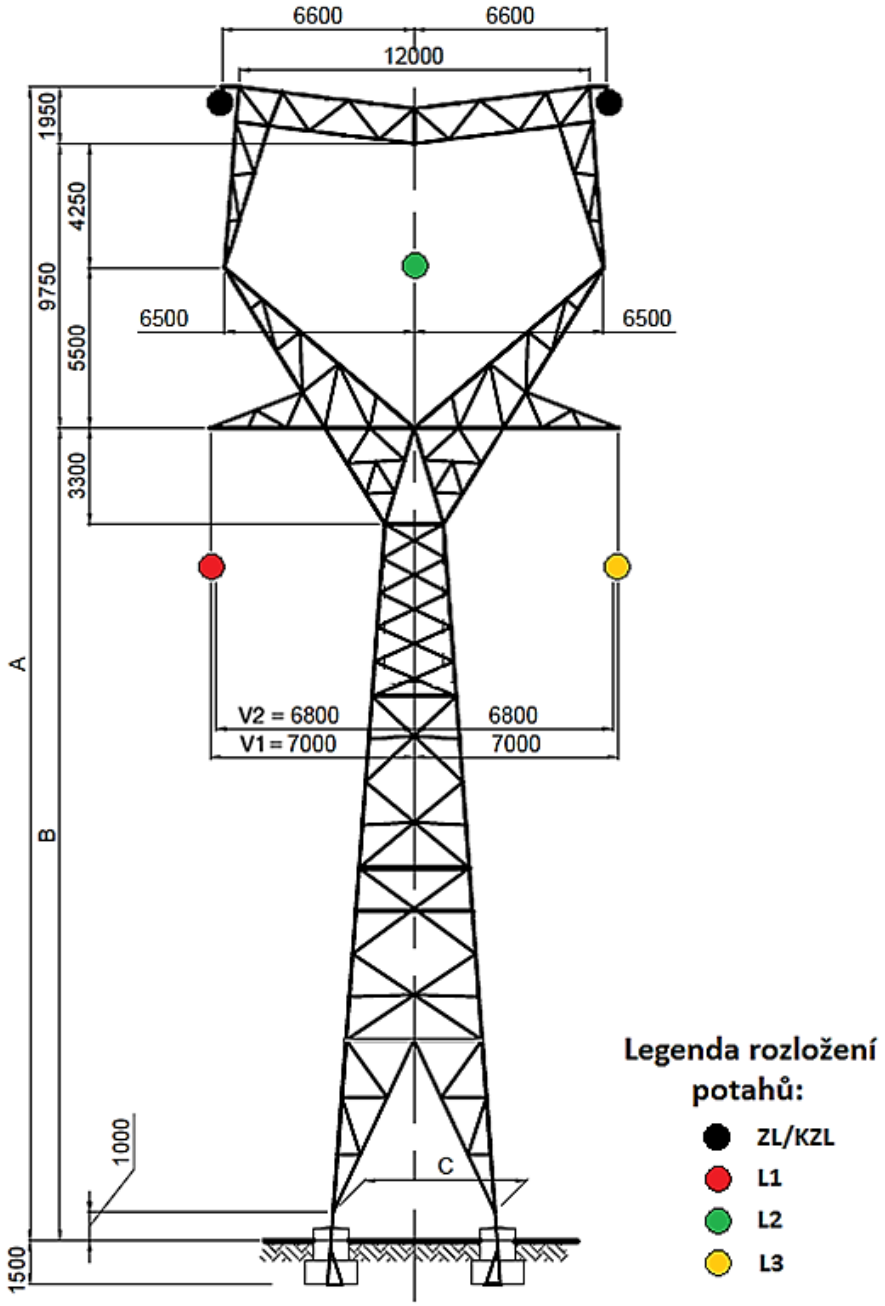
This limit coefficient for members of the general public in a non-occupational environment was used to derive the electric-field-strength and magnetic-flux-density reference limits shown in the calculation graphs below:

- $E_{ef}^{ext}{}_{lim}$ *(50 Hz)* = 2 kV/m
- $B_{ef}^{ext}{}_{lim}$ *(50 Hz)* = 0.2 mT

4 PARAMETERS OF THE ASSESSED LINES

4.1 TOWER STRUCTURES

The SMR ETE project envisages Delta 1 × 400 kV towers for the construction of the new power evacuation overhead line, as shown in Fig. 2. A standard minimum phase-conductor height of 12.5 m above ground is assumed for the line.

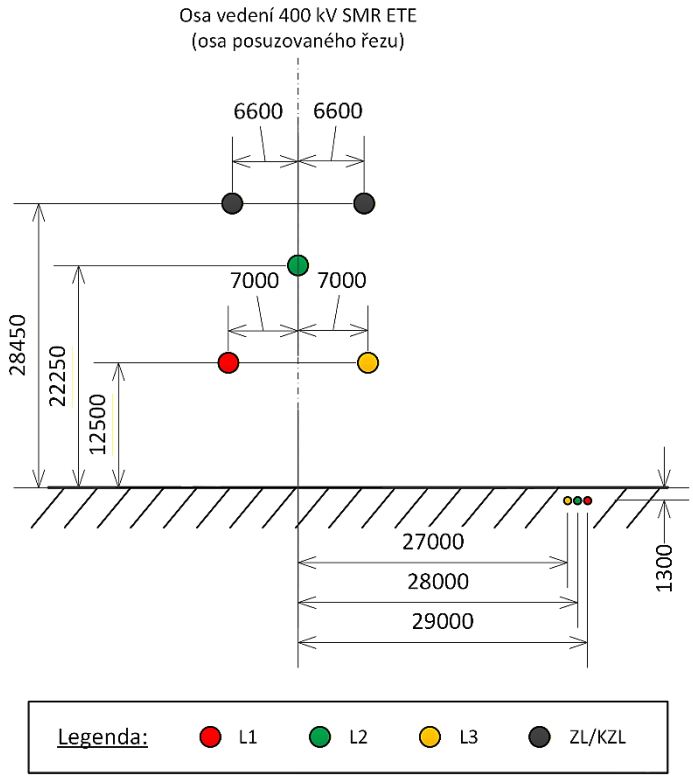


Legenda rozložení potahů:	Circuit arrangement legend:

Fig. 2 Arrangement of a Delta (2023) suspension tower for a 1 × 400 kV line

4.2 ASSESSED PARALLEL ROUTING ARRANGEMENTS

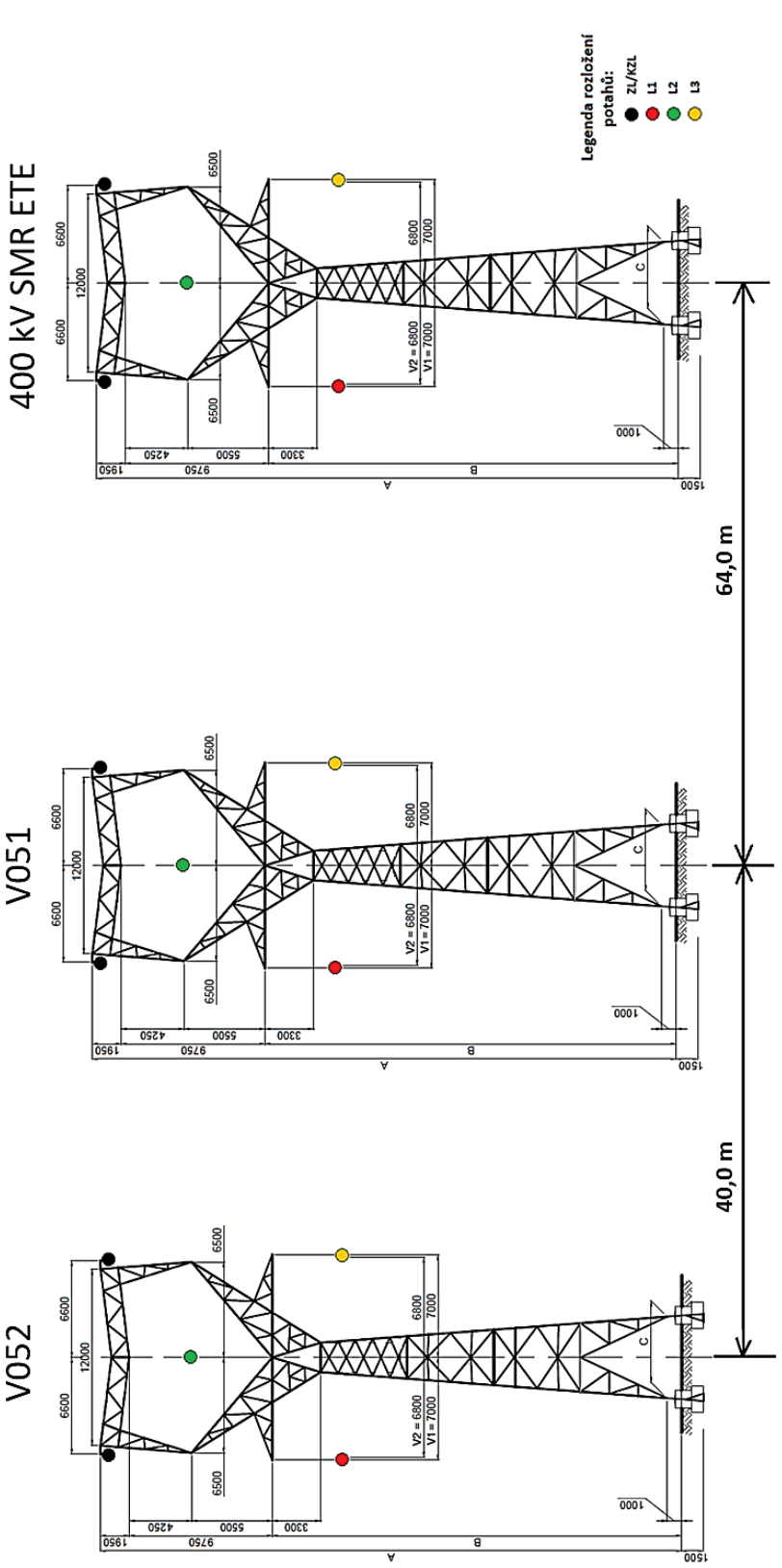
The planned 110 kV underground cable line (auxiliary power supply for SMR ETE) will run in parallel with the planned 400 kV single-circuit overhead line (power evacuation from SMR ETE), which will be carried on Delta 1 × 400 kV towers. The most conservative assessed configuration is shown in Fig. 3.



Osa vedení 400 kV SMR ETE (osa posuzovaného řezu)	Axis of the 400 kV SMR ETE line (axis of the assessed cross-section)
Legenda:	Legend:

Fig. 3 Assessed parallel routing of the planned 110 kV underground cable line (auxiliary power supply for SMR ETE) and the planned Delta 1 × 400 kV overhead line (power evacuation from SMR ETE)

The planned 400 kV single-circuit overhead line (power evacuation from SMR ETE) will also run in parallel with the existing 400 kV single-circuit overhead lines (power evacuation from Units 1 and 2). All parallel lines use Delta 1 × 400 kV tower structures. A cross-section of the assessed parallel routing is shown in Fig. 4. The minimum height of the lower phase conductors above ground is 12.5 m for all 400 kV lines.

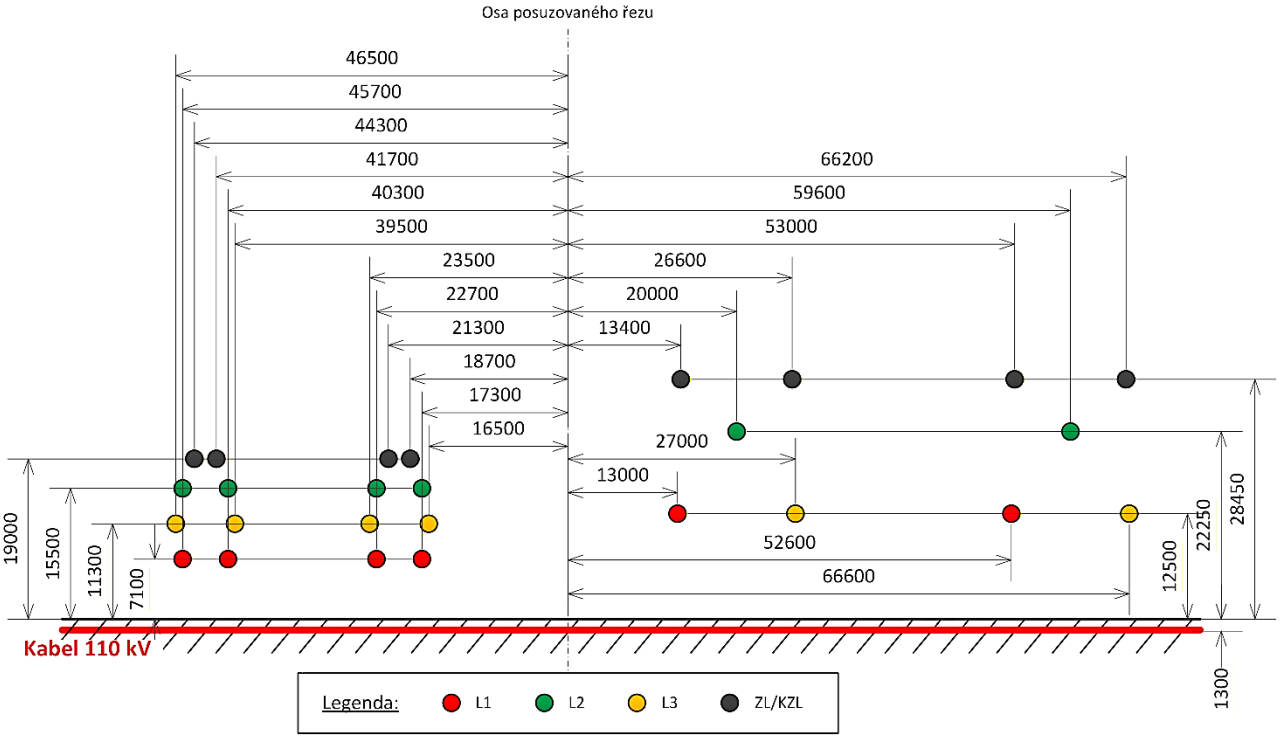


Legenda rozložení potahů:	Circuit arrangement legend:

Fig. 4 Assessed parallel routing of the planned Delta 1 × 400 kV overhead line (power evacuation from SMR ETE) and the Delta 1 × 400 kV overhead lines (power evacuation from Units 1 and 2)

4.3 ASSESSED CROSSING

The planned 110 kV underground cable line (auxiliary power supply for SMR ETE) will cross the 400 kV Delta 1 × 400 kV single-circuit overhead lines (power evacuation from Units 1 and 2) and the 110 kV Soudek 2 × 110 kV overhead line (auxiliary power supply for Units 1 and 2). According to the supporting information for upgrading the 110 kV overhead line, each circuit of the 110 kV overhead line will be routed in duplicate (connected in parallel) on Soudek 2 × 110 kV tower structures at the crossing. A cross-section of the assessed crossing is shown in Fig. 5. For the assessment, all lines in the assessed cross-section were assumed to be operating at maximum current and voltage loading, representing the most conservative condition in terms of electromagnetic-field effects.



Osa posuzovaného řezu	Axis of the assessed cross-section
Kabel 110 kV	110 kV cable
Legenda	Legend

Fig. 5 Cross-section at the crossing of the 110 kV cable line (auxiliary power supply for SMR ETE) with two Delta 1 × 400 kV lines (to the right of the cross-section axis) and two 110 kV Soudek 2 × 110 kV lines (to the left of the cross-section axis)

4.4 CONDUCTOR PARAMETERS

For the 110 kV cable line, the electric field of each phase is effectively shielded by the grounded conductive screen of that phase; consequently, only magnetic-field effects are considered (the electric field strength is negligible). If operating currents were induced in the cable screens, the current flowing in the screens would reduce the magnetic field around the cable. For simplicity, the calculations assumed the most conservative condition in terms of magnetic-field effects: no induced current flows in the screens to reduce the effect of the cable's magnetic field on its surroundings.

The conductor parameters for the planned 110 kV underground cable line (auxiliary power supply for SMR ETE) and for the planned 400 kV single-circuit overhead line (power evacuation from SMR ETE) are provided in Tab. 4 and Tab. 5. The conductor parameters for the 400 kV overhead lines of Units 1 and 2 are provided in Tab. 6. The conductor parameters for the 110 kV overhead lines of Units 1 and 2 at the planned crossing are provided in Tab. 7.

Tab. 4 Parameters of the 110 kV auxiliary-power-supply cable for SMR ETE, three single-core screened cables

Conductor cross-sectional area (mm^2)	Rated voltage (kV)	Rated current (A)	Cable conductor diameter (mm)	Cable conductor material	DC resistance (at 20 °C) (Ω/km)	Minimum burial depth (m)
1 × 400	123	410	23.0	Al	0.0778	1.3

Tab. 5 Conductor parameters of the 400 kV overhead power evacuation line for SMR ETE

Parameters	Type	Conductor diameter (mm)	DC resistance (at 20 °C) (Ω/km)	Total cross-sectional area (mm^2)	Total current-carrying capacity of the system (A)
Phase conductors	3 × 434-AL1/56-ST1A	28.8	0.0666	490.6	1,800
Earth wire (EW)	1 × 185-AL4/43-ST6C	19.6	0.1805	227.8	-
Combined earth wire (CEW)	1 × AL3/A20SA 203/70	22.1	0.1640	272.8	-

Tab. 6 Conductor parameters of the 400 kV overhead lines of Units 1 and 2

Parameters	Type	Conductor diameter (mm)	DC resistance (at 20 °C) (Ω/km)	Total cross-sectional area (mm^2)	Total current-carrying capacity of the system (A)
Phase conductors	3 × 434-AL1/56-ST1A	28.8	0.0666	490.6	1,800
Earth wire (EW)	1 × 185-AL4/43-ST6C	19.6	0.1805	227.8	-
Combined earth wire (CEW)	1 × AL3/A20SA 203/70	22.1	0.1640	272.8	-

Tab. 7 Conductor parameters of the 110 kV overhead lines of Units 1 and 2

Parameters	Type	Conductor diameter (mm)	DC resistance (at 20 °C) (Ω/km)	Total cross-sectional area (mm^2)	Total current-carrying capacity of

					the system (A)
Phase conductors	1 × 679-AL1/86-ST1A	36.0	0.0426	764.5	400
Earth wire (EW)	1 × 185-AL4/43-ST6C	19.6	0.1805	227.8	-
Combined earth wire (CEW)	1 × AL4/A20SA 195/42	20.7	0.1718	236.9	-

5 CALCULATION ERRORS IN OVERHEAD SOFTWARE

OVERHEAD software version 3.1.0.31, used to assess the electromagnetic-field exposure limits, was validated using Wolfram Mathematica and COMSOL Multiphysics. The validation forms part of Internal Report No. Int_1/23 dated August 29, 2023.

The validation confirmed that OVERHEAD software is suitable for use and established the following errors:

- The electric-field calculation error δ_E is less than 0.001 %.
- The magnetic-field calculation error δ_B is less than 6 %.

These are the maximum possible relative errors incorporated into the overall assessment of the numerical simulations when calculating modified electric field strength (see Eqs. (6) and (7)). The assessment therefore also includes calculation of the absolute and relative error of the resulting modified electric field strength using the following equations:

$$\Delta_{Emod} = 6{,}4 \cdot (\delta_B \cdot E_1 + \delta_E \cdot E_2) \tag{9}$$

$$\delta_{Emod} = (\Delta_{Emod} / E_{mod}) \cdot 100 \tag{10}$$

6 CALCULATION RESULTS

6.1 PARALLEL ROUTING OF THE 110 KV UNDERGROUND CABLE LINES (AUXILIARY POWER SUPPLY FOR SMR ETE) AND THE 400 KV SINGLE-CIRCUIT OVERHEAD LINE (POWER EVACUATION FROM SMR ETE)

The root-mean-square electric field strength and magnetic flux density profiles in the cross-section of the assessed parallel routing at a height of 1.8 m above ground are plotted in Fig. 6 and Fig. 7. The profile of modified electric field strength in human tissue at a height of 1.8 m above ground is plotted in Fig. 8. The root-mean-square electric field strength and magnetic flux density profiles in the cross-section of the assessed line crossing at a height of 0.1 m above ground are plotted in Fig. 9 and Fig. 10. The profile of modified electric field strength in human tissue at a height of 0.1 m above ground is plotted in Fig. 11. These profiles are shown in relation to the reference levels specified in GD 2015 for members of the general public in a non-occupational environment. The calculation results and the assessment of the electric-field-strength and magnetic-flux-density reference levels are summarized for a height of 1.8 m above ground in Tab. 8 and for a height of 0.1 m above ground in Tab. 9.

Statement of conformity:

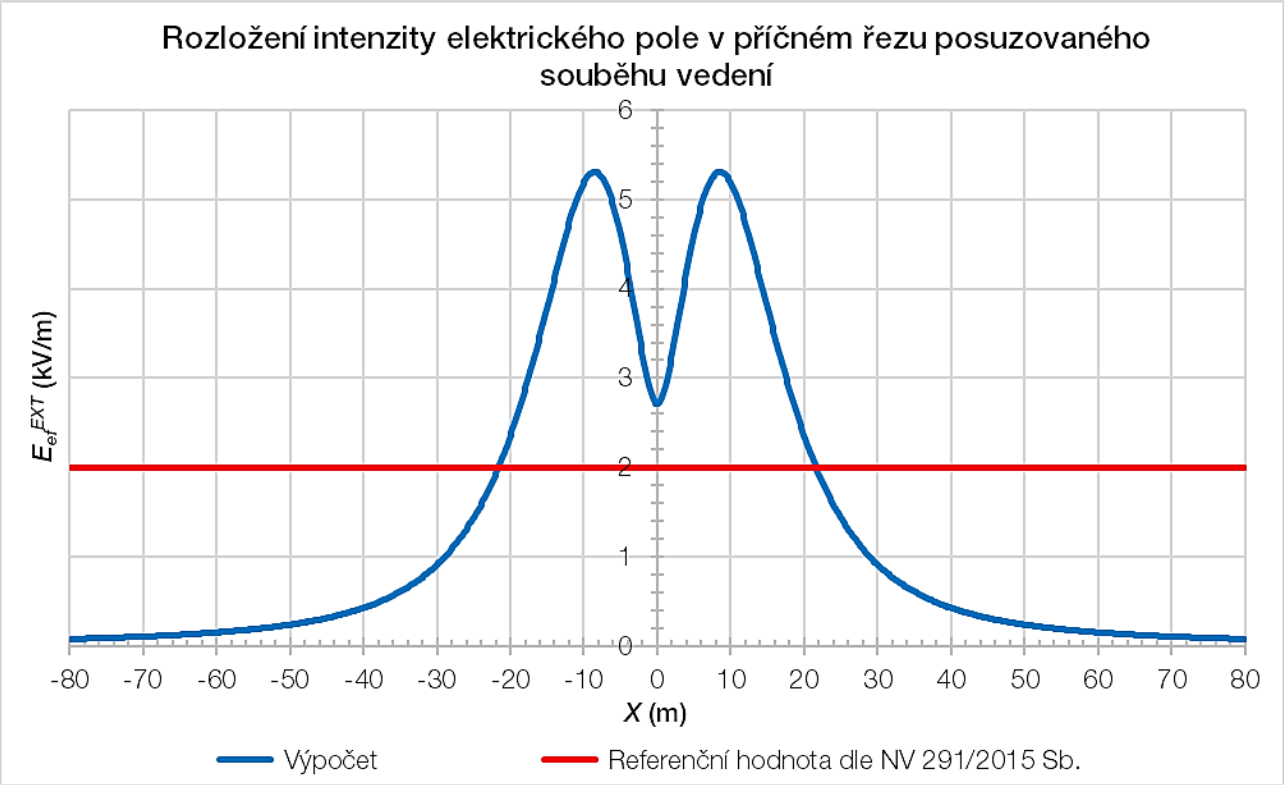
The planned parallel routing of the 110 kV underground cable lines (auxiliary power supply for SMR ETE) and the Delta 400 kV single-circuit overhead line (power evacuation from SMR ETE) complies with the requirements of GD 2015 for members of the general public in a non-occupational environment and ČSN 33 2040, “Electrical engineering regulations. Protection against the effects of 50 Hz electromagnetic fields in areas affected by electric power system equipment.”

Tab. 8 Calculation results and assessment of the reference levels for E and B at a height of 1.8 m above ground

$B_{ef}{}^{EXT}{}_{max}$ (μT)	$E_{ef}{}^{EXT}{}_{max}$ (kV/m)	H (-)	H_{lim} (-)	$H \leq H_{lim}$	E_{mod_max} (V/m)	Δ_{Emod} (mV/m)	δ_{Emod} (%)
26.87	5.31	0.56	0.2	NO	0.047	0.23	0.49

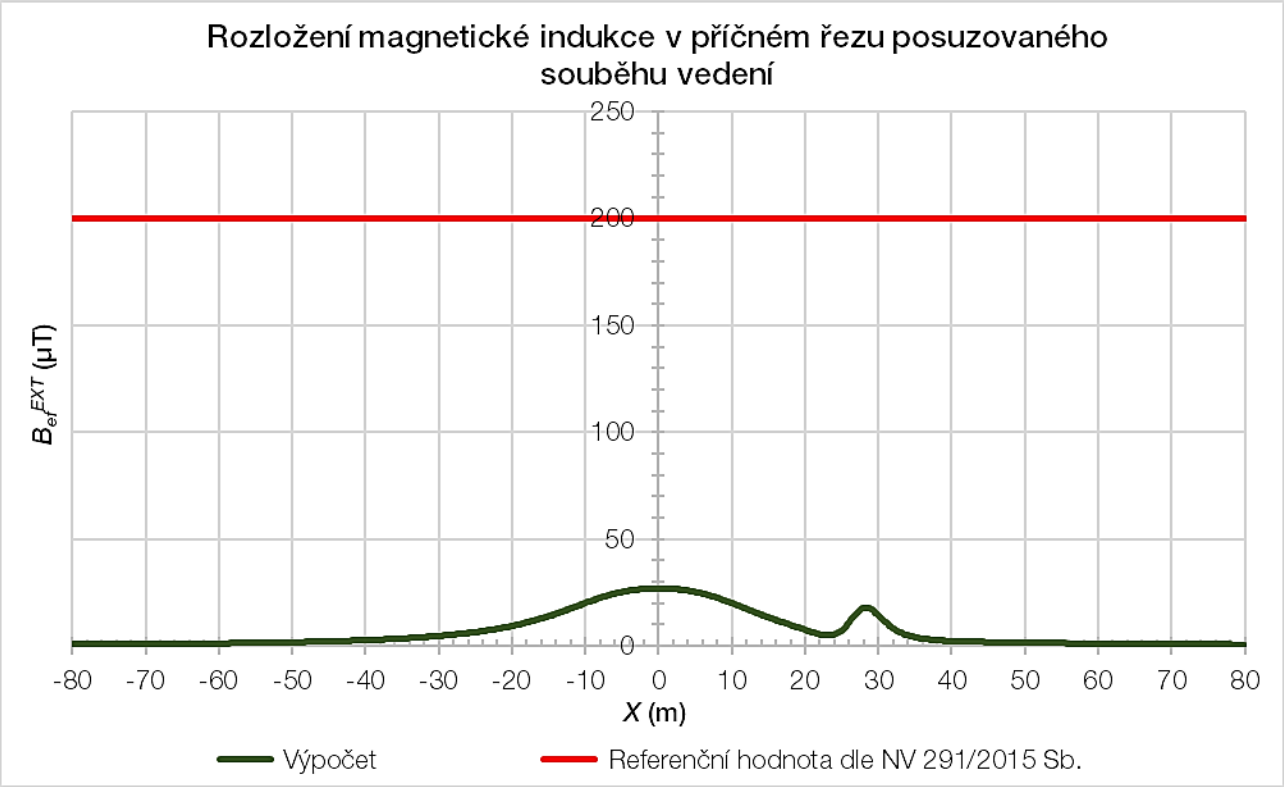
Tab. 9 Calculation results and assessment of the reference levels for E and B at a height of 0.1 m above ground

$B_{ef}{}^{EXT}{}_{max}$ (μT)	$E_{ef}{}^{EXT}{}_{max}$ (kV/m)	H (-)	H_{lim} (-)	$H \leq H_{lim}$	E_{mod_max} (V/m)	Δ_{Emod} (mV/m)	δ_{Emod} (%)
51.57	5.13	0.56	0.2	NO	0.045	0.44	0.97



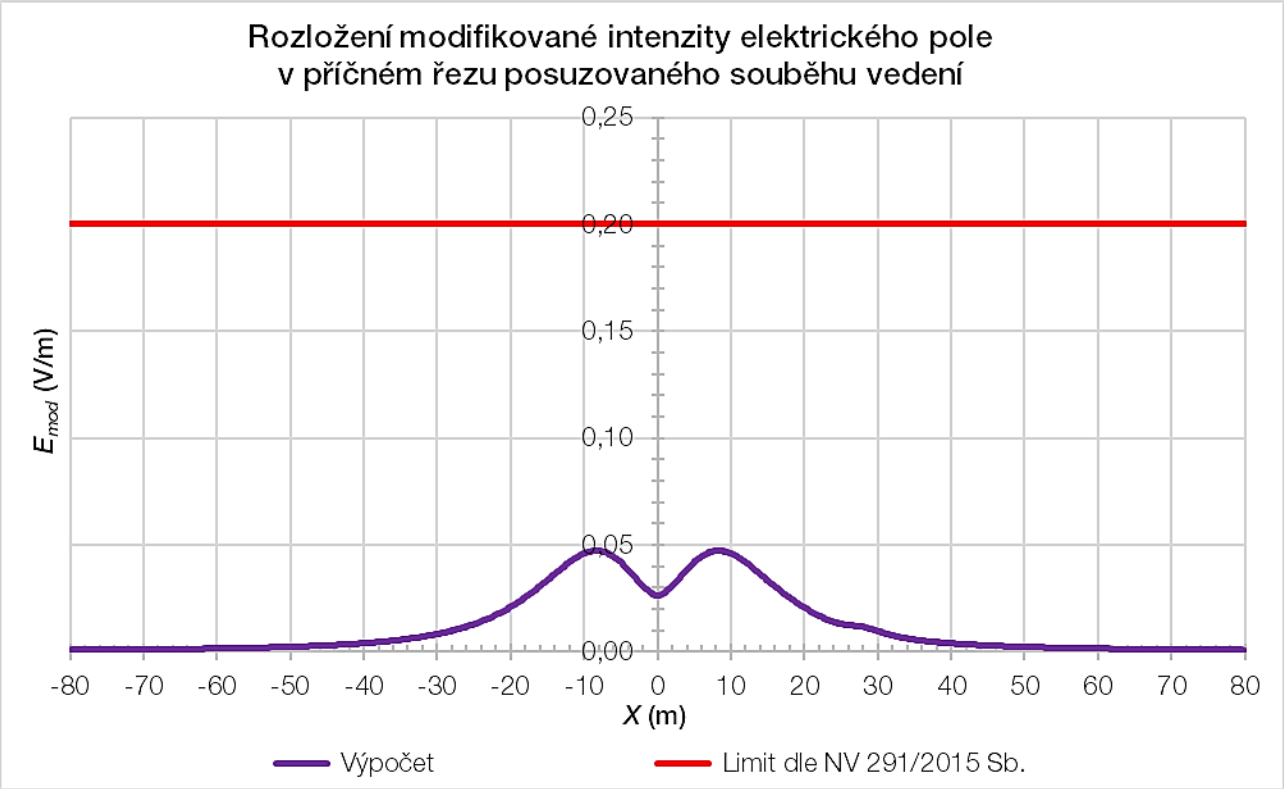
Rozložení intenzity elektrického pole v příčném řezu posuzovaného souběhu vedení	Electric field strength distribution in the cross-section of the assessed parallel routing
Výpočet	Calculation
Referenční hodnota dle NV 291/2015 Sb.	Reference level under GD 291/2015 Coll.

Fig. 6 Electric field strength at a height of 1.8 m above ground as a function of distance from the axis of the assessed parallel routing



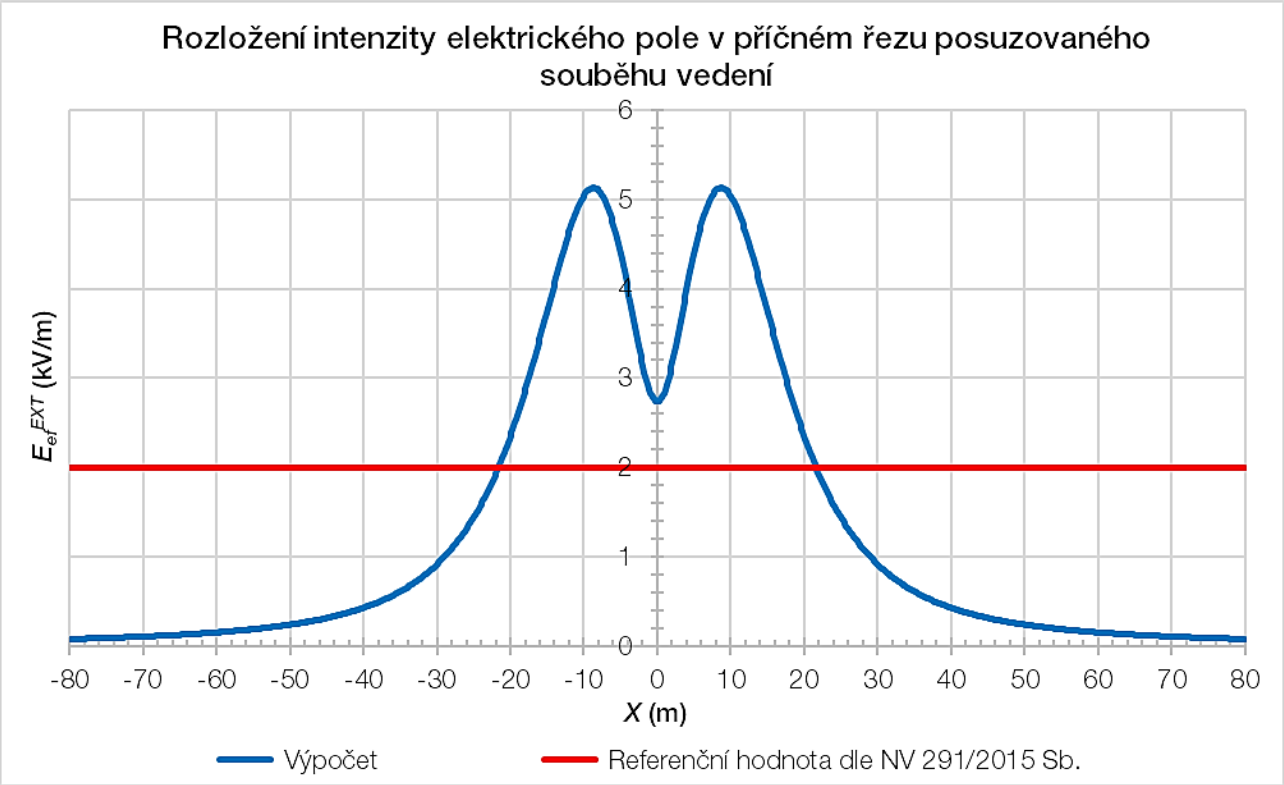
Rozložení magnetické indukce v příčném řezu posuzovaného souběhu vedení	Magnetic flux density distribution in the cross-section of the assessed parallel routing
Výpočet	Calculation
Referenční hodnota dle NV 291/2015 Sb.	Reference level under GD 291/2015 Coll.

Fig. 7 Magnetic flux density at a height of 1.8 m above ground as a function of distance from the axis of the assessed parallel routing



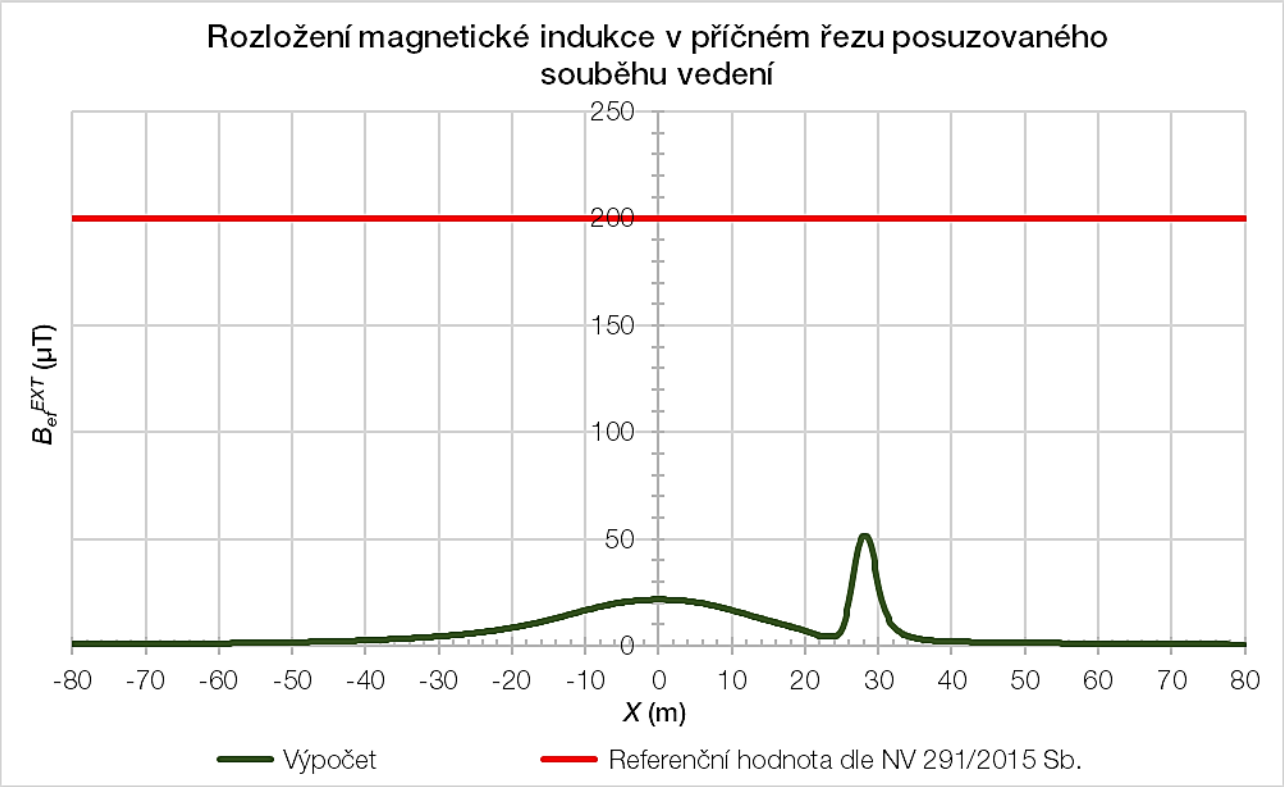
Rozložení modifikované intenzity elektrického pole v příčném řezu posuzovaného souběhu vedení	Modified electric field strength distribution in the cross-section of the assessed parallel routing
Výpočet	Calculation
Limit dle NV 291/2015 Sb.	Limit under GD 291/2015 Coll.

Fig. 8 Modified electric field strength at a height of 1.8 m above ground as a function of distance from the axis of the assessed parallel routing



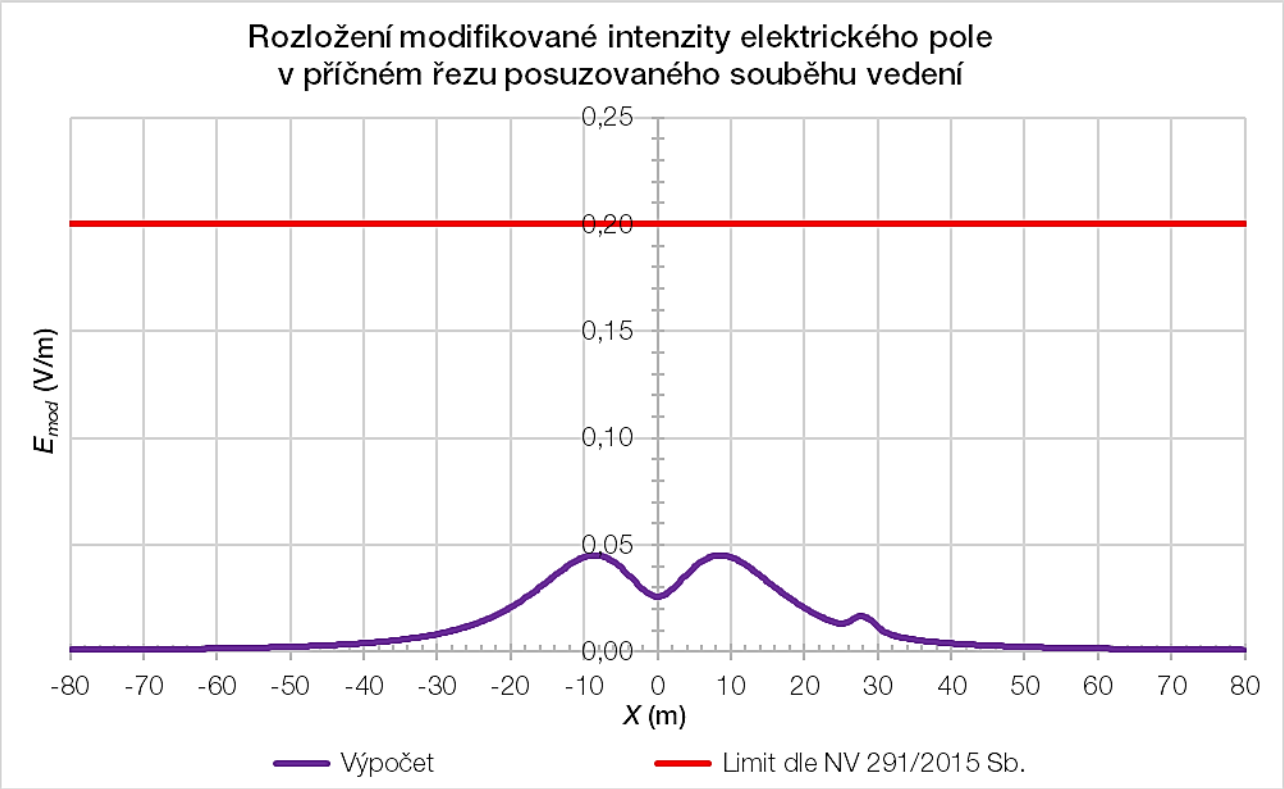
Rozložení intenzity elektrického pole v příčném řezu posuzovaného souběhu vedení	Electric field strength distribution in the cross-section of the assessed parallel routing
Výpočet	Calculation
Referenční hodnota dle NV 291/2015 Sb.	Reference level under GD 291/2015 Coll.

Fig. 9 Electric field strength at a height of 0.1 m above ground as a function of distance from the axis of the assessed parallel routing



Rozložení magnetické indukce v příčném řezu posuzovaného souběhu vedení	Magnetic flux density distribution in the cross-section of the assessed parallel routing
Výpočet	Calculation
Referenční hodnota dle NV 291/2015 Sb.	Reference level under GD 291/2015 Coll.

Fig. 10 Magnetic flux density at a height of 0.1 m above ground as a function of distance from the axis of the assessed parallel routing



Rozložení modifikované intenzity elektrického pole v příčném řezu posuzovaného souběhu vedení	Modified electric field strength distribution in the cross-section of the assessed parallel routing
Výpočet	Calculation
Limit dle NV 291/2015 Sb.	Limit under GD 291/2015 Coll.

Fig. 11 Modified electric field strength at a height of 0.1 m above ground as a function of distance from the axis of the assessed parallel routing

6.2 PARALLEL ROUTING OF THE 400 KV SINGLE-CIRCUIT OVERHEAD LINE (POWER EVACUATION FROM SMR ETE) AND TWO 400 KV SINGLE-CIRCUIT OVERHEAD LINES (UNITS 1 AND 2)

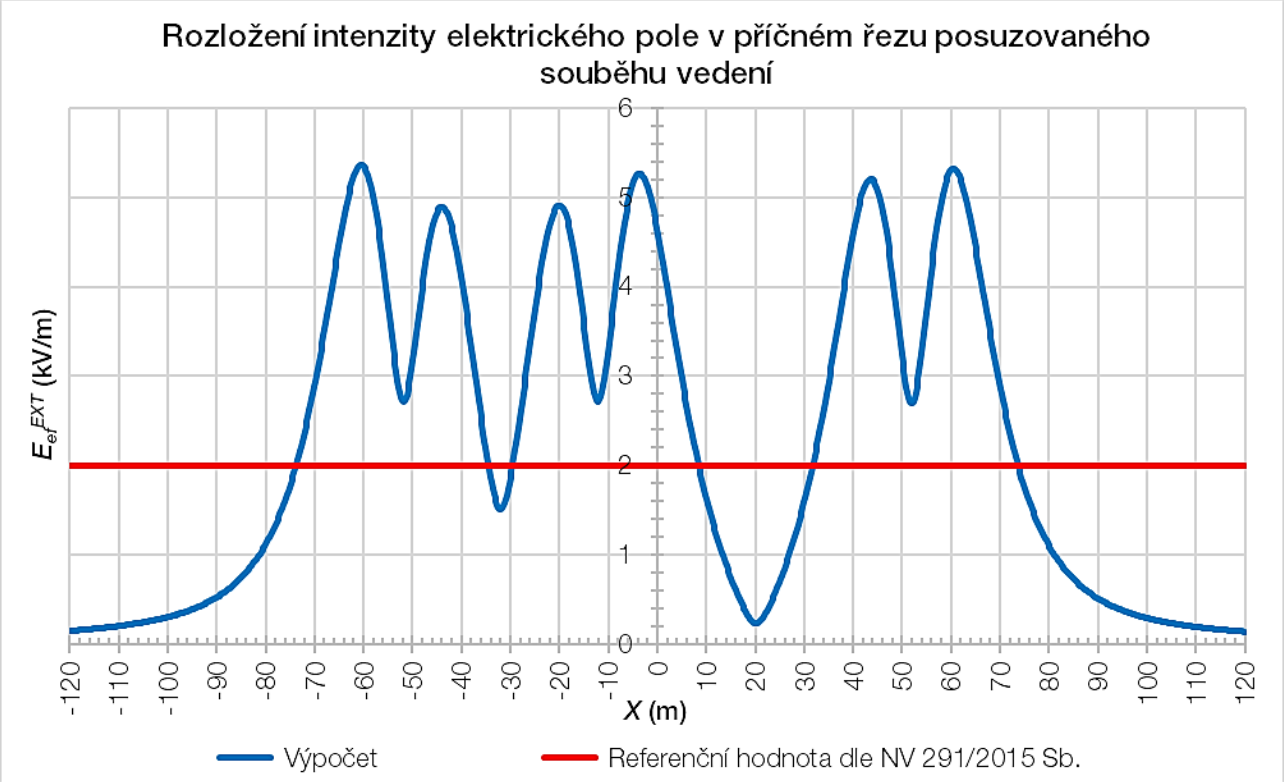
The root-mean-square electric field strength and magnetic flux density profiles in the cross-section of the assessed parallel routing at a height of 1.8 m above ground are plotted in Fig. 12 and Fig. 13. The profile of modified electric field strength in human tissue at a height of 1.8 m above ground is plotted in Fig. 14. These profiles are shown in relation to the reference levels specified in GD 2015 for members of the general public in a non-occupational environment. The calculation results and the assessment of the electric-field-strength and magnetic-flux-density reference levels are summarized in Tab. 10.

Statement of conformity:

The planned parallel routing of the Delta 400 kV single-circuit overhead line (power evacuation from SMR ETE) and two Delta 400 kV single-circuit overhead lines (Units 1 and 2) complies with the requirements of Government Decree No. 291/2015 Coll. for members of the general public in a non-occupational environment and ČSN 33 2040, “Electrical engineering regulations. Protection against the effects of 50 Hz electromagnetic fields in areas affected by electric power system equipment.”

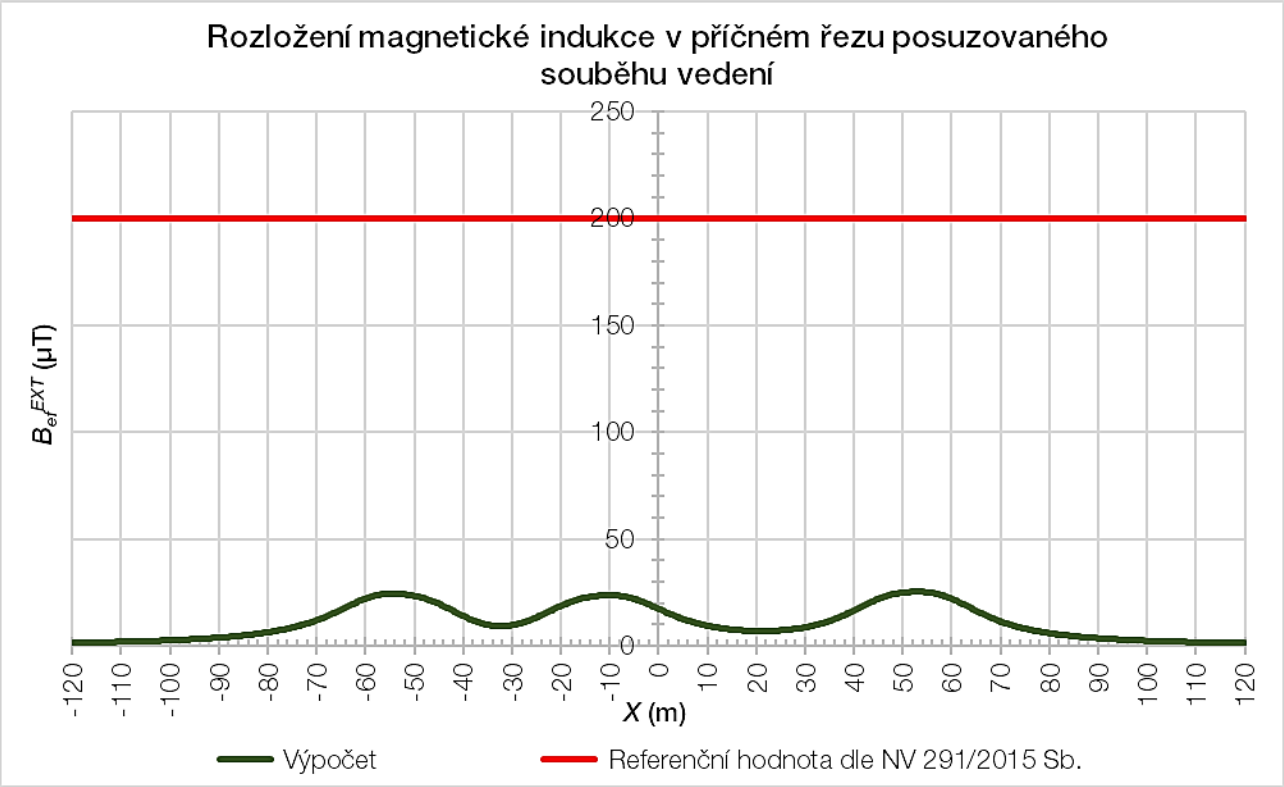
Tab. 10 Calculation results and assessment of the reference levels for E and B at a height of 1.8 m above ground

$B_{ef}{}^{EXT}{}_{max}$ (μT)	$E_{ef}{}^{EXT}{}_{max}$ (kV/m)	H (-)	H_{lim} (-)	$H \leq H_{lim}$	E_{mod_max} (V/m)	Δ_{Emod} (mV/m)	δ_{Emod} (%)
25.36	5.36	0.56	0.2	NO	0.048	0.22	0.45



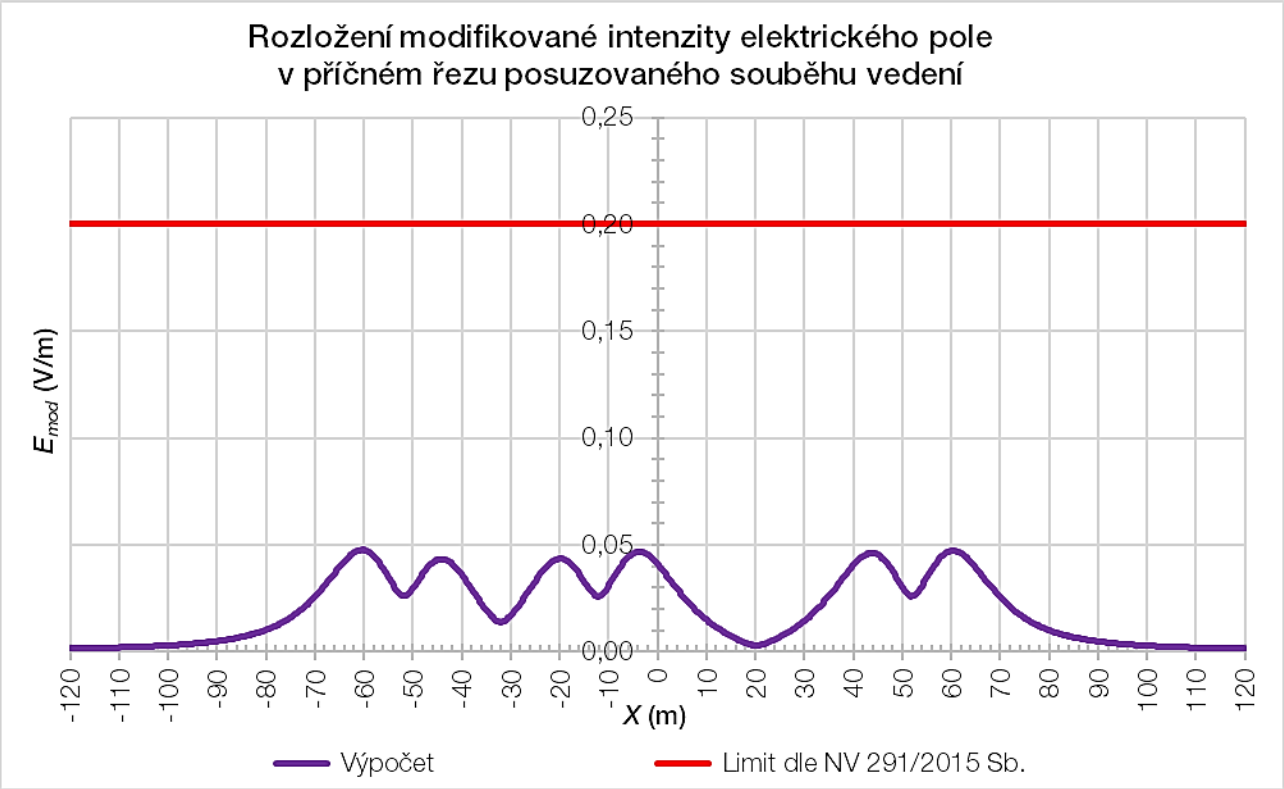
Rozložení intenzity elektrického pole v příčném řezu posuzovaného souběhu vedení	Electric field strength distribution in the cross-section of the assessed parallel routing
Výpočet	Calculation
Referenční hodnota dle NV 291/2015 Sb.	Reference level under GD 291/2015 Coll.

Fig. 12 Electric field strength at a height of 1.8 m above ground as a function of distance from the axis of the assessed parallel routing



Rozložení magnetické indukce v příčném řezu posuzovaného souběhu vedení	Magnetic flux density distribution in the cross-section of the assessed parallel routing
Výpočet	Calculation
Referenční hodnota dle NV 291/2015 Sb.	Reference level under GD 291/2015 Coll.

Fig. 13 Magnetic flux density at a height of 1.8 m above ground as a function of distance from the axis of the assessed parallel routing



Rozložení modifikované intenzity elektrického pole v příčném řezu posuzovaného souběhu vedení	Modified electric field strength distribution in the cross-section of the assessed parallel routing
Výpočet	Calculation
Limit dle NV 291/2015 Sb.	Limit under GD 291/2015 Coll.

Fig. 14 Modified electric field strength at a height of 1.8 m above ground as a function of distance from the axis of the assessed parallel routing

6.3 CROSSING OF THE 110 KV UNDERGROUND CABLE LINES (AUXILIARY POWER SUPPLY FOR SMR ETE) WITH THE 400 KV AND 110 KV OVERHEAD LINES OF THE EXISTING UNITS

The root-mean-square electric field strength and magnetic flux density profiles in the cross-section of the assessed line crossing at a height of 1.8 m above ground are plotted in Fig. 15 and Fig. 16. The profile of modified electric field strength in human tissue at a height of 1.8 m above ground is plotted in Fig. 17. The root-mean-square electric field strength and magnetic flux density profiles in the cross-section of the assessed line crossing at a height of 0.1 m above ground are plotted in Fig. 18 and Fig. 19. The profile of modified electric field strength in human tissue at a height of 0.1 m above ground is plotted in Fig. 20. These profiles are shown in relation to the reference levels specified in GD 2015 for members of the general public in a non-occupational environment. The calculation results and the assessment of the electric-field-strength and magnetic-flux-density reference levels are summarized for a height of 1.8 m above ground in Tab. 11 and for a height of 0.1 m above ground in Tab. 12.

Statement of conformity:

The planned crossing of the 110 kV underground cable lines (auxiliary power supply for SMR ETE) with two Delta 400 kV single-circuit overhead lines (power evacuation from Units 1 and 2) and two Soudek 110 kV overhead lines (auxiliary power supply for Units 1 and 2) complies with the requirements of GD 2015 for members of the general public in a non-occupational environment and

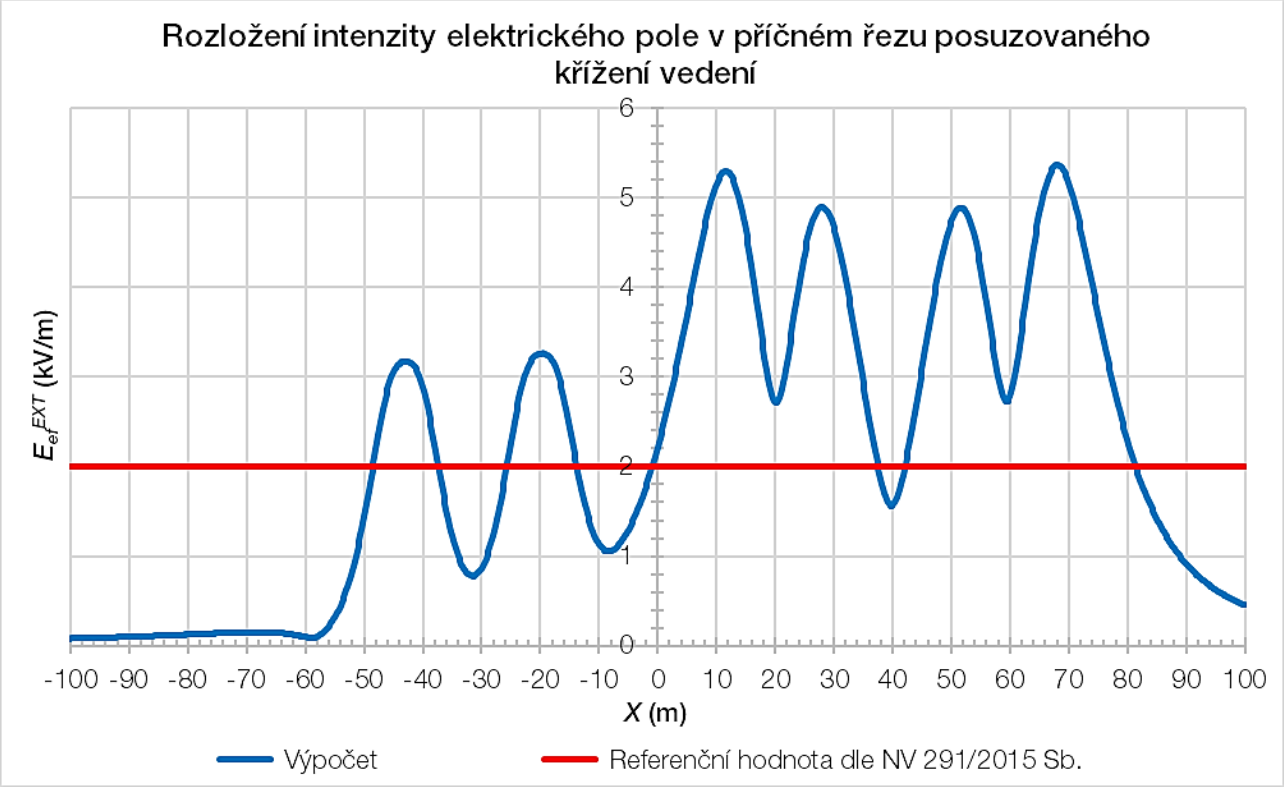
ČSN 33 2040, “Electrical engineering regulations. Protection against the effects of 50 Hz electromagnetic fields in areas affected by electric power system equipment.”

Tab. 11 Calculation results and assessment of the reference levels for E and B at a height of 1.8 m above ground

$B_{ef}{}^{EXT}{}_{max}$ (μT)	$E_{ef}{}^{EXT}{}_{max}$ (kV/m)	H (-)	H_{lim} (-)	$H \le H_{lim}$	E_{mod_max} (V/m)	Δ_{Emod} (mV/m)	δ_{Emod} (%)
35.05	5.36	0.57	0.2	NO	0.049	0.30	0.61

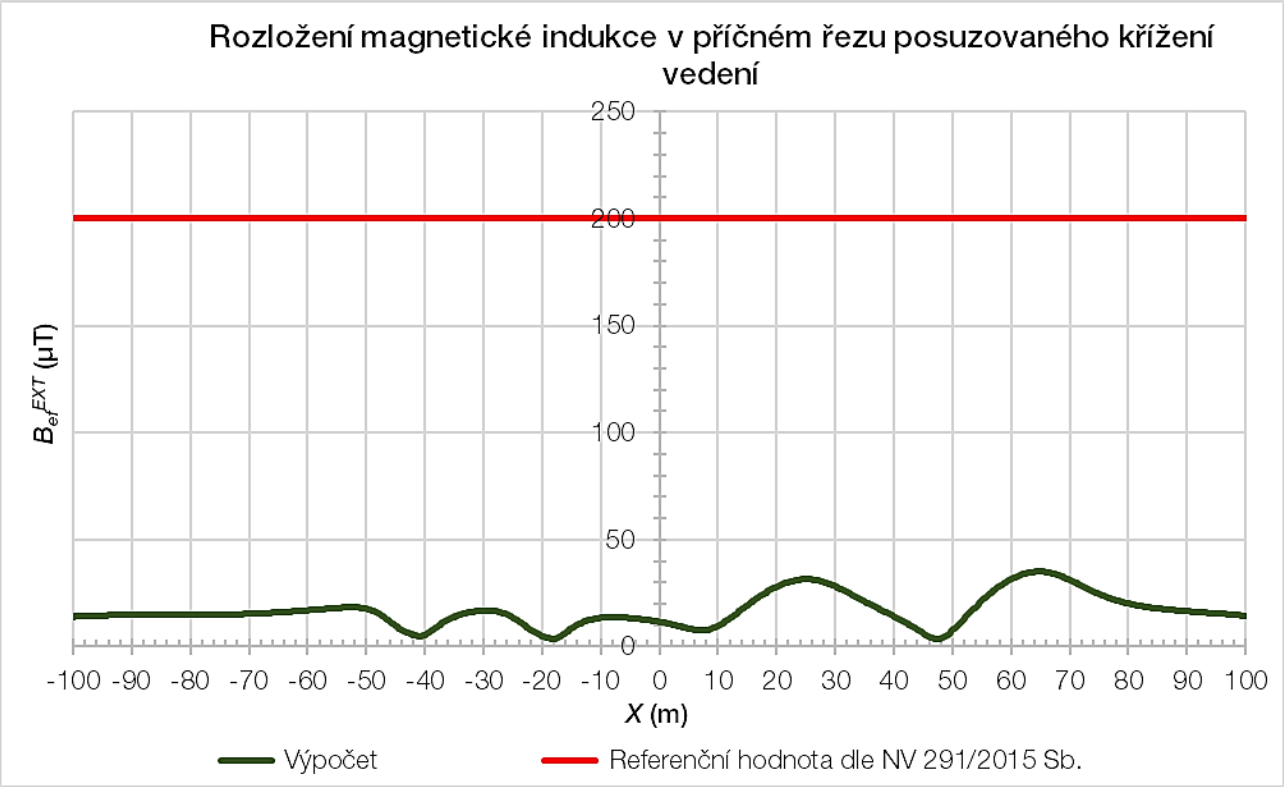
Tab. 12 Calculation results and assessment of the reference levels for E and B at a height of 0.1 m above ground

$B_{ef}{}^{EXT}{}_{max}$ (μT)	$E_{ef}{}^{EXT}{}_{max}$ (kV/m)	H (-)	H_{lim} (-)	$H \le H_{lim}$	E_{mod_max} (V/m)	Δ_{Emod} (mV/m)	δ_{Emod} (%)
63.25	5.18	0.58	0.2	NO	0.052	0.54	1.04



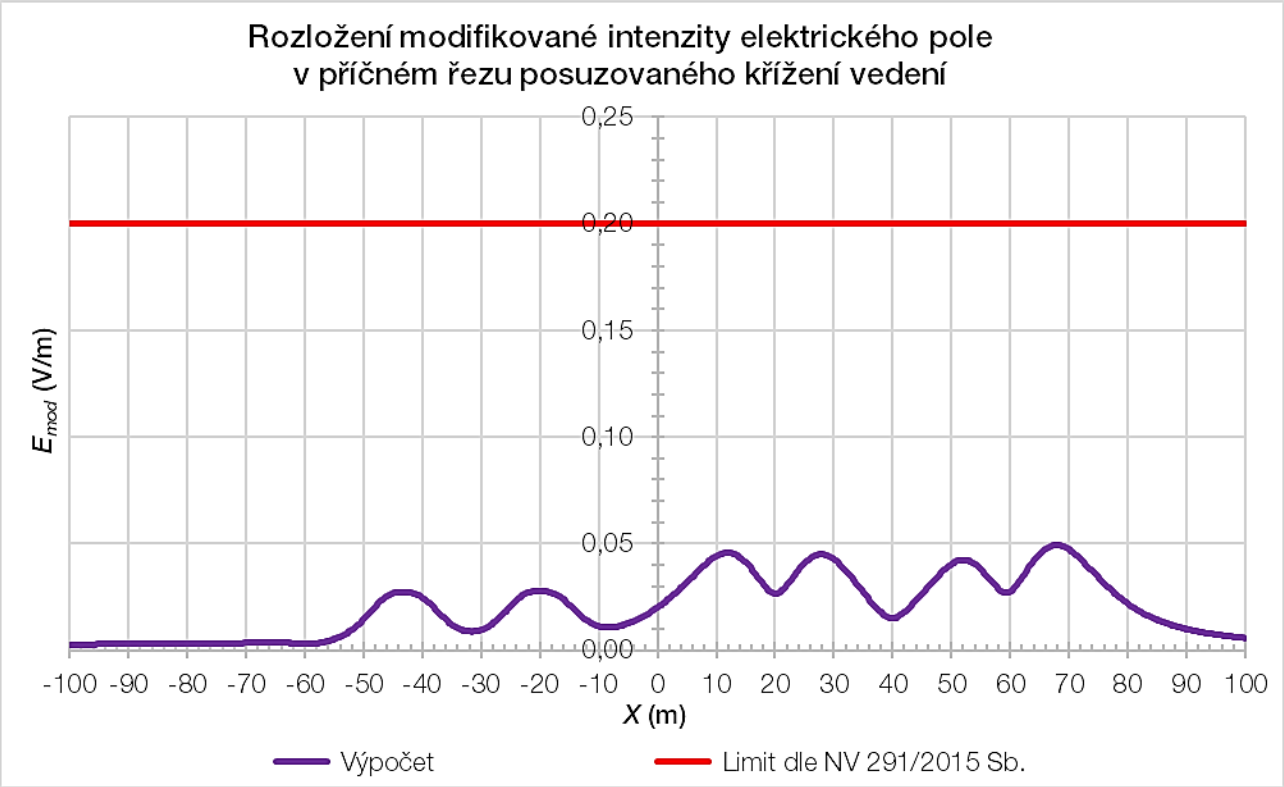
Rozložení intenzity elektrického pole v příčném řezu posuzovaného křížení vedení	Electric field strength distribution in the cross-section of the assessed line crossing
Výpočet	Calculation
Referenční hodnota dle NV 291/2015 Sb.	Reference level under GD 291/2015 Coll.

Fig. 15 Electric field strength at a height of 1.8 m above ground as a function of distance from the axis of the assessed crossing cross-section



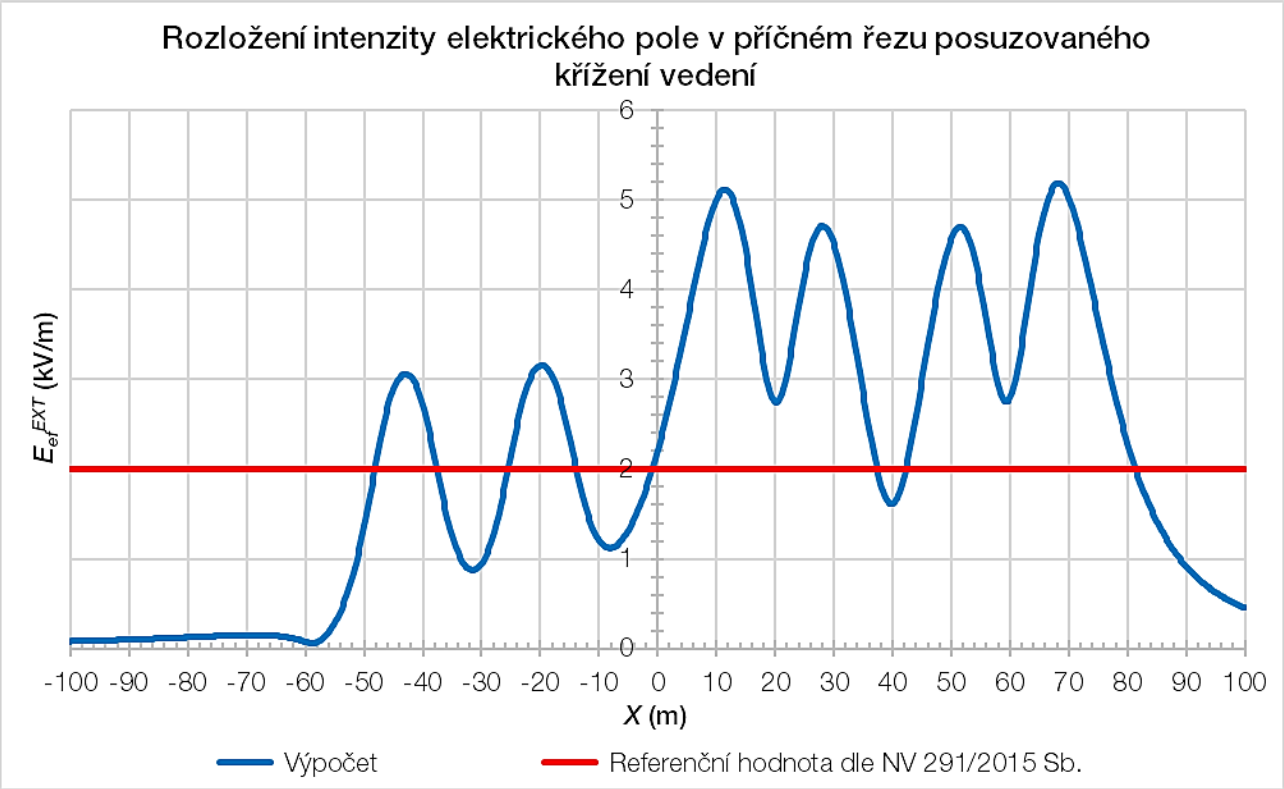
Rozložení magnetické indukce v příčném řezu posuzovaného křížení vedení	Magnetic flux density distribution in the cross-section of the assessed line crossing
Výpočet	Calculation
Referenční hodnota dle NV 291/2015 Sb.	Reference level under GD 291/2015 Coll.

Fig. 16 Magnetic flux density at a height of 1.8 m above ground as a function of distance from the axis of the assessed crossing cross-section



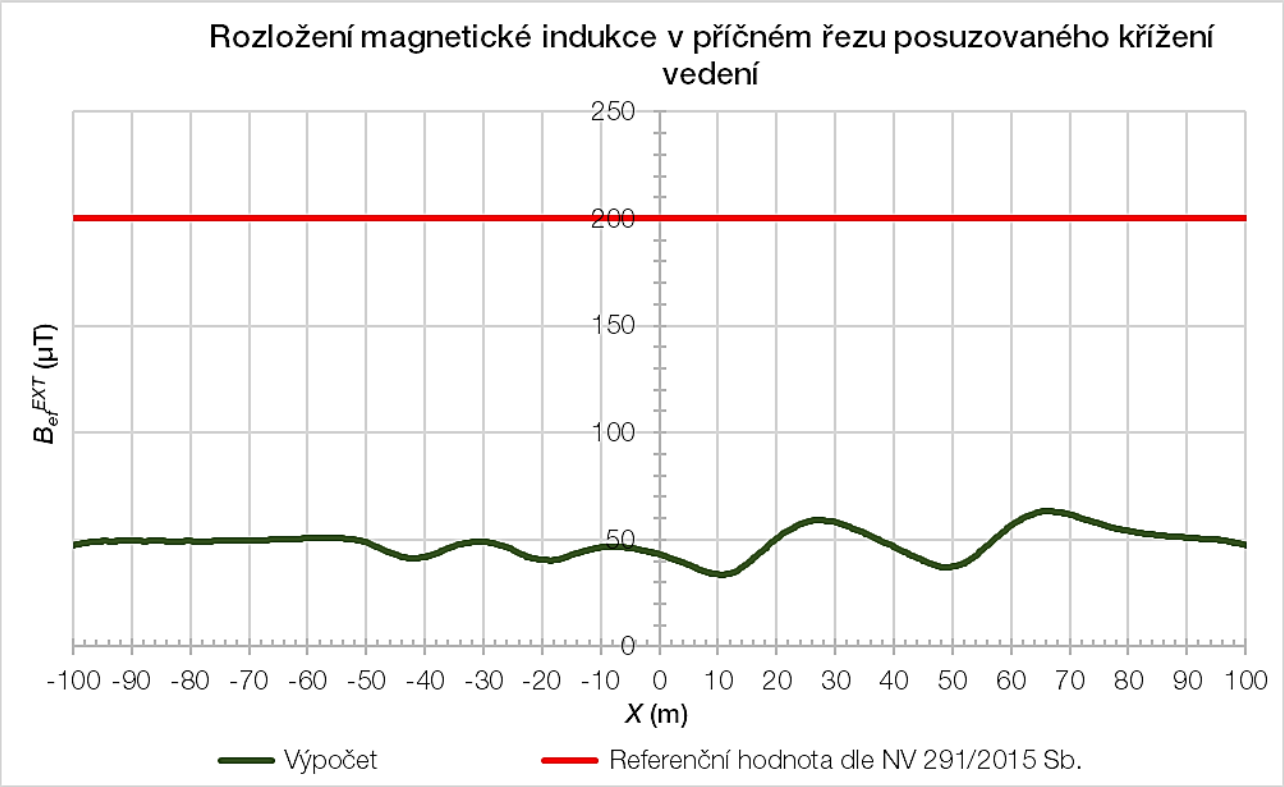
Rozložení modifikované intenzity elektrického pole v příčném řezu posuzovaného křížení vedení	Modified electric field strength distribution in the cross-section of the assessed line crossing
Výpočet	Calculation
Limit dle NV 291/2015 Sb.	Limit under GD 291/2015 Coll.

Fig. 17 Modified electric field strength at a height of 1.8 m above ground as a function of distance from the axis of the assessed crossing cross-section



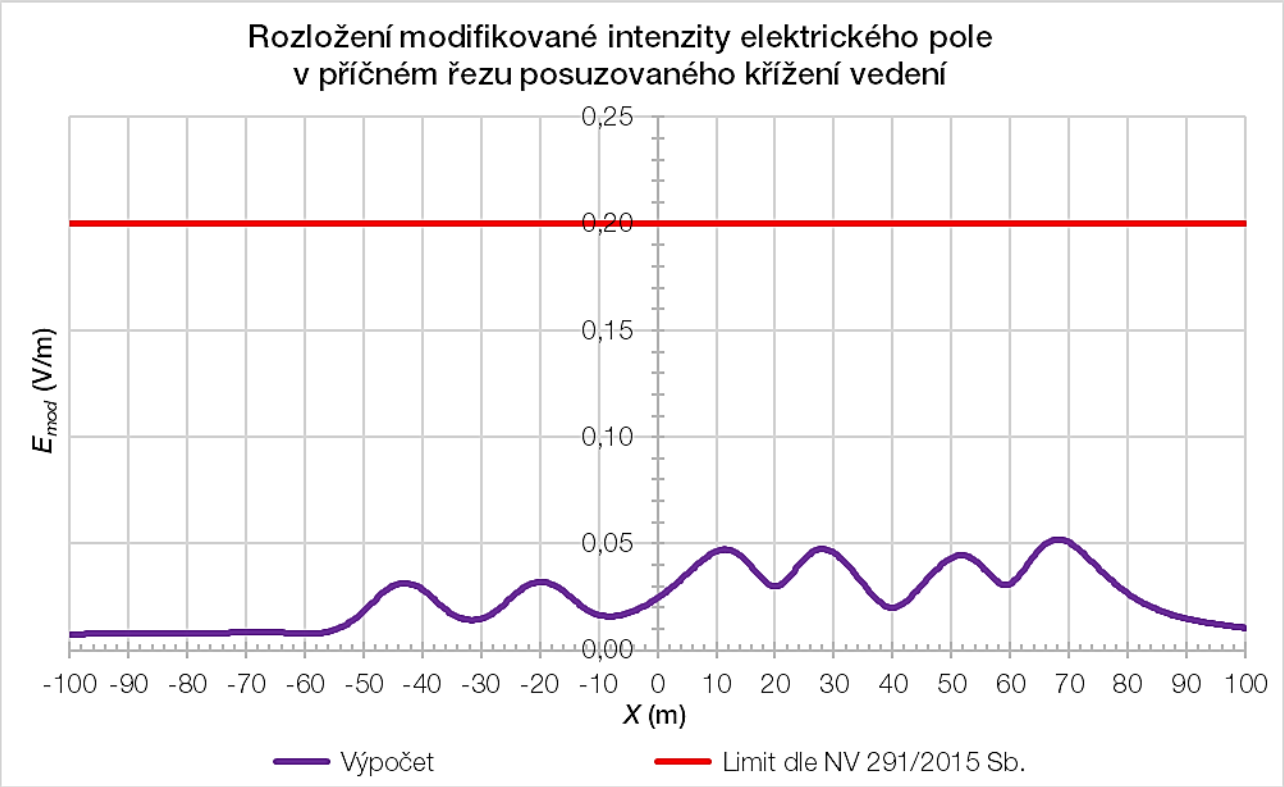
Rozložení intenzity elektrického pole v příčném řezu posuzovaného křížení vedení	Electric field strength distribution in the cross-section of the assessed line crossing
Výpočet	Calculation
Referenční hodnota dle NV 291/2015 Sb.	Reference level under GD 291/2015 Coll.

Fig. 18 Electric field strength at a height of 0.1 m above ground as a function of distance from the axis of the assessed crossing cross-section



Rozložení magnetické indukce v příčném řezu posuzovaného křížení vedení	Magnetic flux density distribution in the cross-section of the assessed line crossing
Výpočet	Calculation
Referenční hodnota dle NV 291/2015 Sb.	Reference level under GD 291/2015 Coll.

Fig. 19 Magnetic flux density at a height of 0.1 m above ground as a function of distance from the axis of the assessed crossing cross-section



Rozložení modifikované intenzity elektrického pole v příčném řezu posuzovaného křížení vedení	Modified electric field strength distribution in the cross-section of the assessed line crossing
Výpočet	Calculation
Limit dle NV 291/2015 Sb.	Limit under GD 291/2015 Coll.

Fig. 20 Modified electric field strength at a height of 0.1 m above ground as a function of distance from the axis of the assessed crossing cross-section

– end of report –

Regional Authority
South Bohemian Region

KUCBX01NJ8RE

Department of the Environment, Agriculture and Forestry
Landscape Ecology, Water Management and NATURA 2000 Unit

Our Ref. No.:	KUJCK 102296/2026
File No.:	OZZL 97467/2026/kaje SO
Contact person:	Ing. Kateřina Jemelíková
Telephone:	386720804
Email:	jemelikova@kraj-jihocesky.cz
Date:	August 14, 2026

ČEZ, a.s.
Duhová 1444/2

140 53 Praha 4

Opinion of the nature conservation authority on the "**New SMR Power Plant at the Temelín site - update**" project

The South Bohemian Regional Authority, Department of the Environment, Agriculture and Forestry (hereinafter the "Regional Authority"), as the competent administrative authority pursuant to Section 67(1)(g) of Act No. 129/2000 Coll., on Regions (Establishment of Regions), as amended, and pursuant to Section 77a(4)(o) of Act No. 114/1992 Coll., on Nature and Landscape Protection, as amended (hereinafter the "Act"), having assessed the **"New SMR Power Plant at the Temelín site – update"** project in response to the application received on July 31, 2026, submitted by ČEZ, a.s., Duhová 1444/2, 140 53 Praha 4, Company ID 45274649, represented by Ing. Silvana Jirotková, Director of the SMR Development Strategy Department (hereinafter the "applicant"), hereby issues the following opinion pursuant to Section 45i(1) of the Act:

The above project **cannot, either alone or in combination with other projects or plans, have a significant effect** on the qualifying features or integrity of any Sites of Community Importance or Special Protection Areas within the jurisdiction of the South Bohemian Regional Authority.

Justification:
The project comprises the construction and operation of a new SMR NPP at the Temelín site, consisting of one generating unit together with the associated structures and technology systems used to generate and evacuate electricity and to ensure the safe operation of the nuclear facility. The project is located south of the existing Temelín NPP.

A "Natura 2000 Screening Report" prepared by Mgr. Vladimír Melichar in June 2026 was submitted for the project. The document was prepared as a specialist supporting document for the EIA Documentation and is based on current project design documents, the project notification, site plans, expert documentation concerning Natura 2000 sites, field surveys conducted in 2024–2026, and data from the Nature Conservation Species Occurrence Database.

On October 29, 2024, the Regional Authority had already issued Opinion Ref. No. KUJCK 126556/2024 pursuant to Section 45i(1) of the Act for the "New SMR Power Plant at the Temelín site" project, ruling out any significant effect of the project, either alone or in combination with other projects or plans, on the favorable conservation status of the qualifying features or the integrity of Sites of Community Importance and Special Protection Areas within the Regional Authority's jurisdiction.

The project has now been updated, and new documentation has been submitted to the Regional Authority in order to reflect the project's current design and examine its potential effects on Natura 2000 sites. Compared with the documentation on which the Regional Authority's 2024 opinion was based, the technical design and parameters of the project and its associated structures and infrastructure have in particular been updated and specified in greater detail.

Compared with the previous documentation, the anticipated long-term concurrent operation of SMR ETE with the existing Units 1 and 2 of Temelín NPP and the planned New NPP ETE has also been specified in greater detail. The implementation option assumes the concurrent operation of the 500 MWe SMR ETE, the 2 × 1,700 MWe New NPP ETE, and the existing 2 × 1,086 MWe Units 1 and 2 of Temelín NPP.

The updated documentation also assesses the project's potential indirect and long-range effects in greater detail, particularly in relation to the water regime, wastewater and stormwater discharges, radiological effects, and landscape permeability. In view of the current project design and the results of field surveys, the potential impact on large-mammal habitat in the northern part of the area of interest and the associated potential effect on the Eurasian lynx were also assessed in greater detail.

The potential effect on the greylag goose, a qualifying feature of the Českobudějovické rybníky SPA, was also examined in greater detail because the 2025 field survey confirmed that the species used the construction facility area. In this context, the potential risk of collision with conductors and ground wires in the power evacuation corridor was also assessed.

With respect to the Natura 2000 network, the updated documentation assessed the project's potential direct, indirect, and long-range effects, including potential cumulative effects arising from the project's concurrent operation with other nuclear power plants at the Temelín site.

Based on the available documentation, the assessment examined which qualifying features could be affected by the project in the following Sites of Community Importance (hereinafter “SCIs”): SCI CZ0313106 Lužnice and Nežárka, SCI CZ0310020 Velký and Malý Kamýk, SCI CZ0314126 Hlubocké obory, SCI CZ0310019 Zelendárky, SCI CZ0313116 Radomilická mokřina, and SCI CZ0310629 Blana; and Special Protection Areas (hereinafter “SPAs”): SPA CZ0311037 Českobudějovické rybníky and SPA CZ0311036 Hlubocké obory. The assessment also covered the habitat of specially protected large-mammal species relevant to SCI CZ0314124 Blanský les, SCI CZ0314123 Boletice, and SCI CZ0314024 Šumava. Particular consideration was given to the nature of the project; all its effects, inputs, and outputs; and, in particular, the presence of qualifying features at the project site and any potential impact on migration potential.

Lužnice and Nežárka SCI

The SCI is approximately 4 km from the northern boundary of the project site. A project output relevant to aquatic ecosystems is the discharge of wastewater, which will, however, be discharged into the Vltava River rather than the Lužnice or Nežárka River. The hermit beetle (*Osmoderma eremita*) is a saproxylic beetle associated with old, sun-exposed deciduous trees, while the European weatherfish (*Misgurnus fossilis*), thick-shelled river mussel (*Unio crassus*), and Eurasian otter (*Lutra lutra*) are species associated with aquatic habitats. Given the nature of the project, the wastewater-management method, and the distance between the project and the SCI, no effects on the qualifying features of this SCI are expected.

Velký and Malý Kamýk SCI

The SCI is approximately 4.6 km from the northwestern boundary of the project site. Its qualifying feature is natural habitat type 9110, *Luzulo-Fagetum* beech forests. Given the nature and location of the project and its distance from the SCI, no potentially significant effect that could affect this habitat was identified.

Hlubocké obory SCI

The qualifying features of Hlubocké obory SCI comprise insect species of Community interest associated primarily with old wood and deciduous forests, together with green shield-moss (*Dicranum viride*). Given the ecological requirements of these species, the nature of the project, and the distance of approximately 6 km from the project, no potentially significant effect that could affect the qualifying features of this SCI was identified.

Zelendárky SCI

Zelendárky SCI consists of a system of 10 fishponds. Given the nature of the project and the distance of approximately 6.7 km from the project, no potentially significant effect that could affect the aquatic habitats and qualifying features of this SCI was identified.

Radomilická mokřina SCI

The qualifying feature of Radomilická mokřina SCI is the European fire-bellied toad (*Bombina bombina*) and its habitat. Given the nature of the project and the distance of approximately 7.3 km from the project, no potentially significant effect that could affect the qualifying feature of this SCI was identified.

Blana SCI

Blana SCI comprises valuable aquatic and wetland habitats formed in depressions left by clay extraction. Given the nature of the project and the distance of approximately 8.4 km from the project, no potentially significant effect that could affect the qualifying features of this SCI was identified.

Blanský les SCI, Boletice SCI, and Šumava SCI

For these SCIs, the assessment focused primarily on the potential impact on landscape permeability for large mammals. One of the qualifying features of the affected SCIs is the Eurasian lynx (*Lynx lynx*). The project area forms part of this species' range, and habitat of specially protected large-mammal species passes through the northern part of the project area, specifically Area F2.

If this area were used during the construction of SMR ETE, its habitat function could be restricted and landscape permeability for large mammals could be affected. For this reason, the potential effect on the Eurasian lynx was assessed in particular. Given their distance from the project and the nature of the potential effects, effects on the other qualifying features of these SCIs are not expected.

For the Eurasian lynx, the assessment focused primarily on the potential effect of the project on landscape permeability and on any restriction of large-mammal movement resulting from changes in land use and the presence of new construction and operating structures. The updated screening identifies only a minor adverse effect. Given the extent and nature of the anticipated impact, however, no risk of a significant effect on the populations of these species or of significant impairment of the integrity of the affected Natura 2000 sites was identified.

Českobudějovické rybníky SPA

One of the qualifying features of the Českobudějovické rybníky SPA is the greylag goose (*Anser anser*). Greylag geese disperse into the surrounding area to forage, often traveling considerable distances. Use of the project area for grazing and resting was confirmed by the 2025 field survey, when a flock of geese was observed directly in construction facility Area H.

Individual birds may collide with conductors and ground wires in the SMR ETE power evacuation corridor. Although the planned power evacuation route runs alongside an existing line, collisions cannot be ruled out entirely. According to the assessment, however, no regular migration route was identified, and the anticipated increase in collision risk does not constitute a significant effect on the greylag goose population or the integrity of the SPA.

Hlubocké obory SPA

The qualifying features of Hlubocké obory SPA are the populations of the middle spotted woodpecker (*Dendrocopos medius*) and collared flycatcher (*Ficedula albicollis*), together with their habitats.
Given the biology of both species, the nature of the project, and the SPA's distance from the project of approximately 6 km, no potentially significant effect that could affect the qualifying features of this SPA was identified.

In terms of potential effects on the Natura 2000 network, the updated screening therefore identified SCI CZ0314124 Blanský les, SCI CZ0314123 Boletice, and SCI CZ0314024 Šumava as potentially affected, in particular due to the potential impact on landscape permeability for large mammals. For SPA CZ0311037 Českobudějovické rybníky, the greylag goose was identified as a potentially affected qualifying feature. No potentially significant effect of the project was identified for the other sites and qualifying features assessed.

The “New Nuclear Power Plant at the Temelín site” project received a favorable EIA opinion, Ref. Nos. 2561/ENV/13 and 2562/ENV/13, dated January 18, 2013 (hereinafter also the “EIA opinion”). Its validity was extended in 2020 under Ref. No. MZP/2019/10/10492, and an application for a further extension is currently pending.

With respect to the potential for significant effects on Natura 2000 sites, the South Bohemian Regional Authority, Department of the Environment, Agriculture and Forestry, issued Opinions Ref. No. KUJCK 21514/2008 OZZL/2-Tr dated July 10, 2008, and Ref. No. KUJCK 118314/2019 dated September 18, 2019, for the project. Both opinions ruled out any significant effect of the project on the favorable conservation status of the qualifying features or the integrity of Sites of Community Importance and Special Protection Areas.

The Regional Authority subsequently issued Opinion Ref. No. KUJCK 126556/2024 for the project on October 29, 2024, likewise ruling out any significant effect of the project, either alone or in combination with other projects or plans, on the favorable conservation status of the qualifying features or the integrity of Sites of Community Importance and Special Protection Areas within the Regional Authority's jurisdiction. The currently submitted Natura 2000 Screening Report also refers to this opinion.

The currently submitted project follows on from the previously assessed project design, and its update consists primarily of refining the design solution, technical parameters, and associated infrastructure, and updating the expert documentation and site data. The updated screening also examined potential indirect and long-range effects in greater detail and took account of the results of more recent field surveys, particularly in relation to large mammals and the greylag goose.

Even after considering the project's updated parameters, the anticipated concurrent construction and operation of the project with the existing and planned nuclear power plants at the Temelín site, and the results of current field surveys, no effect was identified that could significantly affect the qualifying features or integrity of Natura 2000 sites. Potential effects on the Eurasian lynx and greylag goose were assessed as minor adverse effects; however, given their nature, extent, and intensity, they do not pose a risk of a significant effect on the populations of these species or a significant effect on the integrity of the affected sites. No potentially significant effect was identified for any of the other qualifying features assessed.

Based on the submitted application, the current project design documents, and the submitted Natura 2000 Screening Report, and having regard to the nature and location of the project, the ecological requirements of the qualifying features of the affected sites, and the potential for separate and cumulative effects, the Regional Authority concluded that the “New SMR Power Plant at the Temelín site - update” project cannot, either alone or in combination with other projects or plans, have a significant effect on the qualifying features or integrity of any Sites of Community Importance or Special Protection Areas within the jurisdiction of the South Bohemian Regional Authority.

In view of the above, the nature conservation authority has ruled out any significant effect of the project on the favorable conservation status of the qualifying features or the integrity of Sites of Community Importance and Special Protection Areas within the jurisdiction of the South Bohemian Regional Authority.

Ing. Milan Vlášek
head of unit

Electronic signature: August 14, 2026
Signatory's certificate:
Name: Milan Vlášek
Issued by: PostSignum Qualified CA 4
Valid until: October 29, 2028, 08:58 +01:00

Ministry of the Interior

MVCRX09BVV3M
primary identifier

Prague, August 3, 2026
Ref. No.: MV- 61680-4/OBP-2026
Enclosures:

Mgr. Petr Prokop
Acting director of the Security Policy Department

Dear Director,

In response to your letter dated April 8, 2026, containing questions concerning the protection of the future SMR power plant at the Temelín site (SMR ETE), we are providing our revised opinion. At the same time, we ask that you use only this valid document.

The protection of nuclear sites is based on a multilayered approach combining various counter-drone methods. Specific measures and their deployment are selected in light of the current assessment of the security situation, the nature of the threat, and the requirement to maintain a high level of protection.

SMR ETE will be included in prohibited area LKP2. The prohibited area is an important element in protecting critical infrastructure and restricts the operation of both unmanned and manned aircraft in the immediate vicinity of the nuclear facility. Prohibited area LKP2 is currently designated in the airspace above the Temelín site as a cylindrical area 1,500 m high and with a radius of 2 km, centered between the generating units of Temelín NPP. This measure creates an important preventive layer of protection that enables potential unwanted events to be identified and addressed more rapidly.

The airspace at the Temelín site is also monitored by the Army of the Czech Republic and Air Navigation Services of the Czech Republic. This provides another important layer of situational awareness and helps to detect abnormal activity promptly in the airspace around the protected facility.

A standard component of nuclear-facility protection is a multi-tier system for detecting unmanned aircraft, intended to provide the early detection, tracking, identification, and assessment of potential threats. This system combines multiple independent technologies that together improve detection reliability and minimize false alarms. Its core elements include detection using Remote ID, radio-frequency analysis capable of detecting communications between a drone and its operator, radar systems, and associated camera systems for the precise identification of a detected object.

Radar detection plays a particularly important role in this system, enabling continuous airspace monitoring and providing information on the position, direction of flight, speed, and altitude of tracked objects.

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Radar systems can also detect unmanned aircraft that do not transmit Remote ID data or that use unconventional control methods. Combined with radio-frequency sensors and camera systems, radar provides a comprehensive picture of the airspace situation and enables security forces to assess potential risks promptly. The combination of radar, radio-frequency, and optical equipment also makes it possible to detect a wide range of unmanned aircraft, including standard commercial drones, FPV systems, and other types of unmanned aircraft used in the current security environment.

In addition to protection against unmanned aircraft, nuclear facilities are designed to meet requirements for resistance to defined external threats. Key technology buildings are protected by a multilayer physical-protection system, and their structural design must meet the requirements arising from the design basis threat established by the State Office for Nuclear Safety. These requirements also include resistance to projectiles defined in security regulations, while the specific parameters of these projectiles are classified. Resistance to other specified external threats established by national legislation, international recommendations, and security standards for the protection of nuclear facilities is also required.

In addition to physical guarding by a security service, a response unit of the Police of the Czech Republic will be present at the power plant site 24 hours a day, 7 days a week, to respond immediately to security incidents. This unit is also prepared to cooperate with other state security and armed forces according to the nature of the situation. Operational command of any response is conducted in accordance with the applicable security procedures and the powers of the Police of the Czech Republic.

Yours sincerely

Mgr. Petr Prokop

Dear Ms.

Ing. Silvana Jirotková

Director, SMR Development Department

New Energy Division

ČEZ, a.s.

Electronic signature: August 5, 2026
Signatory's certificate:
Name: Mgr. Petr Prokop
Issued by: NCA SubCA1/RSA 10/2023
Valid until: August 3, 2029, 12:17 +02:00

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SÚRAO | CZECH RADIOACTIVE WASTE REPOSITORY AUTHORITY

RNDr. Lukáš Vondrovic, Ph. D.
director

Prague, June 15, 2026

Dear Director,

Further to your letter dated May 11, 2026, requesting information and an opinion on selected issues concerning radioactive waste (RW) and spent nuclear fuel (SNF) management in connection with the New SMR Power Plant at the Temelín site (SMR ETE), the Czech Radioactive Waste Repository Authority (SÚRAO) provides its opinion on the following topics:

A. Responsibilities of SÚRAO and tasks arising from the Concept of RW and SNF Management in Czechia
B. Availability of capacity for the disposal of RW from nuclear power plant operation, including New NPPs and SMRs
C. SNF management
D. Janoch site
E. Financing RW management

The information provided is based primarily on the currently discussed update to the Concept of Radioactive Waste and Spent Nuclear Fuel Management in Czechia, which the Government of the Czech Republic acknowledged in Resolution No. 249/2025. We expect it to receive final approval this year.

I would also like to thank your company for participating, as a future license holder, in the joint meetings held at the Ministry of Industry and Trade on future SNF and RW management. I believe that sharing information at this stage of preparation will enable an efficient future system to be established for managing radioactive waste from SMRs

Please let me know if anything is unclear or if the opinion requires any further additions.

Yours sincerely

SÚRAO Digitally signed by RNDr. Lukáš Vondrovic Ph.D. Date: 2026.06.15 16:02:24 +02'00'

Lukáš Vondrovic

Enclosure No. 1: SÚRAO Opinion on Selected Topics in the EIA Screening Procedure for the Construction of SMR ETE.

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SÚRAO | CZECH RADIOACTIVE WASTE REPOSITORY AUTHORITY

SÚRAO Opinion on Selected Topics in the EIA Screening Procedure for the Construction of SMR ETE

A. Responsibilities of SÚRAO and tasks arising from the Concept of RW and SNF Management

The Czech Radioactive Waste Repository Authority (hereinafter "SÚRAO") is a state organizational body established under Section 26 of Act No. 18/1997 Coll. (the Atomic Act) to carry out activities associated with radioactive waste disposal. Section 113 of the new Atomic Act, Act No. 263/2016 Coll., specifies the activities performed by SÚRAO. SÚRAO's activities are financed through the state budget from funds held in the nuclear account. SÚRAO's principal activities are the preparation, construction, commissioning, operation, and closure of radioactive waste repositories; monitoring the effects of radioactive waste repositories on their surroundings; and their institutional control after closure. Other activities include administering radioactive waste disposal fees and inspecting the reserves maintained by license holders for the decommissioning of nuclear facilities. SÚRAO operates on the basis of its government-approved Statute and annual, three-year, and long-term plans of activities, and proceeds in accordance with the Concept of Radioactive Waste (RW) and Spent Nuclear Fuel (SNF) Management in Czechia approved by the Government of the Czech Republic.

SÚRAO currently operates and ensures the safe disposal of RW at three repositories:

- Dukovany repository for the disposal of RW from nuclear reactor operation;
- Richard repository for the disposal of RW from the institutional sector (research, industry, and health care); and
- Bratrství repository for the disposal of RW containing naturally occurring radionuclides.

Following the strategic environmental assessment (SEA) process, the Concept of Radioactive Waste (RW) and Spent Nuclear Fuel (SNF) Management in the Czech Republic was approved by Government Resolution No. 597 of August 26, 2019.

A further update to the Concept of RW and SNF Management in Czechia is currently being prepared, primarily to reflect legislative developments, recommendations from international organizations, and the planned expansion of nuclear power in Czechia. The Government of the Czech Republic acknowledged the draft update in Resolution No. 249/2025. The process is now continuing with screening under Act No. 100/2001 Coll., on Environmental Impact Assessment, including the subsequent SEA process.

The updated Concept fully reflects the requirements of Council Directive 2011/70/Euratom and establishes strategic objectives for RW management. Among other obligations, a license holder for RW management is required under Section 111 of Act No. 263/2016 Coll. (the Atomic Act) to prepare a radioactive waste management strategy in accordance with the national Concept.

B. Availability of capacity for the disposal of RW from nuclear power plant operation, including New NPPs and SMRs

Operational waste from nuclear power plants is disposed of at the Dukovany repository, which has been in operation since 1995. The disposal spaces have a total volume of 55,000 m³ (approximately 180,000 drums) in a total of 112 reinforced concrete chambers arranged in two double rows. This is sufficient for the disposal of all low-level waste from the existing Dukovany and Temelín nuclear power plants and one New NPP, including decommissioning RW that meets the repository's waste acceptance criteria (WAC). Based on current nuclear-power development forecasts, the remaining disposal capacity described in the draft update to the Concept of RW and SNF Management in Czechia is sufficient for the repository's continuous filling until approximately 2079 if four New NPP units and six SMR units are built and Dukovany Units 1-4 and Temelín Units 1 and 2 are decommissioned.

In terms of the characteristics of the waste disposed of, the requirements are determined by the repository's applicable WAC. Compliance with the following is particularly important:

- Use of a suitable solidification matrix. Bitumen and inorganic geopolymer matrices are currently used to solidify liquid operational RW, with requirements governing the strength of the RW solidified in this manner and compliance with the criterion for the leachable fraction from such solidified RW.
- Operational RW is normally conditioned in a 200 l steel drum. Alternatively, certain types of waste may be disposed of as solid items without a waste package, provided that the conditions specified in the WAC are met.

Additional conditions are established in an internal SÚRAO document; the version in effect when the waste is conditioned applies.

The anticipated inventory from all New NPPs and SMRs shows that the repository's existing capacity may not be sufficient for the entire service life of all New NPPs and SMRs (Fig. 1). Specific measures will be implemented to address any future shortfall in operational-waste disposal capacity, depending on the waste characteristics. The options considered include:

- expanding the existing capacity of the Dukovany repository by constructing a third double row, for which a land reserve exists at the site;
- preparing a facility that could accommodate larger volumes of very low-level waste from nuclear power plant decommissioning;
- constructing a new repository of a design similar to the Dukovany repository at a new site;
- disposing of operational RW within the planned deep geological repository complex

The updated Concept includes milestones requiring regular assessment of operational RW and the implementation of necessary technical measures, when required, in response to actual developments in nuclear power (see Table 1).

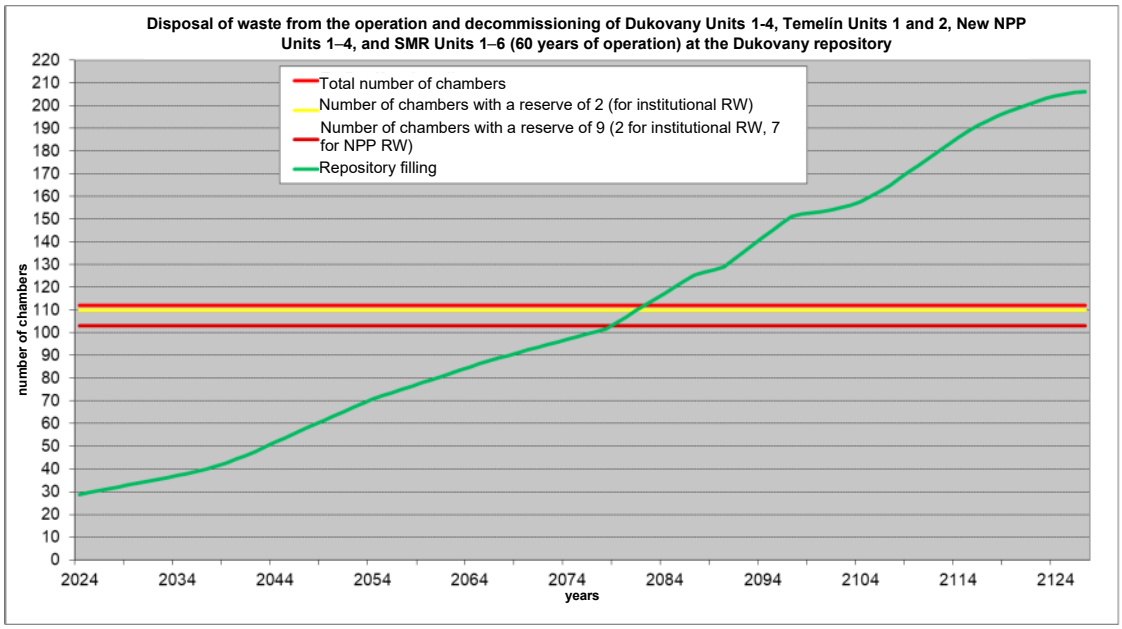


Fig. 1 Estimated Dukovany repository filling schedule

In view of the data you provided on the anticipated parameters of operational waste from SMR ETE, enclosed with your letter of May 11, 2026, the preferred option is the time-limited disposal at the Dukovany repository of operational RW from SMR ETE that meets the WAC applicable at the time of disposal, followed by possible disposal in the deep geological repository. This option is preferred because operational RW from all existing and anticipated nuclear power plants, namely Dukovany Units 1-4, Temelín Units 1 and 2, four New NPP units, and six SMR units, must be disposed of concurrently, and because of the anticipated waste characteristics, taking account of the current WAC for the Dukovany repository. The capacity of the deep geological repository will also be sufficient for operational waste and SNF, and a site with sufficient spare volume capacity is currently being sought. Given the uncertainties in the schedules for all related construction projects, we generally recommend that the RW producer provide sufficient reserve storage capacity at the site where any RW expected not to meet the Dukovany repository WAC will be generated, covering approximately 10 years of production.

Table 1 Selected milestones concerning the disposal of operational RW under the updated Concept of RW and SNF Management

5.1 Continuously monitor and update the inventory of operational RW and SNF	5.1.1 Monitor the rate at which the capacity of the Dukovany repository is being used and, if necessary, address the construction of additional capacity in response to the actual implementation of New NPP and SMR projects (and reflect this in revisions to estimated cost profiles and assumptions).	Continuously (at least once every 5 years) / SÚRAO

	5.1.3 Conduct ongoing consultations with the entities responsible for preparing the Concept concerning new nuclear-facility projects that generate RW and SNF	Ongoing/New NPP and SMR investors
6.1 Plans and technical solutions for the management of low- and intermediate-level radioactive waste	6.1.3 Based on strategic studies, the actual implementation of New NPP and SMR projects, and the rate at which capacity is being filled, decide on the further development of the Dukovany repository.	2036–2040/SÚRAO

C. SNF management

The SNF producer is responsible for managing and storing SNF until it is declared to be waste. Until the deep geological repository is commissioned, it is therefore necessary to ensure its safe long-term storage by the producer or under arrangements secured by the producer.

Once it has been declared waste, responsibility for its final disposal transfers to the state-managed system administered through SÚRAO, and the final solution is disposal in a deep geological repository (DGR). The deep geological repository for radioactive waste in Czechia (Fig. 2) is planned for the safe and permanent disposal of all types of radioactive waste that do not meet the WAC for the existing repositories, including unreprocessed SNF from nuclear reactors and high-level waste. The DGR concept is based on capacity requirements for the disposal of operational waste and SNF from the existing Dukovany and Temelín nuclear power plants, four New NPP units, and up to six SMR units. The draft update to the Concept of RW and SNF Management in Czechia therefore provides for the SNF from New NPPs and SMRs in both the capacity and scheduling arrangements for the DGR. Commissioning of the DGR is expected to begin in 2050.

The permitting processes for DGR construction include several key steps governed by different legislation. The principal legislation comprises Act No. 263/2016 Coll., the Atomic Act; Act No. 283/2021 Coll., the new Building Act; Act No. 44/1988 Coll., the Mining Act; Act No. 100/2001 Coll., on Environmental Impact Assessment; and Act No. 53/2024 Coll., on Proceedings Related to the Deep Geological Repository for Radioactive Waste.

The technical solution for disposing of SNF in the DGR is based on a modified version of the Swedish KBS-3 disposal concept. This approach entails disposing of individual steel disposal packages in vertically oriented boreholes surrounded by engineered barriers such as a bentonite buffer. Other waste is expected to be disposed of in the appropriate packages (e.g., VBK) in a separate section.

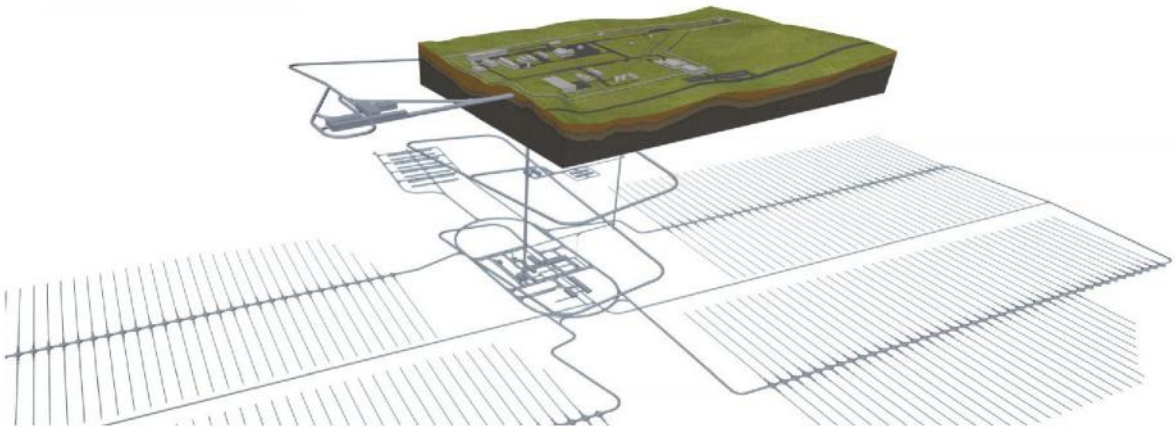


Fig. 2 Diagram of the deep geological repository and its underground and surface facilities

The selection of sites for the DGR in Czechia began in the 1990s, when the Czech Geological Institute, under the direction of the Ministry of the Environment, prepared the first assessment of geological conditions. A 1991 study identified 32 potential areas in the Bohemian Massif, subsequently reduced to 27 geological bodies. Further research in 1993 and 1998 refined the options for site selection, and critical literature reviews identified 13 sites. From the early 1990s until SÚRAO was established, DGR development was coordinated by ÚJV Řež, a. s. After

SÚRAO was established, 11 sites suitable for the DGR were analyzed. A detailed assessment of six selected sites was performed in 2003–2005, resulting in recommendations for further research. Three additional sites, including Janoch, were gradually added to the list between 2011 and 2017. Extensive geological research and exploration work was therefore conducted at a total of nine sites between 2014 and 2019. Following a multicriteria assessment, the Government selected four sites on this basis:

- Březový potok in the Horažďovice area (Plzeň Region);
- Horka between Velké Meziříčí and Třebíč (Vysočina Region);
- Hrádek in the Jihlava area (Vysočina Region);
- Janoch near the Temelín power plant (South Bohemian Region).

These four sites are currently being investigated through characterization work conducted as part of geological exploration and research. Once this has been completed (expected after 2030), SÚRAO will recommend a final site and a backup site for the DGR in Czechia to the Government of the Czech Republic, as envisaged in Section 4 of Act No. 53/2024 Coll. The DGR will be constructed at the final site after 2030.

The anticipated timetable for the preparation, construction, and operation of the DGR according to the draft Concept of RW and SNF Management in Czechia is provided in Table 2.

Table 2: Anticipated timetable for the preparation and operation of the deep geological repository (Concept, 2025)

Milestones	Date
Selection of the final and backup sites	2028–2030
Commencement of the procedure to designate a protected area for special intervention into the Earth's crust	2031
Commencement of the environmental impact assessment process for the project	2031
Siting of the nuclear facility under the Atomic Act	2032
Commencement of the construction of the characterization facility (site investigation using mining methods)	2031–2036
Proceedings for the issuance of a framework permit	2033–2035
Permit to construct a nuclear facility (under the Atomic Act)	2037
Project permit and DGR construction (including the first disposal section)	2040–2050
Permit to commission the nuclear facility (under the Atomic Act)	2046
Permit to conduct activities related to nuclear facility operation	2046
DGR commissioning	2050
Anticipated end of DGR operation	2167

D. Janoch site

The Janoch site is one of four sites currently undergoing further investigation during preparations for the deep geological repository, with a view to the potential future selection of a final site and a backup site. The inclusion of the Janoch site among the four sites undergoing further investigation does not in itself prejudge a decision to locate the deep geological repository at this site.

Its area is defined by the designated investigation area for special intervention into the Earth's crust, within which geological exploration is being conducted, among other purposes, to identify a suitable rock mass at a depth of approximately 500 m for the disposal of SNF and RW and to site the DGR surface facility. The underground section within the investigation area is preliminarily expected to cover approximately 3–4 km², with the DGR surface facility covering up to 15 ha. The preliminary location of the rock masses for the DGR is approximately in the area north of Nová Ves. The potential locations for the surface facilities are, as alternatives, near the Coufalka homestead in the first case and the farms at Výšice in the second. The location of the surface facility will be defined more precisely in fall 2026, while prospective rock masses for the underground section of the deep geological repository can be delineated only on the basis of the results of the ongoing geological exploration, which is expected to continue until 2030.

Based on the current delineation of the Janoch investigation area and the polygons considered to date for siting SMR ETE, we do not anticipate any significant spatial conflict between the two projects. This conclusion relates primarily to siting a nuclear facility under Decree No. 378/2016 Coll. However, potential effects must also be assessed under Act No. 100/2001 Coll., on Environmental Impact Assessment. From SÚRAO's perspective, this assessment follows from the applicable timetable set out in the draft updated Concept of RW and SNF Management in Czechia, forms part of the subsequent preparation process, and is planned for 2031. A definitive assessment of the mutual compatibility of the two projects will, however, be possible only once they have been defined in greater technical and spatial detail during subsequent preparation stages.”

We also note that this statement does not constitute a binding statement within the meaning of Section 20(b) of Decree No. 378/2016 Coll., because the land considered for siting SMR ETE is not within the designated Janoch investigation area.

Table 3 Geographic coordinates of the vertices of the Janoch investigation area in the S-JTSK Křovák coordinate system

Point No.	X	Y
1	-761118	-1144798
2	-754988	-1144428
3	-756592	-1149256
4	-761361	-1148200

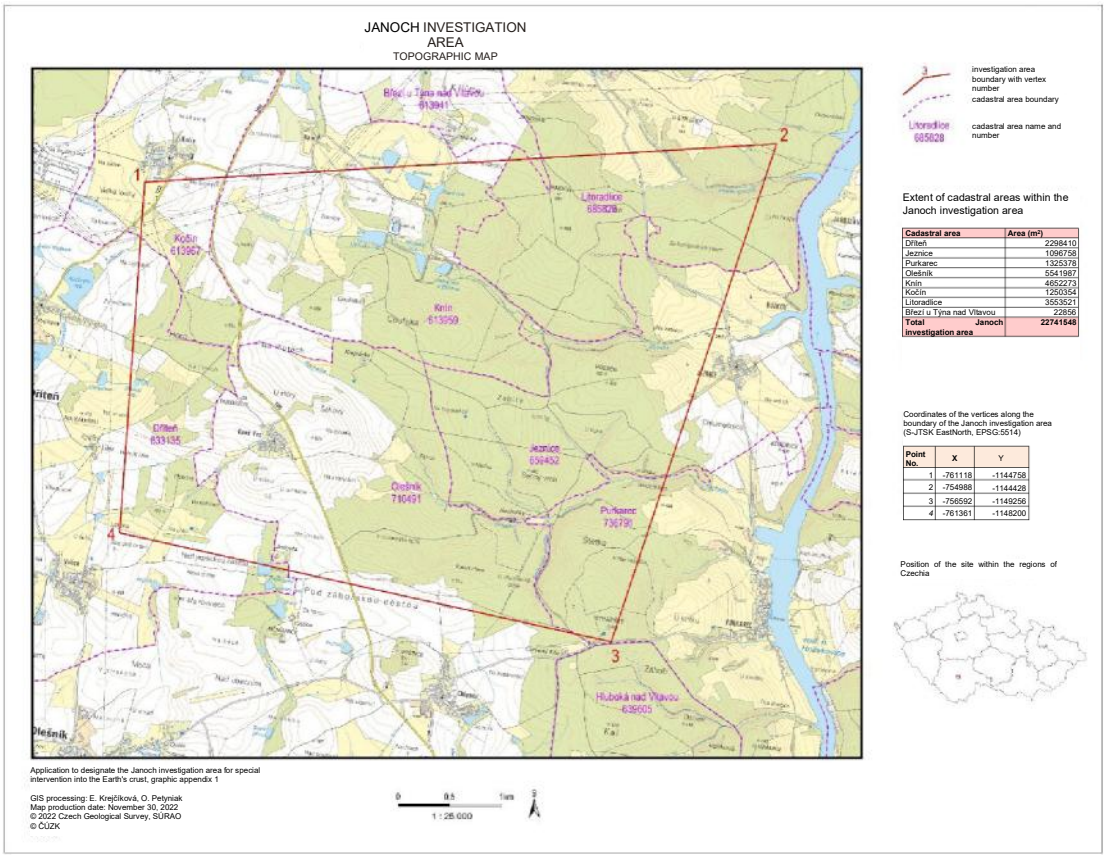


Fig. 3 Map showing the investigation area for special intervention into the Earth's crust at the Janoch site

E. Financing RW management

Under the Atomic Act, the producer bears all costs associated with RW management, meaning costs incurred from the time the waste is generated until its disposal, including the costs of monitoring repositories after closure, as well as the costs of necessary research and development. The producer performs pre-disposal RW management activities itself or engages specialist authorized organizations. In both cases, the producer bears these costs in full. SÚRAO provides for RW disposal and for any conditioning and disposal of SNF after it is declared to be RW. Payment amounts are specified in Act No. 263/2016 Coll. and in a Government Decree, and the producer pays them to the nuclear account in the form of fees.

The nuclear account was established under the Atomic Act to provide financial coverage for all activities associated with RW disposal and, in the future, with the disposal of SNF after it is declared to be RW. It is held by the Czech National Bank and administered by the Ministry of Finance. Funds accumulated in the nuclear account may be used exclusively through SÚRAO to perform the tasks specified in the Atomic Act and included in SÚRAO's Plan of Activities for the relevant year. The management of financial resources for RW and SNF management and the decommissioning of nuclear facilities is subject to a European Commission recommendation. Funding is obtained from several sources. The principal sources include:

- regular fees from radioactive waste producers, based on the valuation of activities associated with conditioning and disposing of spent nuclear fuel after it is declared to be RW and with disposing of radioactive waste; under Government Decree No. 98/2025 Coll., the rate is set for a five-year period at CZK 88/MWhe and CZK 35/MWht, effective January 1, 2026. For the thermal-energy rate, an amendment to the Atomic Act is expected to cover not only research reactors but also nuclear facilities whose principal purpose will be the production of thermal energy, with a view to the future use of SMR reactors for district heating.
- one-time fees from radioactive waste producers, based on the valuation of activities associated with radioactive waste disposal; under Section 1 of Government Decree No. 35/2017 Coll., the one-time fee in 2017 was CZK 145,000/m³ for radioactive waste in the form of a standard disposal unit meeting the limits and conditions for the repository concerned as approved by the State Office for Nuclear Safety, or CZK 174,000/m³ for other radioactive waste, with these rates increasing by 2% in each subsequent year; under the proposed amendment to this Decree, or the amendment to the Atomic Act adopted in 2025, the one-time fee may be up to CZK 250,000/m³ for radioactive waste in the form of a standard disposal unit meeting the limits and conditions for the repository concerned as approved by the State Office for Nuclear Safety, or CZK 300,000/m³ for other radioactive waste;
- returns from financial-market transactions involving nuclear-account funds under the conditions established by the Atomic Act, conducted by the Ministry of Finance;
- paid SÚRAO activities, grants, and payments received from abroad (IAEA and EU projects).

Nuclear-account funds are managed in accordance with the rules established by the Atomic Act and are released on the basis of SÚRAO's Plan of Activities approved by the Government and the State Budget Act for the relevant year. The amounts and methods of paying the fees are established by the Atomic Act and a Government Decree. SÚRAO administers fees paid into the nuclear account and prepares the supporting documentation used to establish them. The assets in the nuclear account amounted to CZK 46.34 billion at the end of 2025. The total costs of constructing, operating, and closing the deep geological repository and the Dukovany repository amount to CZK 280 billion, assuming an inventory for disposal from Dukovany

Units 1-4, Temelín Units 1 and 2, four New NPP units, and SMRs. These costs are included in the regular fees paid by radioactive waste producers under Government Decree No. 98/2025 Coll.

A substantial portion of payments to the nuclear account is intended to cover the costs of activities that will take place in the future. The methodology for setting fee amounts is based on current price levels and takes into account known cost estimates, risks, and other relevant factors, such as anticipated national economic development, interest rates, inflation, and the New NPP construction scenarios assumed in the State Energy Policy. It complies with the Concept of RW and SNF Management in Czechia and will also be regularly adjusted to reflect potential investors' published plans for the construction of New NPPs and, prospectively, SMRs. The accumulation of funds in the nuclear account is compared with anticipated future expenditure at appropriate intervals of no more than five years. If material deviations are identified, the relevant Government Decree will be amended or an amendment to the relevant provision of the Atomic Act will be initiated.

Prague, June 15, 2026

SÚRAO Digitally signed by RNDr. Lukáš Vondrovic Ph.D. Date: 2026.06.15 16:02:24 +02'00'

RNDr. Lukáš Vondrovic, Ph.D.