

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 (<i>French: Institut de radioprotection et de sûreté nucléaire</i>)
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: <i>Úrad verejného zdravotníctva</i>)
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
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Fig. 1 Location of the base of the SMR ETE ventilation stack in the centre of the nuclear island.

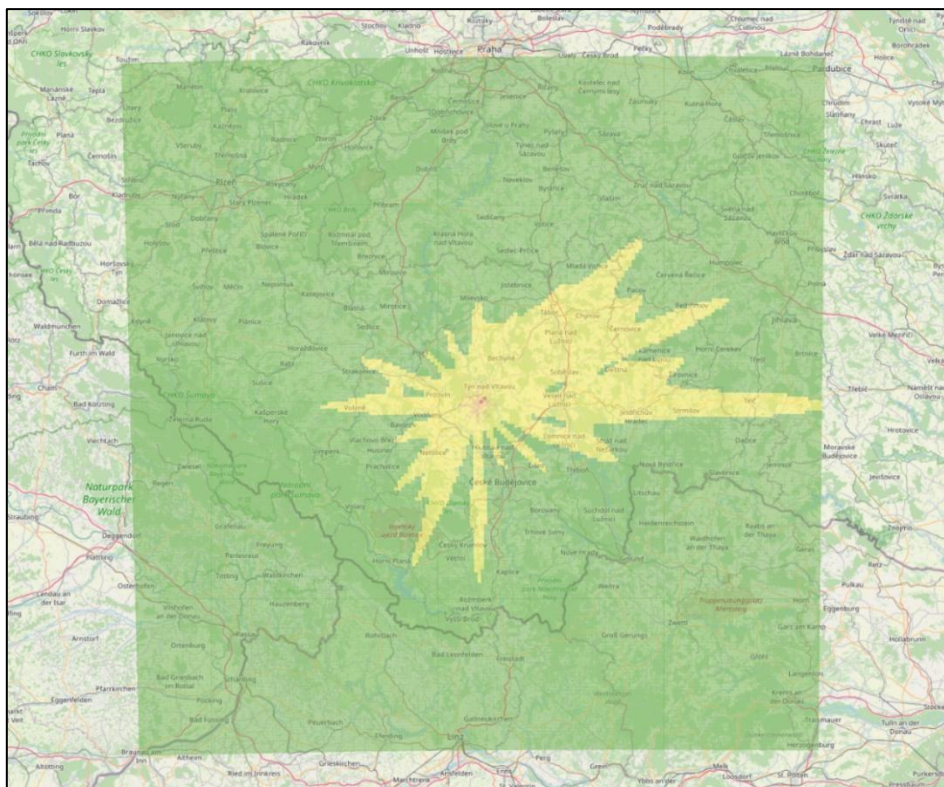


Fig. 2 Schematic arrangement of the calculation grid.

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 $1.0 \text{ m}^3/\text{s}$, 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 $L = 2\text{--}20 \text{ km}$. 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.

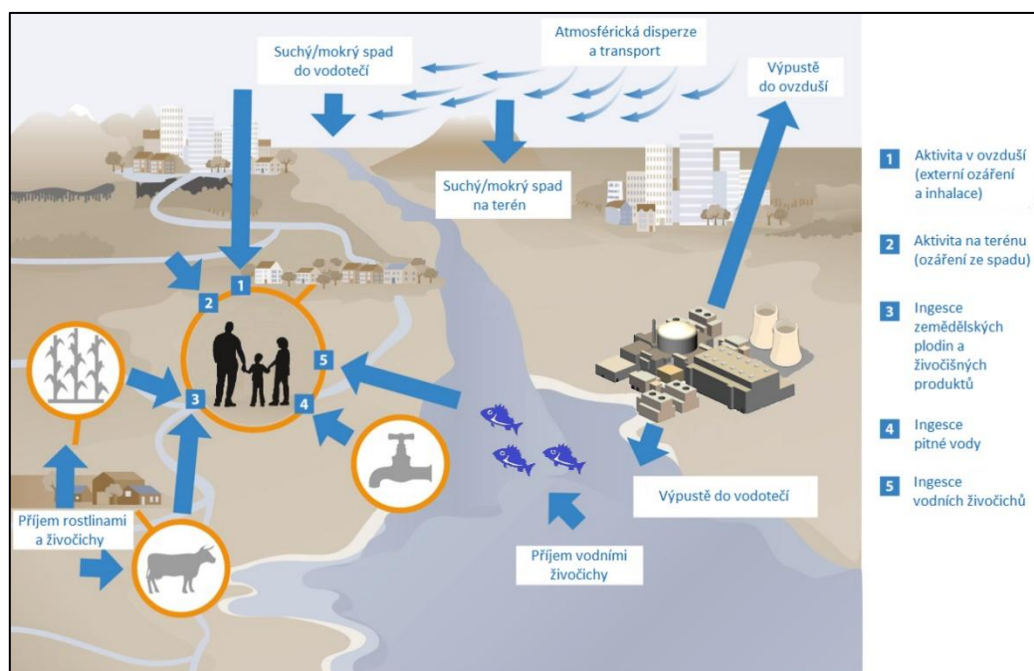
The representative person may therefore be exposed to radionuclides present in the air in their surroundings. Radionuclides in the air may cause a dose from external exposure and internal exposure by inhalation of radionuclides in the inhaled air. This person may also be exposed to radionuclides present 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).

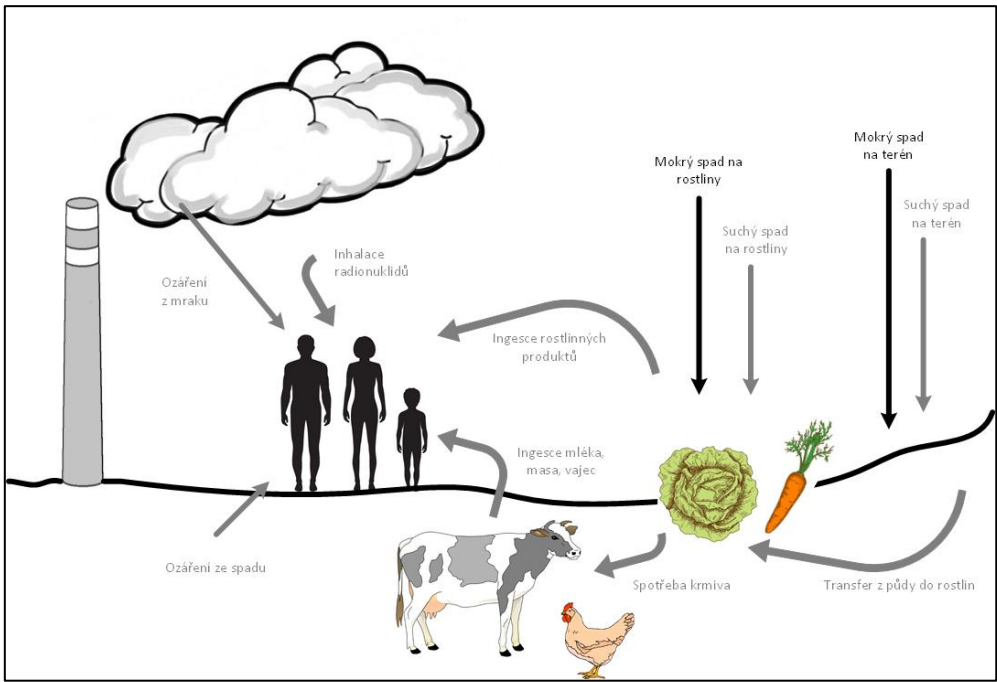
The exposure pathways for humans modelled by the ESTE AI software are shown graphically in the following figure.



	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

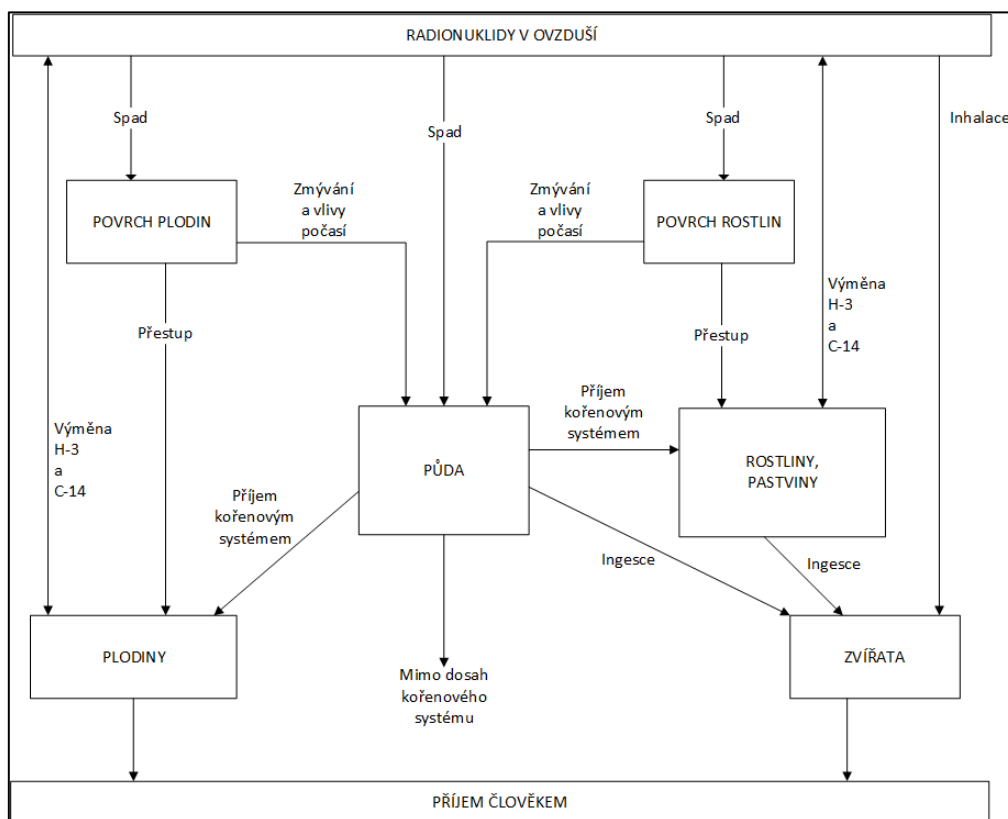
Aktivita v ozduší (externí ozáření a inhalace)	Atmospheric activity (external exposure and inhalation)
Aktivita na terénu (ozáření ze spadu)	Activity on the ground (exposure from deposition)
Ingesce zemědělských plodin a živočišných produktů	Ingestion of agricultural plants and animal products
Ingesce pitné vody	Ingestion of drinking water
Ingesce vodních živočichů	Ingestion of water animals

Fig. 3 Exposure pathways considered by the ESTE AI software [2].



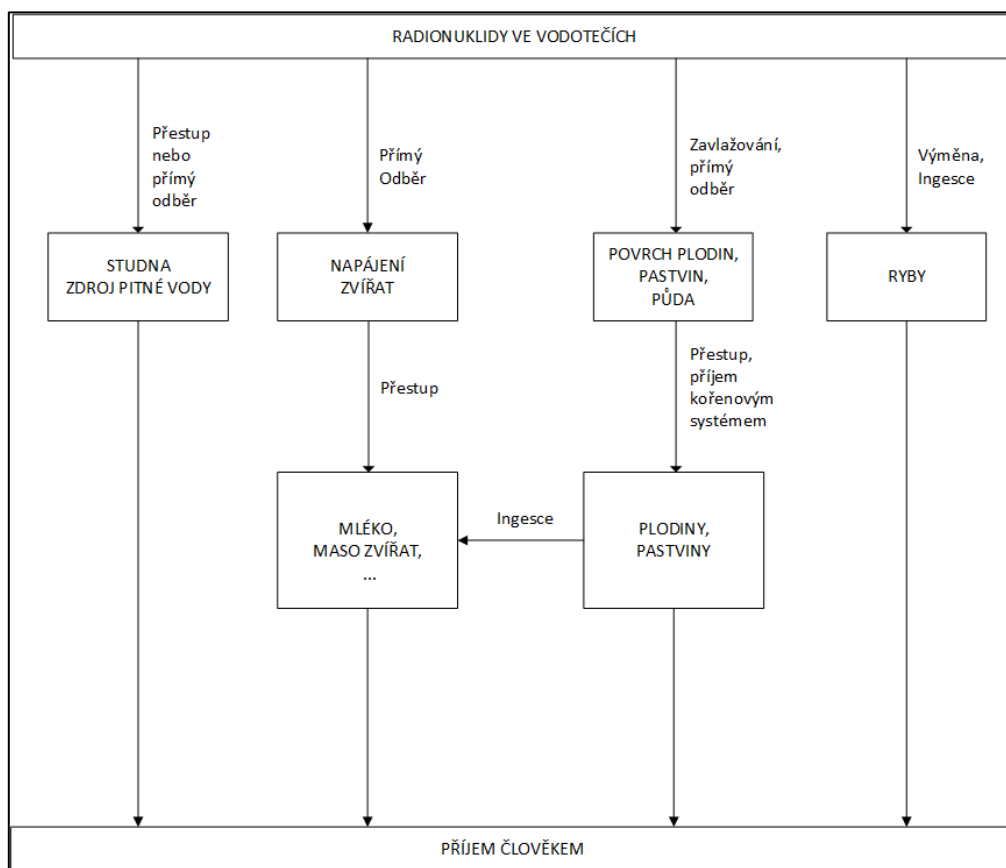
Ozáření z mraku	Exposure from the cloud
Inhalace radionuklidů	Inhalation of radionuclides
Ingesce rostlinných produktů	Ingestion of plant products
Mokrý spad na rostliny	Wet deposition on plants
Suchý spad na rostliny	Dry deposition on plants
Mokrý spad na terén	Wet deposition on the ground
Suchý spad 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
Přijem 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

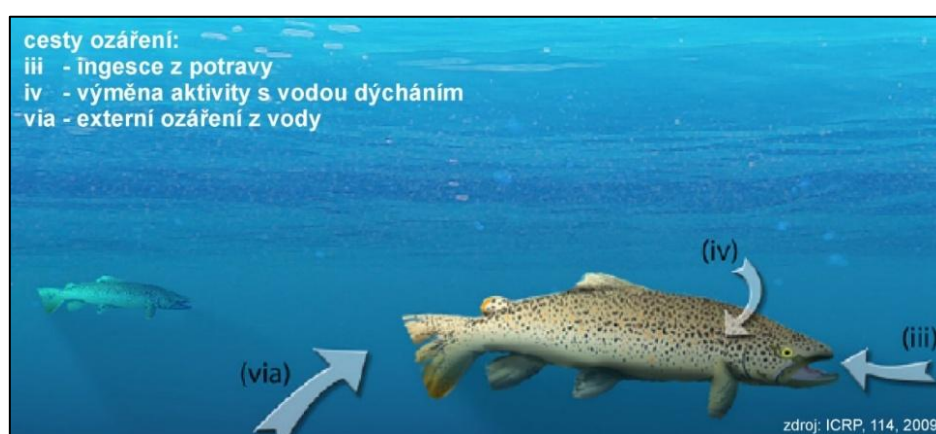
Fig. 6 Schematic representation of the procedure for calculating the individual dose from ingestion due to discharges to watercourses [2].

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.

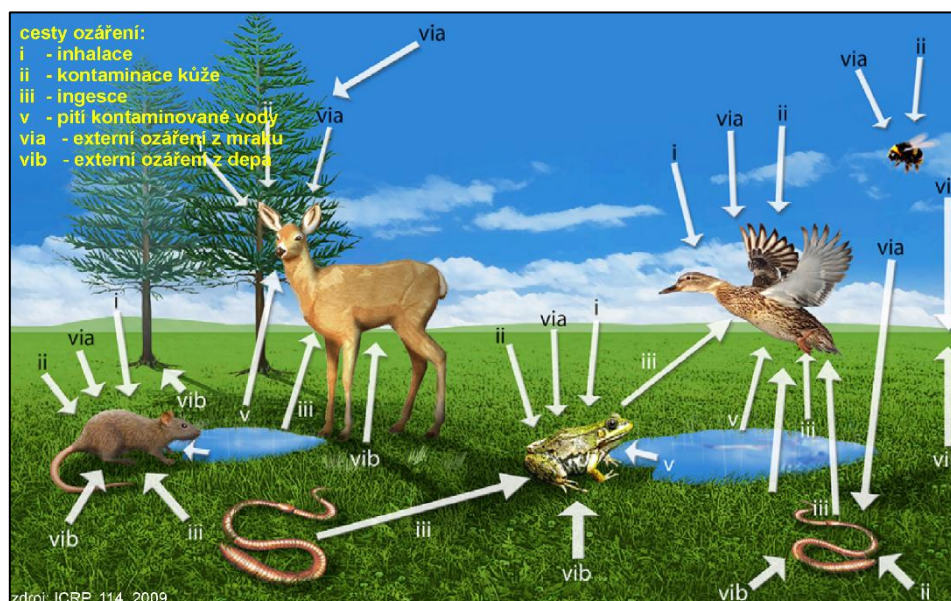
For terrestrial reference animals and plants, external exposure from deposition on the ground and internal exposure are considered, particularly as a result of ingestion of food that is in contact with deposition on the ground, or as a result of inhalation of airborne CO₂ and H₂O (for tritium and C-14). 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.

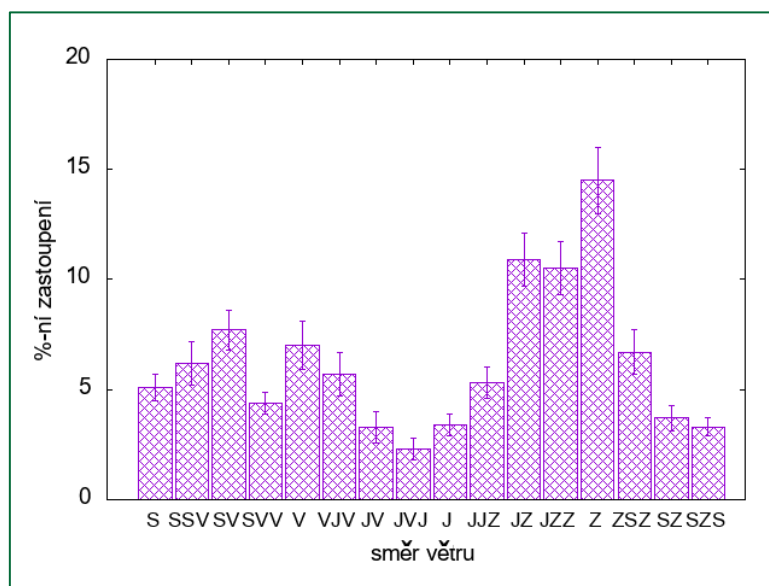
Knowledge of the land cover type is used in the ESTE AI software when calculating the dispersion of radioactive gases and aerosols in the ambient atmosphere and calculating deposition on the ground. Different land cover types are characterised by different values of the “terrain roughness” parameter, 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 $\pm$ 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.

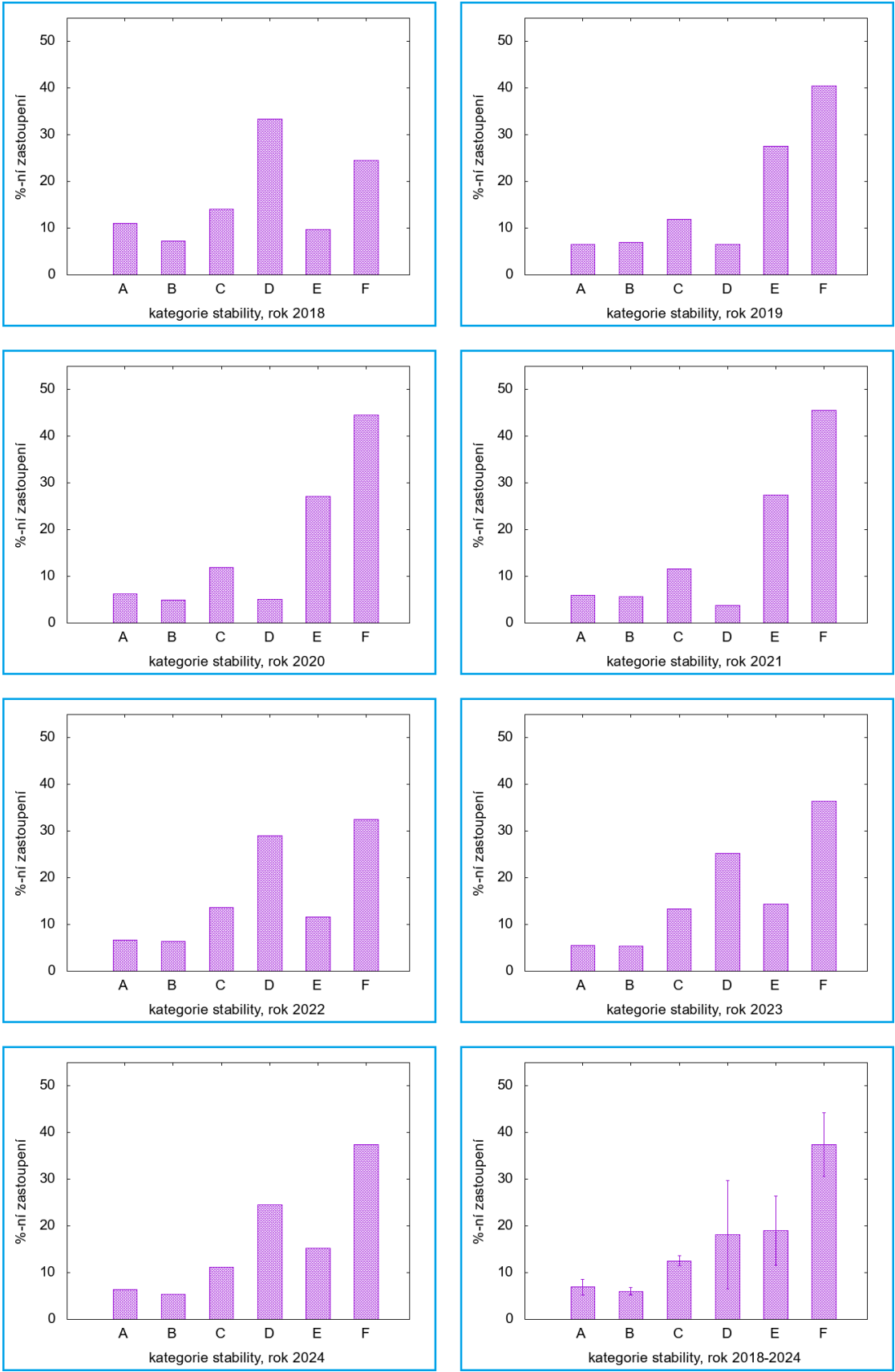
In the analysis of average precipitation and the median, the years 2018, 2021, and 2022 are close to the overall seven-year behaviour.

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 [m ³ /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/yea r]	4	12	4	10	20	10	9	15	9
pork	[kg/yea r]	5	5	3	21	23	15	42	46	28
poultry	[kg/yea r]	9	4	4	35	16	17	30	13	14
Fish	[kg/yea r]	2	2	4	4	5	8	6	8	12
eggs	[kg/yea r]	9	8	10	24	22	25	13	14	15
grain	[kg/yea r]	33	71	31	125	122	116	137	91	104
potatoes	[kg/yea r]	18	13	10	66	47	37	70	49	38
other vegetable	[kg/yea r]	39	95	46	83	162	95	88	121	105
leaf vegetable	[kg/yea r]	7	8	9	16	16	18	16	17	20
fruit	[kg/yea r]	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.

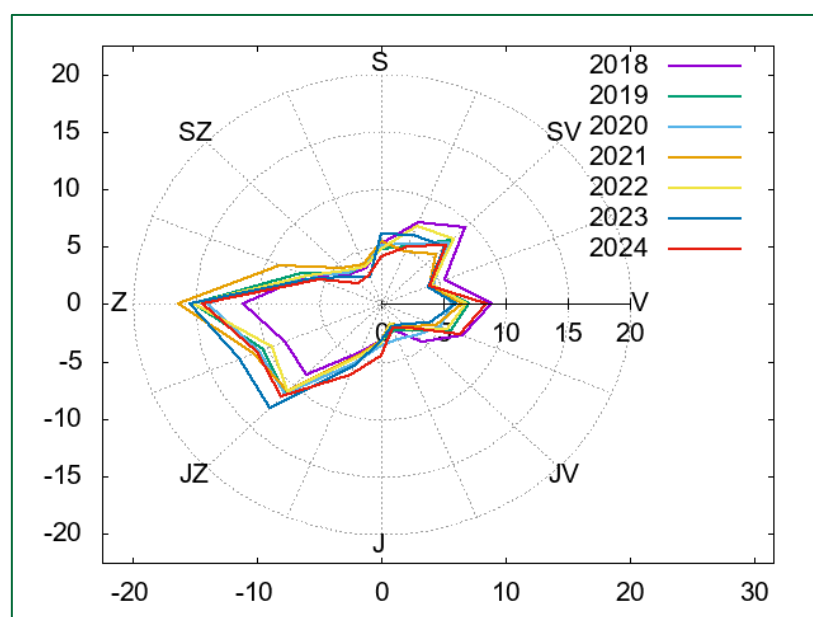


Fig. 11 Wind rose for the period from 2018 to 2024.

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]:

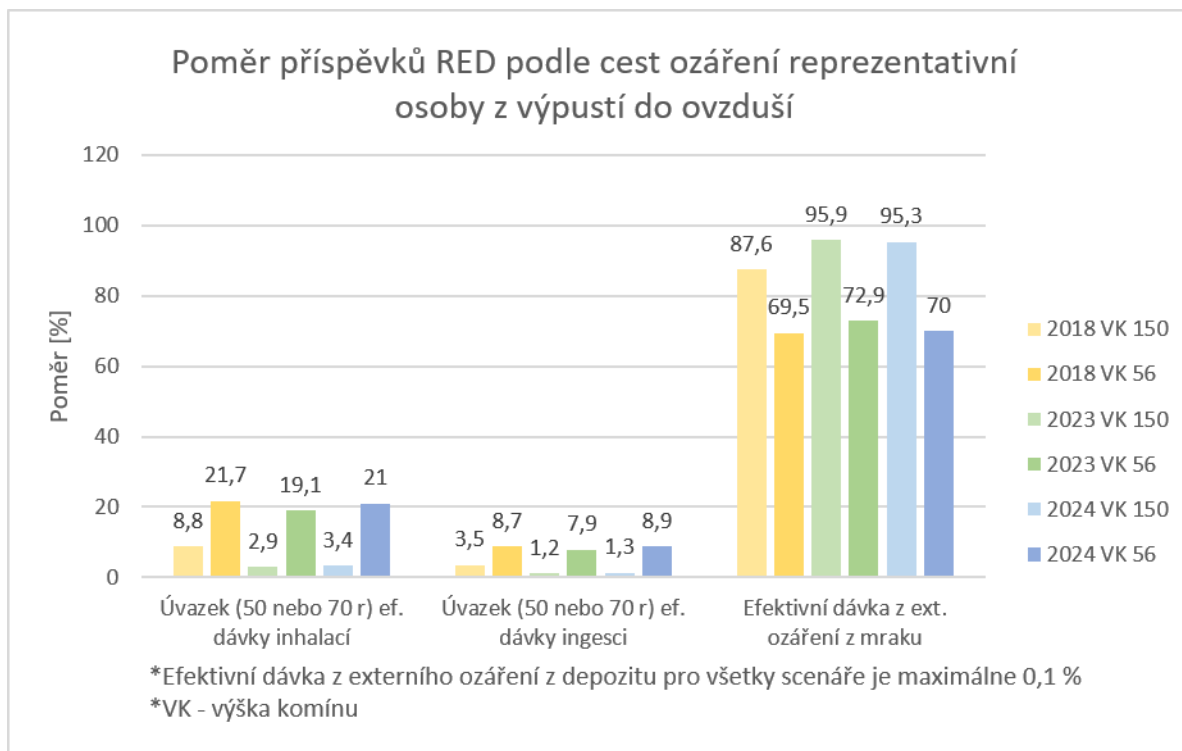
Study [2] identified two age groups of the population as those for which the maximum annual effective dose values from atmospheric discharges apply, namely the 6–15 years and 16+ years age groups. For hydrospheric discharges, the age groups of interest were identified as the foetus and children aged 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 všechny scénáře je maximálně 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

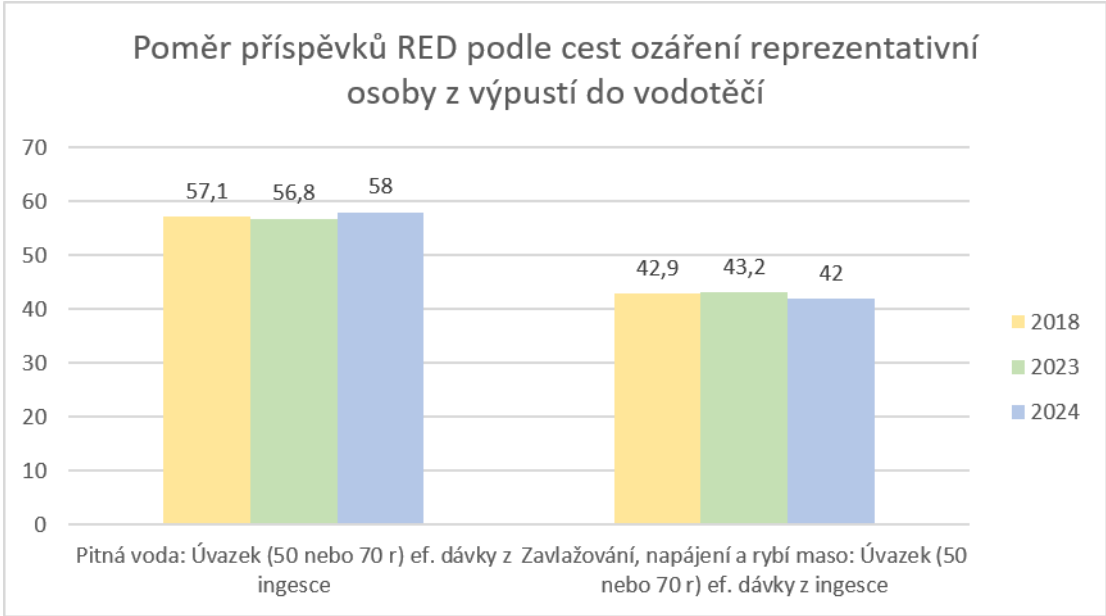
approximately 30%. For both stack heights considered, the effect of exposure from radionuclide deposition is practically negligible.

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 výpustí 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 CO₂ and H₂O (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	Chrástany, Všemslice	3.50E-10
Frog	Chrástany, Všemslice	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, Chrástany, Všemslice	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	Chrástany, Všemslice	1.90E-10
Frog	Chrástany, Všemslice	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, Chrástany, Všemslice	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	Chrástany, Všemslice	1.80E-10
Frog	Chrástany, Všemslice	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, Všemslice	3.10E-10
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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.

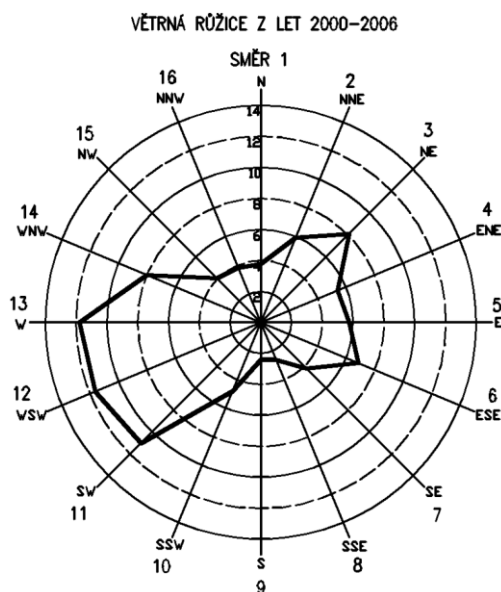
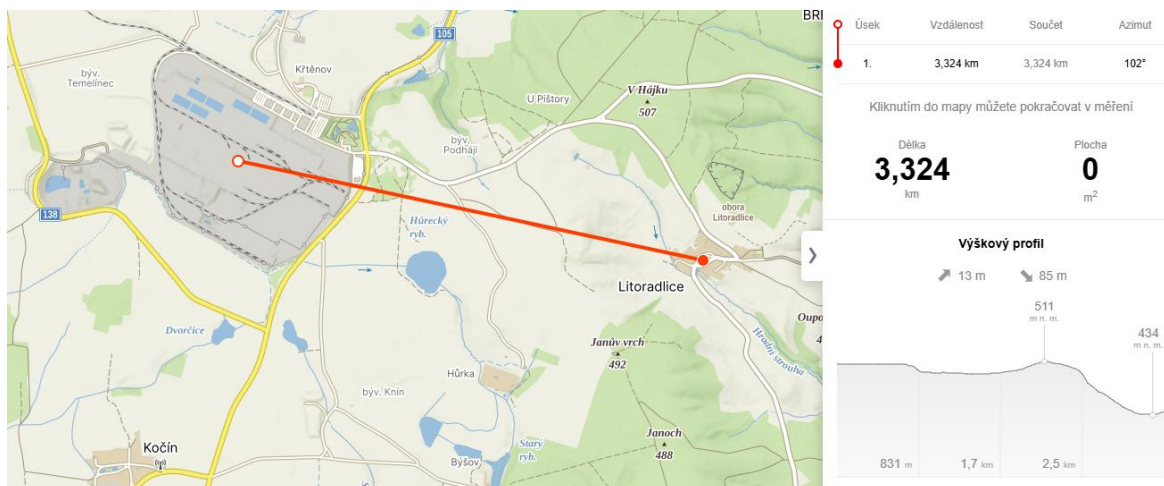


Fig. 14 Wind rose with sectors and cardinal directions marked [10].

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.

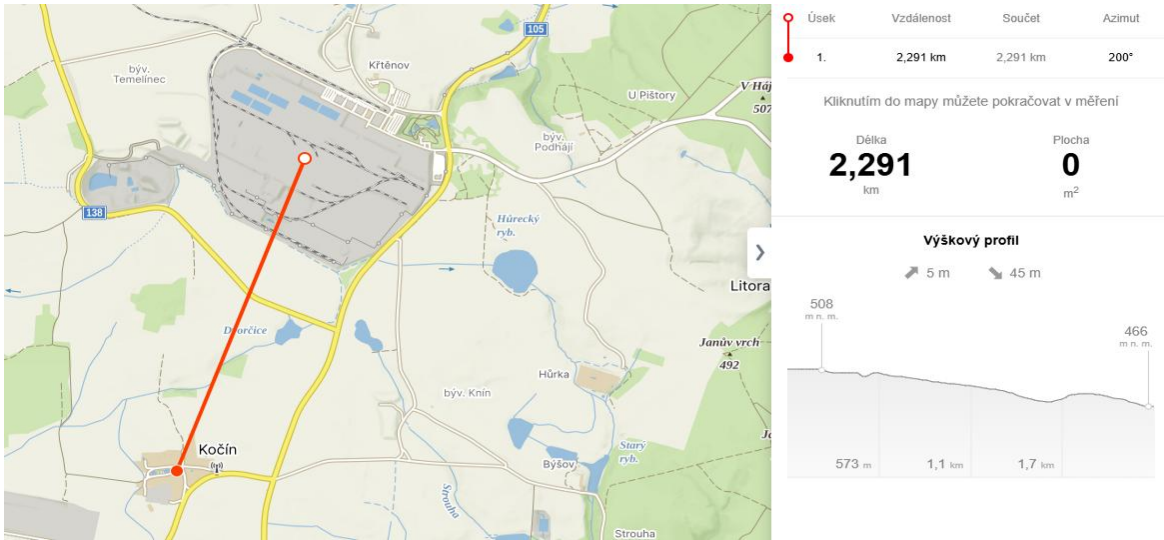
Given the distances of the locations determined in the study of radiological effects of normal operation of SMR ETE [2] from the Kočín, Zvěrkovice, and Litoradlice locations in terms of atmospheric discharges, the distances of interest are 2,333 m and 3,333 m from ETE1,2; see Tab. 17 and Tab. 18.



Úsek	Section
Vzdálenost	Distance
Součet	Total
Azimut	Azimuth

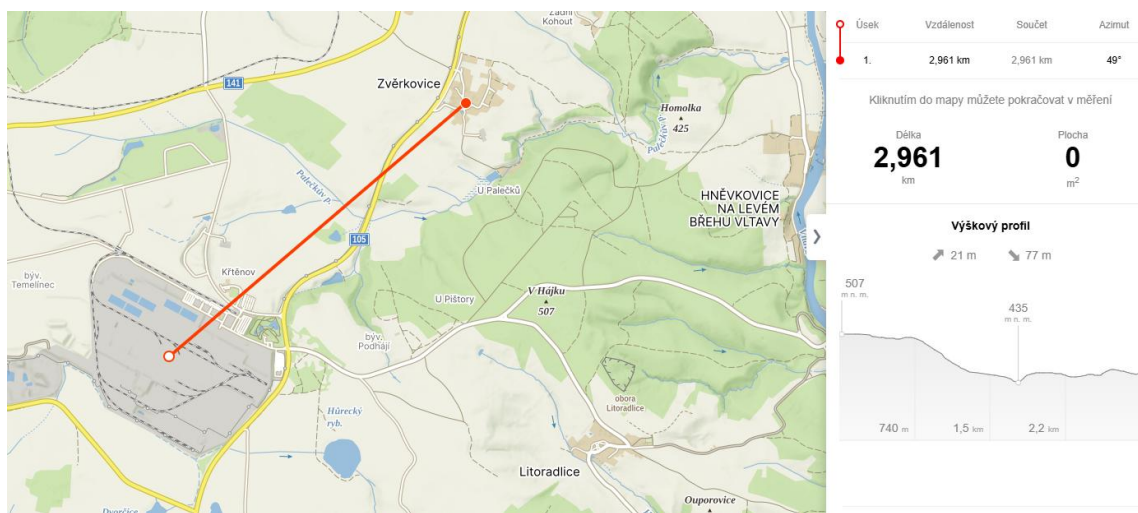
Klepnutím do mapy můžete pokračovat v měření	Tap on the map to continue measuring
Délka	Length
Výškový profil	Elevation profile
Plocha	Area

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 ($2 \times 1,700 \text{ MW}_e$). 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 $1\text{E-}07 \text{ Sv/year}$, 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 discharges².

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 m³/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.

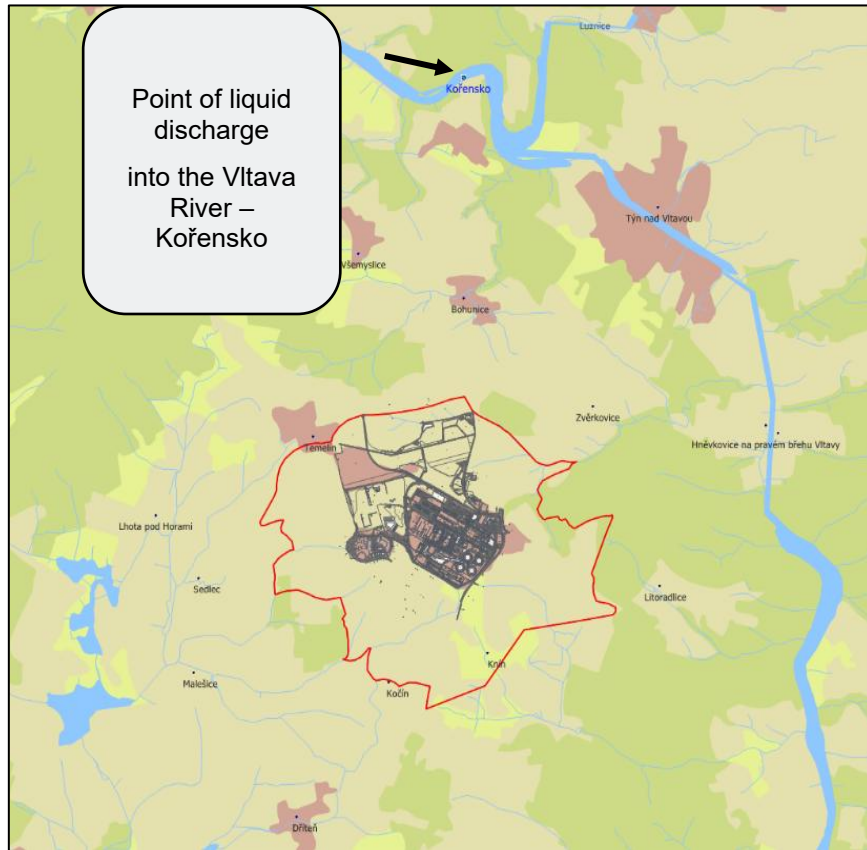


Fig. 18 Discharge of liquid wastewater into the Vltava River.

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 $2 \times 1,700 \text{ MW}_e$ bounding case, whose overall consequences exceed those of the $2 \times 1,200 \text{ MW}_e$ 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
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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 $\mu\text{Sv}/\text{year}$, and the difference in annual individual doses between the large and small ventilation stacks is up to 0.1 $\mu\text{Sv}/\text{year}$.

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 $5.83\text{E-}07$ Sv, which only constitutes a small fraction of the radiation exposure from natural background, which at this location is approximately $5.65\text{E-}03$ 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, $5.83\text{E-}07$ 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	$1.43\text{E-}06$
Scenario 2A, VK 56 m	Kočín, children aged 0–5	$1.47\text{E-}06$
Scenario 3A, VK 150 m	Zvěrkovice, children ages 0–5	$9.87\text{E-}07$
Scenario 4A, VK 56 m	Zvěrkovice, children ages 0–5	$1.05\text{E-}06$
Scenario 5A, VK 150 m	Litoradlice, children ages 0–5	$9.79\text{E-}07$
Scenario 6A, VK 56 m	Zvěrkovice, children ages 0–5	$1.03\text{E-}06$
Exposure scenarios for hydrospheric discharges		
Average-year scenario (2023)	Újezd and Chaty Pašovice, foetus/children aged 0–5 years	$3.89\text{E-}06$

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 **$1.47 \mu\text{Sv/year}$** 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 **$1.43 \mu\text{Sv/year}$** . 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 Schnellenzopf 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 $\mu\text{Sv/year}$, and the difference in annual individual doses between the large and small SMR ETE ventilation stack is up to 0.1 $\mu\text{Sv/year}$.

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 $\mu\text{Sv/year}$** . 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 $\mu\text{Sv/year}$** 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 $\mu\text{Sv/year}$** (SMR ETE VK 150 m) and **1.47 $\mu\text{Sv/year}$** (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 $\mu\text{Sv/year}$** and **2.01 $\mu\text{Sv/year}$** , 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 $\mu\text{Sv/year}$** 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 $\mu\text{Sv}/\text{year}$) and the atmosphere (200 $\mu\text{Sv}/\text{year}$) 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.