Jadrová a vyraďovacia spoločnosť, a.s., Tomášikova 22, 821 02 Bratislava

REPORT

Optimisation of treatment capacities of radioactive waste treatment and conditioning technologies JAVYS, a.s. at Jaslovské Bohunice

in accordance with Act of the National Council of the Slovak Republic No. 24/2006 Coll. on

environmental impact assessment as amended

Revision No.: 0

Date of preparation: 07/2019

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Abbreviations used and certain terms

ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
Al	Aluminium
ALARA	As Low As Reasonable Achievable
As	Arsenic
Ba	Barium
BIDSF	Bohunice International Decommissioning Support Fund
BL	Bituminisation line
BRWTC	Bohunice Radioactive Waste Treatment Centre
Cd	Cadmium
CO	Carbon monoxide
CO_2	Carbon dioxide
Cu	Copper
WWTP	Waste water treatment plant
WW CS	Waste water cleaning station
DBL	Discontinuous bituminisation line
DeNOx	Flue gas denitrification
DL	Decontamination line
EBO	Bohunice Power Plant
EBRD	European Bank for Reconstruction and Development
EMEP	European Monitoring and Evaluation Programme
EMO	Mochovce Power Plant
ESTE AI	Emergency Source Term Evaluation Annual Impacts
EU	European Union
LRW FTF	Liquid RAW Final Treatment Facility
^{3}H	Tritium
HCl	Hydrochloric acid
HEPA	High Efficiency Particulate Arrestance
HF	Hydrofluoric acid
Hg	Mercury
HIA	Health Impact Assessment
HNO_3	Nitric acid
HQ	Hazard quotient

PLA	Protected landscape area
SPA	Special protection area
IED	Individual effective dose
IRAW	Institutional radioactive wastes
IRAWS	Integral radioactive waste storage facility
JAVYS, a.s.	Jadrová vyraďovacia spoločnosť, a.s.
NPP	Nuclear power plant
SE	South-East
NI	Nuclear installation
LRAW	Liquid radioactive wastes
CFP	Corrosion and fission products
L&C	Limits and conditions
LPF	Forest land fund
IAEA	International Atomic Energy Agency
MB WWTP	Mechanical biological waste water treatment plant
mGy	Milligray (radiation dose unit)
MPa	Megapascal
MSK-64	Macroseismic Medvedev–Sponheuer–Karnik 12-degree scale
ISFS	Interim spent fuel storage facility
MH SR	Ministry of Health of the Slovak Republic
MoE SR	Ministry of Environment of the Slovak Republic
N	hazardous waste
Ni	Nickel
HS	Hazardous substances
NO_2	Nitrogen dioxide
NOx	Nitrogen oxides
NOx-Out	Reducing agent for the reduction of nitrogen oxide emissions
NR SR	National Council of the Slovak Republic
O	Other wastes
str.	Structure
OWS	Oil-water separator
OU	District Office
PCDD/DF	Polychlorinated dibenzo-p-dioxins (PCDD) and dibenzofurans (PCDF)
PE	Polyethylene
WMP	Waste management programme

PPF	Agricultural land fund
SRAW	Solid radioactive wastes
PS	Elementary system
RA	Radioactive
RAS, RS	Radioactive substances
RAM	Radioactive material
RAW	Radioactive wastes
RfC	Reference concentration
RMUO	Radioactive material of unknown origin
NRWR	National RAW Repository
RPHA	Regional Public Health Authority
SE a.s.	Slovenské elektrárne a.s.
SE-EBO	SE a.s., Jaslovské Bohunice Nuclear Power Plant
SEZ	Energy equipment mechanic
SHMU	Slovak Hydrometeorological Institute
SEI	Slovak Environmental Inspectorate
SO	Civil structure
SO_2	Sulphur dioxide
SR	Slovak Republic
STN	Slovak technical standard
Sv	Sievert
NW	North-West
TAVOS, a.s.	Trnavská vodárenská spoločnosť, a.s.
Tl	Thallium
TOC	Total Organic Carbon
RAW TCT	Radioactive waste treatment and conditioning technologies
TWT	Thermal water treatment
PM	Particulate matters
NRA SR	Nuclear Regulatory Authority of the Slovak Republic
USES	Territorial system of ecological stability
PHA SR	Public Health Authority of the Slovak Republic
FCC	Fibre-concrete container
FCM	Fibre-concrete mixture
LCDL	Large-capacity decontamination line
VS	Ventilation stack

HV	High voltage
VLLW	Very Low Level Waste
VOC	Volatile Organic Compounds
SC	Supercompaction
HTU	Higher territorial unit
FCC PP	Fibre-concrete container producing plant
VHV	Very high voltage
VZT	Air conditioning
Coll.	Collection of Laws
ZL	Pollutants
Coll.	Collection of Laws
APS	Air pollution source
ENV	Environment

ALTERNATIVE PACKAGING SET – is a packaging set intended for transportation and long-term storage of LLW. The alternative packaging set for LLW represents an alternative to the currently used FCCs. It is cube-shaped with the dimensions 1.7 x 1.7 x 1.7 m with a maximum weight including conditioned RAW of 12.5t and it is developed in order to change and replace the components used in producing FCC while meeting all the legislative requirements for final disposal of low level wastes (LLW).

Ionising radiation - the radiation transmitting energy in the form of particles or electromagnetic waves with a wavelength of up to 100 nm or with a frequency of 3.10^{15} Hz or higher, which is able to create ions, directly or indirectly

Irradiation - exposure to ionising radiation

Natural source of ionising radiation - a source of ionising radiation of natural earth or cosmic origin

Radiation protection - protection of people and of the environment against irradiation and its effects including the means for achieving it

Radioactive contamination - contamination of any material, surface, environment or individual by radioactive substances. For human body, radioactive contamination shall mean external contamination of skin and internal contamination regardless of the way in which radionuclides are received.

Radioactive substance - every substance containing one or more radionuclides whose activity or mass activity or volume activity is not negligible in terms of radiation protection

Radioactive source - a radioactive substance whose activity and mass activity exceed the values of activity and mass activity included in Annex No. 2 to Government Order of the Slovak Republic No. 345/2006 Coll.

RAW treatment - the activity focused on separation of radionuclides from radioactive wastes, on the change of their composition and on the reduction of their volume with the objective to increase safety and economic efficiency of their disposal

Artificial source of ionising radiation - a source of ionising radiation other than natural source of ionising radiation

RAW conditioning – the activity leading to an output in the form of packed radioactive wastes, ready for safe handling, storage, transport and disposal in compliance with requirements.

A. BASIC DATA

I. BASIC DATA ON THE PROPOSER

I.1. NAME

Jadrová a vyraďovacia spoločnosť, a.s.

I.2. ID NUMBER

Comp. ID No.: 35 946 024

I.3 REGISTERED OFFICE

Tomášikova 22
821 02 Bratislava

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II. BASIC DATA ON THE PROPOSED ACTIVITY

II.1. NAME

Optimisation of treatment capacities of radioactive waste treatment and conditioning technologies JAVYS, a.s. at Jaslovské Bohunice.

II.2. PURPOSE

The purpose of the activity under assessment is optimisation - supplementation of treatment capacities of the operation of the set of radioactive waste treatment and conditioning technologies of JAVYS, a.s. situated at Jaslovské Bohunice.

The proposed technologies will be utilised for the treatment and conditioning of low level and very low level RAW produced during A1 NPP decommissioning, which is currently in Stage III and IV of decommissioning, V1 NPP decommissioning (currently in Stage II of decommissioning), RAW from NI operation, operation of NPPs in the SR, institutional RAW from various areas of human activities such as research, medicine, etc. produced out of the operations of nuclear power plants, RMUO, and RAW management within the provided nuclear services for external foreign producers of RAW.

The nuclear installation “RAW Treatment and Conditioning Technologies” consists in particular of the Bohunice RAW Treatment Centre (BRWTC), including equipment for the concentration of liquid radioactive wastes, equipment for solid RAW sorting, incineration plant for solid, liquid RAW and saturated sorbents, equipment for supercompaction of solid RAW and cementation plant for final grouting of treated RAW by cement mixture in fibre-concrete containers or alternative packaging sets. Moreover, the nuclear installation also includes bituminisation lines, active waste water cleaning station, fixed RAW pre-conditioning line, metallic RAW remelting facility, decontamination and fragmentation workplaces, line for the treatment of contaminated cables, and other RAW management equipment, as well as RAW storage facilities and structures.

The subject of the activity under assessment is to optimise the treatment capacities of the NI RAW TCT as a follow up to requirements of individual RAW producers from the SR and requirements resulting from contractual obligations in order to achieve as efficient way of utilisation of treatment and personnel capacities of the NI RAW TCT as possible.

RAW import from external – foreign RAW producers is subject to the fulfilment of legislative requirements resulting from Act No. 541/2004 Coll. on peaceful use of nuclear energy (Atomic Act) and on the amendment to certain acts, i.e. RAW import to the territory of the SR for purpose of treatment or conditioning in the territory of the Slovak Republic is possible only if export of material with aliquot activity is contracted and permitted by the authority.

II.3. USER

Jadrová a vyraďovacia spoločnosť, a.s.
Tomášikova 22
821 02 Bratislava

II.4 CHARACTER OF THE PROPOSED ACTIVITY

The activity includes the supplementation of the already existing assessed activities at the site, which can be categorised in accordance with Annex No. 8 to Act No. 24/2006 Coll. on environmental impact assessment and on the amendment to certain acts as amended as follows:

Chapter 2 Energy industry

Item No. 10 Facilities for treatment, conditioning and deposition of intermediate and low level wastes from operation and decommissioning of nuclear power plants and utilisation of radionuclides

The proposed activity is subject to mandatory assessment without limit. Optimisation of capacities of RAW incineration, solid RAW supercompaction, metallic RAW remelting, relocation and affiliation of already assessed fragmentation and decontamination facilities (project BIDSF C7-A3), line for the treatment of contaminated cables, workplace for material release from institutional control (project BIDSF C10), to the existing unused civil structures at the site within the structure system of the RAW TCT including the supplementation of RAW storage capacities, is proposed for assessment in the form of Variant No.1 and described in detail in the following chapters.

II.5. SITING OF THE PROPOSED ACTIVITY

Region: Trnava
District: Trnava
Municipality: Jaslovské Bohunice
Cadastral territory: Bohunice

Variant 0

Structure No.	*Parcel No.*
32	704/55
34	704/54
46	704/57
41	704/65, 704/68
44/20	704/96
808	704/99
809	704/67
641	701/53
723	701/37
724	701/46, 704/92

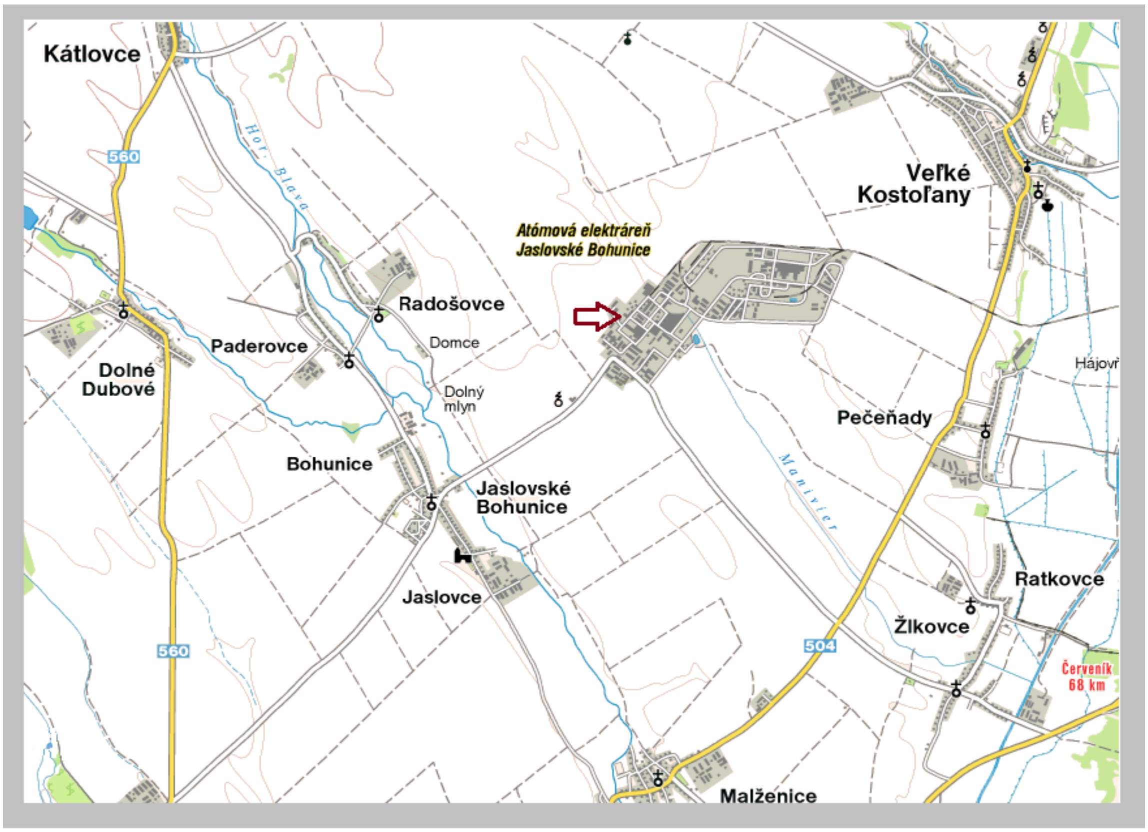
Variant 1

In addition to the structures and rooms mentioned in Variant 0:

Structure No.	*Parcel No.*
Civil structures of the structure system of the RAW TCT	Related parcel numbers
760-II.3,4,5	701/86

II.6. GENERAL LAYOUT OF THE SITING OF THE PROPOSED ACTIVITY

Fig. A.II.6.



Legenda: orientačné označenie umiestnenia činnosti

Legend: informative designation of activity siting (Jaslovské Bohunice NPP)

II.7. THE REASON FOR SITING AT THE PROPOSED SITE

The siting of the NI RAW TCT was related to the existing ready infrastructure of NPPs in operation and the planned scope of NPP decommissioning activities at Bohunice. The nuclear installation RAW TCT was gradually modified during its operation and supplemented with technological systems necessary for the fulfilment of set goals and stages of NPP decommissioning at the site in compliance with the document “Draft national policy and national programme of spent nuclear fuel and radioactive waste management in the SR as an update of the strategic document Strategy of Back End of Peaceful Use of Nuclear Energy in the SR“. The civil structures containing equipment for RAW treatment and conditioning are situated in the bounded area of JAVYS, a.s. All the mentioned parcels owned by the Proposer are registered as built-up areas and courtyards, out of the built-up territory of the municipality.

With respect to the already completed technologies of treatment, storage, and the transport and communication structure of the NI RAW TCT, the siting of the proposed activity “Optimisation of NI RAW TCT treatment capacities“ represents the most suitable solution.

II.8. DATE OF BEGINNING AND COMPLETION OF CONSTRUCTION AND OPERATION OF THE PROPOSED ACTIVITY

Expected date of construction commencement: 12/2019
Expected date of construction completion: 12/2021
Expected date of operation commencement: 2022
Expected date of operation end: 2050

II.9. DESCRIPTION OF TECHNICAL AND TECHNOLOGICAL SOLUTION

Variant 0

The description of technical and technological solution of Variant 0 represents the following assessed set of operated technologies included in the nuclear installation “Radioactive Waste Treatment and Conditioning Technologies (RAW TCT)“ :

- RAW concentration
- RAW cementation
- RAW sorting
- RAW incineration
- RAW supercompaction
- RAW bituminisation PS 44 and PS100
- Discontinuous bituminisation line (DBL)
- Waste water cleaning station – part in operation (WW CS)
- Workplace of metallic RAW treatment (fragmentation line)
- Treatment of air-conditioning filters
- Large-capacity decontamination line
- Metallic RAW remelting facility at SO34
- Fixed RAW pre-conditioning line at SO44/20

Bohunice RAW Treatment Centre (STR. 808)

The Bohunice Treatment Centre treats RAW, which can be divided into the following categories:

- combustible solid and liquid wastes,
- compactable solid wastes,
- non-combustible and non-compactable wastes,
- concentrates,
- saturated ion-exchange resins (sludge), fixed ion-exchange resins (sludge),
- other contaminated liquids and sludge.

The following treatment facilities serve to treat them:

1. *Liquid radioactive waste concentration plant - evaporator (PS 03)*

The concentration plant concentrates inorganic liquid RAW; after the concentration, RAW is led to the tanks of concentrate and then to the dosing tank of cementation, where they are further treated.

The vapour condensate is used to flush the tubes of the concentration plant or as the filling of scrubbers in the system of cleaning of flue gases from the incineration plant. After having been cleaned at the cleaning station in str.41 or in str. 809, the excessive quantity of vapour condensate is released into the environment.

2. *Cementation plant for the conditioning of concentrates, saturated ion exchangers and sludge (PS 04)*

The facility enables RAW conditioning for final disposal, i.e. grouting of treated RAW by cement mixture in fibre-concrete containers (FCC) or drums.

RAW enters the dosing tank of the cementation line either directly (concentrates) from the concentration plant or through input reservoirs (resins - ion exchangers, sludge). RAW in solid form (compacted material, etc.) is put directly into FCCs or drums, where they are grouted by the cement mixture prepared in the cementation plant (slant mixer). RAW, LRAW with additives and cement according to verified prescriptions are also dosed to the slant mixer. Once the cement product has been properly mixed, it is discharged into the fibre-concrete container. Containers with mature and hard cement are transported to the National Repository in Mochovce.

3. *Sorting plant for solid RAW sorting (PS 05)*

The equipment serves to sort wastes (in sorting boxes) by RAW types and further methods of treatment and conditioning. RAW are sorted to:

- compactable,
- combustible,
- non-compactable and non-combustible.

The workplace also has the possibility of RAW fragmentation, i.e. mechanical division of larger pieces.

4. *Incineration plant of solid and liquid RAW (PS 06)*

The furnace of the incineration plant is designed as a shaft furnace, with RAW dosing in its upper part; there are no internal in-built components in the combustion shaft.

Combustion takes place in two zones. In the lower zone, RAW is incinerated with steam-air mixture, which ensures that temperature in the burning material does not exceed 900 °C, and creation of clinker and sintering on the wall of the furnace is excluded. In the upper zone (above the incinerated material) sufficient quantity of air is supplied (operation with oxygen excess), which ensures incineration temperature up to 1050 °C.

Flue gases from the combustion chamber are exhausted through the after-burning chamber, where they are after-burnt at temperatures ranging from 850 - 1100 °C. A DeNOx system injecting water with the addition of NOx-Out reducing agent is also installed in the after-burning chamber.

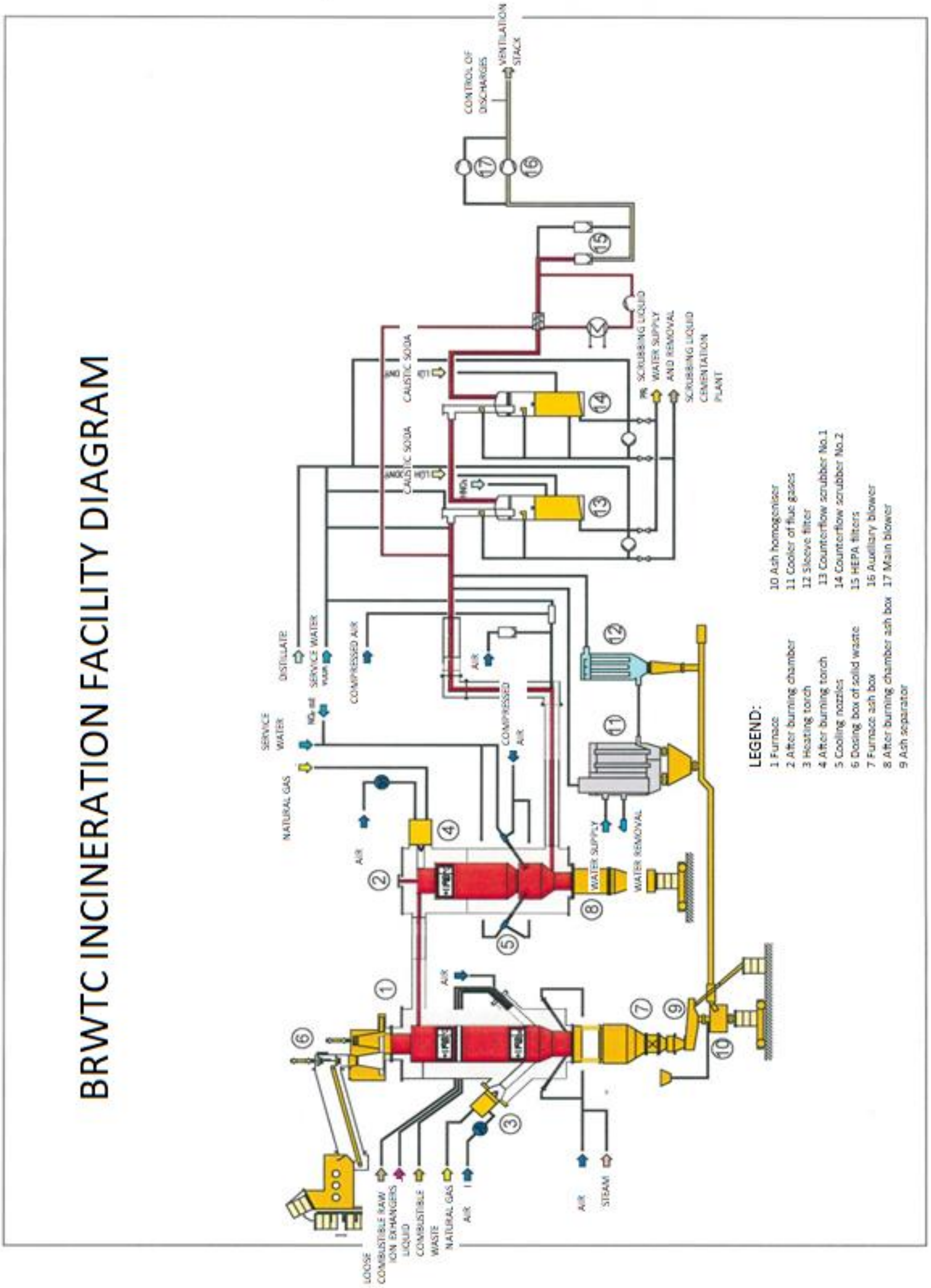
There is a mixer at the output from the after-burning chamber, in which flue gases are sharply cooled down by injecting water and compressed air to 340 °C, which considerably reduces the creation of dioxins (the most optimum interval of temperatures for dioxin creation is 600 - 350 °C).

After the flue gases have been cooled down, they are scrubbed in two wet scrubbers and cleaned at HEPA-filters, in which radioactive particles are caught with an efficiency of 99.9 %.

The ash produced in the incineration plant is treated by crusher. Then, it is possible to paraffinate it in the ash homogeniser and fill it into 200 dm^3 MEVA drums. Such product is further transported to be treated by compaction. The flue gas scrubber liquid is treated by cementation.

In 2013, within the BIDSF C7-C Project "Reconstruction of the BRWTC", modifications were carried out (change of fuel, change of LRAW incineration system, modification of the system for cooling down the flue gases, supplementation of self-regeneration sleeve filter and modification of the system for gaseous fluid filtration), which ensured better burn-up of flue gases, modified system of incineration of ion exchangers, lower consumption of HEPA filters, etc. At the same time, within the execution of changes at the NI RAW TCT, a node of loose RAW dosing to the RAW incineration plant was added. The node of loose RAW dosing includes technological devices allowing receiving loose wastes, homogenising them and drying with the following transport and dosing into the furnace.

Fig. A.II.9.



BRWTC INCINERATION FACILITY DIAGRAM
LEGEND:
1 Furnace
2 After burning chamber
3 Heating torch
4 After burning torch
5 Cooling nozzles
6 Dosing box of solid waste
7 Furnace ash box
8 After burning chamber ash box
9 Ash separator
10 Ash homogeniser
11 Cooler of flue gases
12 Sleeve filter
13 Counterflow scrubber No.1
14 Counterflow scrubber No.2
15 HEPA filters
16 Auxiliary blower
17 Main blower

5. ***RAW supercompaction facility (PS 08)***

The facility serves to compact the sorted RAW and mixtures of ash with paraffin or ash with crushed metallic material and other solid compactable wastes packed in 200 dm^3 drums. The drum is compacted using a force of 20,000 kN. The produced compacted material is subsequently put into fibre-concrete containers or other packaging sets and grouted by cement mixture or sent to the RAW producer as a final product. In 2013, within the BIDSF C7-C Project "Reconstruction of the BRWTC", improvements and modifications were carried out, consisting of supplementation of the workplace with an X-ray instrument, reconstruction of the rail track, modification of the roller track for the transportation of drums, handler accelerating the transport of 200 L drums and control of the crane for placing the drums into FCCs.

TREATMENT LINES IN STR. 809

The following technological equipment is operated in structure 809:
- ✓ PS 44 - bituminisation line
- ✓ PS 100 - bituminisation line
- ✓ PS 44/2 - discontinuous bituminisation line (DBL)
- ✓ RA water cleaning station
- ✓ Rotary kiln incinerating plant PS 45

The structure is designed as four separate, constructionally mutually independent dilatation units. The structure is interconnected with the structures of the Waste Water Cleaning Station and the BRWTC by piping. The structure is equipped with special sewerage, which creates a basic system catching possible leaks of LRAW. Within the BIDSF D4.1 Project "Modification and modernisation of the V1 NPP Power Plant", the LRAW management system was supplemented with piping routes and storage tanks at SO 724 due to the need to solve the system of LRAW transport from the NI ISFS after the decommissioning and demolition of the structure of auxiliary systems of the V1 NPP.

The bituminisation facilities PS 44 and PS 100 represent mutually interconnected technological units.

The main equipment of the ***bituminisation line PS 44*** is a rotary film evaporator, whose main function is to evaporate water from RAW concentrate and cover the dry fine crystals of dried salts with bitumen - fixation medium. Both components (bitumen and concentrate) are dosed to the evaporator above the heating zone in the tangential direction. The resulting product is emptied into 200 dm^3 galvanised drums, which are capped and placed into temporary RAW stores or grouted by cement mixture in fibre-concrete containers.

The vapour condensate, after it has been cleaned on the deoiler, Vapex and carbon filter, is pumped to the active waters treatment plant for additional cleaning.

Elementary system PS 100 (in operation since 2000) consists of a similar bituminisation device as PS 44, including equipment for the treatment of low contaminated waste waters.
Water treatment in the ***active waters treatment plant PS 100*** is carried out by evaporating in the evaporator with natural circulation. After the condensation, the vapours are additionally treated on adsorption columns.

Once their volume activity has been reduced below the limit values, the condensate is released into the environment. After achieving the optimum concentration, the concentrated share is treated by bituminisation on bituminisation lines PS 100 or PS 44.

The ***discontinuous bituminisation line*** (PS44/Stage 2) serves to treat RAW containing sorbents. Bituminous product containing dried and bituminised ion exchangers and sludge comes from the discontinuous bituminisation line.

Line operation runs in campaigns and each campaign consists of the following steps:

1. transport of sorbents to the structure of bituminisation lines and their preparation for treatment,
2. centrifuging of sorbents in batches,
3. drying of the centrifuged solid phase in batches,
4. bituminisation of the dried share and its filling into drums.

After solidification, the resulting product is transported to the BRWTC and put into fibre-concrete containers.
The produced vapour condensate is caught in a tank. Sludge from the evaporator is stored in the sludge tank equipped with blender; from there, the sludge is transported by a pump to waste water tanks or dosed into the drying equipment. The centrifuged water rid of solid impurities is taken away and collected in treated water tank. Treated water can be further used to flush the solid particles in storage tanks or treated in the rotary film evaporator PS 44, PS 100, or concentrated in the circulating evaporator PS 100.
Storage capacities for temporary storage of RAW are situated in structure No. 723 Fixed Radioactive Waste Interim Storage Facility. Charging into the storage facility takes place in campaigns, according to the quantity of production of final products. RAW can be transported to the structure on the original roads and newly built road to the store entrance.

Internal transport, storage and drum handling is provided by a bridge crane with a bearing capacity of 5000 kg and a high-lift electric truck. Radiation situation monitoring is ensured organisationally, technically and personally in the rooms of the store and also in the surroundings of the structure prior to each transport.

About 800 MEVA drums with RAW can be stored in the structure. Only packaging sets with a dose rate on the surface maximum 4 mGy/h can be received in the structure; the total activity of packaging sets may reach 1.9×10^{12} Bq.

Rotary kiln incinerating plant of solid and liquid RAW (PS 45)

It represents technological equipment situated at Jaslovské Bohunice as part of the NI RAW TCT in the existing structure 809. The technological equipment works on the principle of modern incineration plants for hazardous industrial and hospital waste, without the use of the produced heat energy from incineration. The waste heat produced is used in the technological process to pre-dry the crushed wastes before they enter the furnace and, for example, to heat up the combustion air, to heat up the flue

gases at the output from the cleaning line, and also to heat up the technological equipment intended for the treatment of input and output wastes.
The principle of technology consists in thermal decomposition in a two-degree incineration device with automated gas torches intended for direct oxidation two-degree continual incineration of solid, pasty, loose and liquid waste in vacuum regime. The resulting products are ash and fly ash. The technology consists of a rotary kiln furnace as the first degree and a thermal reactor as the second degree of thermal treatment of waste, waste dosing system, cooling system and flue gases cleaning. Through a safety absolute filter, cleaned flue gases are removed by means of fan to the existing stack in structure 46.
Incineration takes place in two incineration degrees, the first one in the incineration furnace allows operation at a temperature of up to 1400 °C, the second one in the after-burning chamber - reactor at a temperature of 900 to 1200 °C. Natural gas is the stabilisation fuel in both degrees. The lower part of the after-burning chamber serves to capture and exclude fly ash from flue gases. The technology of flue gases cleaning ensures the capture of heavy metals and PCDD/DF-type substances on the principle of selective absorption with mechanical cleaning of flue gases on cloth filter.
The cleaned flue gases will be transported by means of a flue gas fan to the air-conditioning channel str.809 and to the stack str.46. The efficiency of flue gases cleaning will be checked by continuous measurement of chemical emissions of pollutants at the input to the air-conditioning channel with the evaluating and logging device. In the stack str.46, there is continuous measurement of RA aerosols in the removed gaseous fluid with information provided back to the technology of incineration. The whole technological equipment will be controlled by means of the system of automatic control based on continuous check of cleaned flue gases and regulation of dosing of wastes. The equipment will be secured by an emergency after-cooling system with the respective system of continuous electric supply of emergency after-cooling elements.
The optimisation of treatment capacities of RAW incineration will increase the total annual capacity by 240 t/year, i.e. the total capacities for RAW incineration operated within the RAW TCT will represent 480 t/year. For the equipment, the building permit has been issued by Decision of the Nuclear Regulatory Authority No. 176/2019 dated 12 June 2019, and contracts have been concluded for the implementation of the project.

WASTE WATER CLEANING STATION (STR. 41)

The cleaning station allows:

- ✓ receiving LRAW, whose specific beta, gamma activity does not exceed the approved limit and whose pH is 6-8,
- ✓ LRAW storage in two storage tanks with a capacity of about 90 m^3,
- ✓ LRAW cleaning by the technology of evaporation with after-cleaning of vapour condensates on the ion exchanger filtration station,
- ✓ pumping of RA concentrate from the evaporator for storage before further treatment on bituminisation lines,
- ✓ storage of vapour condensate from the evaporator str.41, 808 or 809,
- ✓ storage of heating steam condensate from str. 41, 808 or 809,
- ✓ controlled discharge of low level waters to the environment after determining their volume activities through the SOCOMAN sewerage system

In addition to the storage tanks for the collection of RA waste waters for cleaning, tank for the capture of vapour condensate, tank for re-treated vapour condensate, storage tanks for the capture of condensate of heating steam, the structure also contains a retention tank, through which treated waste waters are released into the environment.
The water treated from the subgrade of A1 NPP premises also flow through this tank. The saturated ion exchangers from water treatment are further treated by incinerating or cementing at the BRWTC.

Workplace of metallic RAW treatment (str. 34)

The workplace has been established for purposes of metallic RAW sorting, fragmentation, subsequent decontamination, release into the environment or further management within the remelting workplace.

It consists of the following workplaces:

PS001 – Coarse fragmentation workplace
PS002 – Fragmentation workplace
PS003 – Coarse sorting workplace
PS006 – Workplace of exhaustion and filtration KEMPER
PS007 – Division and blast cleaning workplace
PS008 – Workplace for crushing the used electrical cables

At the ***PS003 Coarse sorting workplace***, the dismounted material is sorted into categories according to material composition or level of contamination. Subsequently, at the ***Coarse fragmentation workplace PS001,*** it is divided by means of plasma or acetylene - oxygen device to dimensional pieces, which can be further fragmented at ***the Fragmentation workplace PS002*** and at the ***Division and blast cleaning workplace PS007***, to pieces with dimensions suitable for placing into 200 dm^3 MEVA drums or into transportation pallets. Metallic material is temporarily stored or transported for further treatment in the transportation pallets.

From the transportation pallets, the material is placed into decontamination baskets and put into tanks of the large-capacity decontamination line. Metallic material placed in 200 dm^3 MEVA drums is stored in storage areas. The polluted air from workplaces is removed by the discharge system equipped with three-degree filtration capturing radioactive aerosols (***Workplace of exhaustion and filtration PS 006***). The KEMPER system 9000 filtration device is intended for the separation of harmful pollutants produced during welding and thermal division of metals in the form of dust particles. The cleaned air is removed to the central air-conditioning stack of the A1 NPP.

Used electrical cables are treated at the ***PS 008 Workplace*** by removing the external insulation, crushing the cables and separating the insulation and non-ferrous metals.

In the process of assessment alone, the changes carried out within the project BIDSF C7-A2 “Increase in the capacity of fragmentation and decontamination equipment” were assessed:

- PS 002
  - was supplemented with the technology for division of large-size metallic RAW with dimensions of about 1200 mm x 1200 mm (width x height) with a length of cut of about 4000 mm for steel materials (including cast-steel), and also for non-ferrous metals and their alloys. A band saw was supplied for this purpose.

- PS 004
  - New workplaces were connected to the exhaust air-conditioning system:
    - ✓ Fragmentation of large-size metallic RAW (PS 002),
    - ✓ The tank for rinsing of metallic material by material after decontamination (PS 24 LCDL),
    - ✓ The hanging blast cleaning device (PS 24, LCDL).
- PS 005
  - the existing electric power supply distribution system and power circuits were modernised

  The purpose of modernisation was to increase the treatment capacity of the workplace from 200 t/year (2011) to 250 t/year (in single-shift operation), where the increase by 50 t/year of metallic RAW represents the metallic RAW from V1 NPP decommissioning.

WORKPLACE FOR THE TREATMENT OF AIR-CONDITIONING FILTERS (PS 009)

The facility for the treatment of air-conditioning filters PS 009 is intended for the treatment of contaminated filters from the operation of air-conditioning systems of nuclear installations in operation and under decommissioning**.** It allows sorting and packing the waste according to individual RAW types (metallic material from carbon steel, aluminium, paper and cellulose, wood, polyethylene or polypropylene). The sorted RAW types, after they have been packed and monitored, are handed over for further treatment.

The workplace consists of three technological units:

- ✓ technological workplace of crushing and separation,
- ✓ technological workplace of compaction of separated crushed material,
- ✓ sanitary node.

First, the air-conditioning filters are crushed. Subsequently, vibrator is used to divide the fragments (40x40 mm) into separate particles, from which the magnetic separator will separate magnetic metallic parts, which are placed into 200 dm^3 MEVA drums. Non-magnetic fragments are again crushed (20x20 mm) and pieces containing aluminium are separated from the resulting pieces by electrodynamic separator and placed again to 200 dm^3 MEVA drums.
The other components of crushed material (filtration textiles, paper, plastics, wood) are further treated depending on the level of contamination. In case of higher contamination they are homogenised with antimicrobial additives and put into 200 dm^3 MEVA drums, which are treated by supercompaction. In case of a lower level of contamination, the components are sorted into combustible and non-combustible shares. The combustible part is put into PE bags and transported to incineration plant in 200 dm^3 drums. The non-combustible part is treated similarly to the components with higher contamination by supercompaction.

LARGE-CAPACITY DECONTAMINATION LINE (LCDL, PS24, STR. 34)

It is a technological complex intended for decontamination of fragmented metallic materials. The LCDL consists of a system of tanks, whose technical equipment allows applying various decontamination procedures:

- ✓ steeping tank,
- ✓ chemical decontamination tank,
- ✓ ultrasound decontamination tank,
- ✓ rinsing ultrasound decontamination tank,
- ✓ drying tank,
- ✓ electrochemical decontamination tank.

In addition to the basic equipment, the line includes additional appertaining units for the preparation of decontamination solutions, their regeneration, management of sludge phases, and heating and air-conditioning systems.

In the process of assessment alone, the changes carried out within the project BIDSF C7-A2 “Increase in the capacity of fragmentation and decontamination equipment” were assessed:

1. modification of the rinsing (ultrasound) tank of V2 to increase the efficiency of decontamination,
2. addition of a new tank for the rinsing of metallic materials after the decontamination and of a storage tank for rinsing water,
3. addition of a new titanium decontamination basket,
4. replacement of the pumps Č1 ÷ Č5,
5. supply of two Č2 pumps,
6. supplementation of a hanging blast cleaning device,
7. supplementation of a high-lift truck.

The purpose of modernisation was to increase the treatment capacity of the workplace from 200 t/year (2011) to 250 t/year (in single-shift operation), where the increase by 50 t/year of metallic RAW represents the treatment of metallic RAW from V1 NPP decommissioning.

METALLIC RAW REMELTING FACILITY (STR.34)

The technology of metallic radioactive waste remelting, which was assessed in a separate environmental impact assessment process (final statement of the MoE SR 1775/2015-3.4/hp), serves to treat low level metallic RAW in the remelting facility with an electric pot induction furnace situated in civil structure 34 (former machine room of the A1 NPP under decommissioning) as part of the nuclear installation “Radioactive Waste Treatment and Conditioning Technologies“.

Remelting is a technology suitable for decontamination of metallic radioactive wastes (RAW). The technological process of remelting produces remelting ingots usable as a secondary raw material on condition of observing the limits for the release into the environment. The remelting of metallic RAW also considerably reduces the volume of RAW.

The melting facility, medium-frequency induction vertical pot furnace is used for the remelting of ferromagnetic materials (metallic RAW). The facility consists of several separate units. They include: furnace body, electric supply system, charging device, exhaust and filtration system of tail gases, system of water cooling of furnace components, system of casting of remelted RAW and a common hardware and software control system of all units. The capacity of the remelting facility is 1000 t/year. These days, technologies are installed, the beginning of active operation is expected in the first quarter of 2020.

FIXED RAW PRE-CONDITIONING LINE AT SO44/20

Elementary system: PS 35 Fixed RAW pre-conditioning line

The technological equipment allows destructing, crushing, milling and following sorting of solid fixed RAW in drums. The line separates any metallic materials placed in the drums from the combustible materials; it dries up the combustible materials, breaks them into pieces, mills them into fine combustible fraction, and then, it homogenises the milled material in order to reach the resultant maximum permitted activity for the following handling on the existing lines of the RAW TCT. In addition to drum content conditioning, the line also allows crushing empty drums. The drums are transported to pre-conditioning from the RAW storage facilities.

The equipment is situated in containers with their own exhaust system and all necessary and supporting systems, which are also situated in the structure of "Solid RAW Storing Space" - civil structure SO 44/20. Drum handling in structure 44/20 is carried out by means of a high-lift truck with special self-grip jaws to seize the drums.

RAW STORAGE SYSTEM

RAW intended for treatment or intermediate products of RAW treatment are stored in several structures in the premises of the Proposer.

RAW accompanying document containing respective data is issued for each stored packaging with RAW, which is identified in accordance with the respective internal regulation.

1. *FCC shelter (structure 807)*

   As an extension of the elementary system PS 07 of BRWTC structure, it serves to store 24 pieces of cemented FCCs intended for maturing before the transport to the National RAW Repository Mochovce.

   It consists of a steel supporting structure, partially covered by trapezoidal galvanised sheet. The floor is the surface reinforced with all-concrete cover so that it is suitable for storing concrete blocks with a weight of 12,000 kg/piece.

2. *Certified storage facilities in structure No.32*

   They serve for storage of solid wastes from NI operation and decommissioning, as well as institutional RAW until they are treated by the solved treatment technologies.

   These are the following storage facilities:

   a) store in room No. 30 – the total storage capacity of solid RAW is 2,508 pcs of 200 L MEVA drums stored in metallic pallets PS 15/4 *(dimension: 1200x1200x1300mm, capacity of the* *leakage sump: 205 L, bearing capacity: 1200 kg),* max. total activity of stored RAW is 1.256 x 10^{14} Bq,

b) store in room No. 54 – the total storage capacity of solid RAW is 1,216 pcs of 200 L MEVA drums stored in metallic pallets PS 15/4, max. total activity of stored RAW is 5.922 x 10^{13} Bq,

c) store in room No. 97 – the total storage capacity of solid RAW is 2,050 pcs of 200 L MEVA drums, max. total activity of stored RAW is 9.984 x 10^{13} Bq,

d) store in room No. 106 – the total storage capacity of solid RAW is 1,480 pcs of 200 L MEVA drums or max. 1,048 pcs of 200 L MEVA drums and max. 1,134 pcs of filter cartridges, max. total activity of stored RAW is 7.208x10^{13} Bq.

The surface dose rate in contact of each stored drum must not exceed 10 mGy/h and the surface wipeable contamination of a drum for beta, gamma RA-nuclides and alpha RA-nuclides with low toxicity must be maximum 3 Bq/cm^2, for other alpha RA-nuclides maximum 0.3 Bq/cm^2 (measured from a minimum area of 100 cm^2). At the same time, the weight of a stored drum must not exceed 450 kg.

3. *Certified storage facilities in structure No.34*

Like in the previous case, it serves for storage of solid (non-flammable) wastes from NI operation and decommissioning, as well as institutional RAW until they are treated by the solved treatment technologies. It is situated in room No. 1 and its total storage capacity is 2,860 pcs of 200 L MEVA drums stored in metallic pallets PS 15/4. Maximum activity of stored RAW must not exceed 5.29x10^{12} Bq. MEVA drums are stored in pallets PS 15/4, four pieces in one drum. The pallets are stacked in two or three layers according to the structural height of storage boxes. Drums can be stored in two layers without pallets in order to utilise the full capacity of the storage facility.

The weight of one drum with RAW must not exceed 450 kg and their joint weight on one storage pallet must not exceed 1,200 kg. The surface dose rate of a drum with RAW in contact must not exceed 0.7 mGy/h and the surface wipeable contamination of a drum for beta, gamma radionuclides and alpha radionuclides with low toxicity must be lower (or equal to) 3 Bq/cm^2, for other alpha radionuclides it must be lower (or equal to) 0.3 Bq/cm^2 (measured from a minimum area of 100 cm^2).

4. *Structure No. 723*

The structure serves as an interim storage facility for solid or fixed radioactive waste in approved packaging sets. The total activity of all stored packaging sets with solid or fixed RAW in the structure must not exceed 1.9x10^{12} Bq. Maximum dose rate on the surface of the stored packaging set must not exceed 4 mSv/h. At the same time, all packages must have non-fixed surface contamination $\leq$ 0.03 Bq/ cm^2 for toxic RN, and $\leq$ 0.3 Bq/cm^2 for beta, gamma and low-toxic alpha RN. Its storage capacity is 800 MEVA drums, stacked in two layers, in special pallets with leakage sumps, type 1216 PS 15/4. The annex building (storage facility II) of structure 723 also serves to store drums. Like in the main hall, MEVA drums are stored in special pallets with leakage sumps, type 1216 PS 15/4, four drums in each pallet, in two layers in spatially separated groups so that there is free handling area necessary for handling the pallets using high-lift trucks, the area for truck parking and free access to check the stored RAW. The storage capacity in the storage facility II is 60 pallets, i.e. 240 drums. The controlled area of the structure 723 is interconnected with the controlled area of the structure 809, i.e. the access to the controlled area is common for both structures.

5. *Structure 641*

The civil structure SO 641 was built in the 1970s as a three-aisle, single-storey steel hall. The structure was used as a storage facility for timber and construction materials of V1 NPP central maintenance. It is a single-storey structure with external dimensions 54.8 x 68 m. The structure is connected to the roads on the premises and distribution systems of technical equipment. The roads allow the access of trucks with semi-trailers through the entrance rolling gates (four pieces). The storage hall is divided into three rooms: 101, 102 and 103; each part of the hall is equipped with a bridge crane with a lifting power of 5000 kg. In 2016, a reconstruction was carried out in the structure in order to create suitable technical and storage conditions, thus allowing using the structure for the storage of radioactive materials at Jaslovské Bohunice. In SO 641, it is possible to store solid RAW in 2-EM-01 - type containers or in MEVA drums with a capacity of 200 dm^3, 220 dm^3 or 400 dm^3 , in box pallets, and large-size metallic fragments in bulk with non-fixed contamination lower than 0.3 $Bq.cm^{-2}$. It is not possible to store liquid RAW or open emitters in the structure. Total max. activity of radioactive materials in the structure $3x10^{12}$ Bq, max. dose rate on the surface of the packaging 2 $mSv.h^{-1}$, max. non-fixed contamination on the surface of the packaging: 0.3 $Bq.cm^{-2}$.

6. *Pool water storage facility in str. 724*

The civil structure 724 with a sufficient storage capacity for LRAW is intended for the case of necessity to empty SF storage pools from the NI ISFS. It consists of a system of pipelines, channels for storage and other necessary technical equipment for pumping waters to be treated in str. 41, 809. The bottom of the civil structure consists of a monolithic ferroconcrete slab connected with vertical walls also produced from monolithic ferroconcrete. The foundation slab of the structure is built on piles. The hydro insulation system of the monolithic structure is able to transmit movements in case of a seismic event without loosing its function. The civil structure consists of a shaft for tanks and a technical room containing pumping stations. The bottom and vertical walls of the shaft for tanks are equipped with stainless steel lining up to the height sufficient for catching the capacity of one tank. The bottom is inclined towards the leakage sump for any leakage from the tanks. In case of leakage, leaked liquids are pumped to structure SO 809 for further treatment. The area with tanks – the room with the shaft is exhausted by an air-conditioning system, which ensures vacuum in the room with tanks as well as suction of the air escaping from tanks while they are filled with pool waters, and it is connected to the existing air-conditioning system in structure S0 809. The air-conditioning system in SO 809 is connected to the existing ventilation stack with the measurement of discharges for controlled release of gaseous fluids into the air. The tanks in SO 724 are from stainless steel. The operating capacity of each tank is 650 m^3, inner diameter D = 10,000 mm. The tanks are covered by roof. The tank bottom drain is equipped with two shut-off valves and overflow is led to the leakage sump.

The pool water storage facility is executed within the BIDSF D4.1 Project and follows the demolition and removal of buildings and technological systems of V1 NPP under decommissioning. Currently, the project is being implemented.

Variant 1

Optimisation of current assessed RAW incineration capacities, RAW supercompaction, RAW remelting, relocation of the existing fragmentation and decontamination facilities from the V1 NPP, relocation of the workplace for the management of electric cables from the V1 NPP and the workplace for release of materials from institutional control and supplementation of RAW storage capacities within the existing civil structures of the structure system of the NI RAW TCT or V1 NPP with the existing auxiliary, storage, and transport systems in operation, or annex buildings to them at Jaslovské Bohunice.

OPTIMISATION OF TREATMENT CAPACITIES FOR RAW SUPERCOMPACTION

The change of the proposed activity represents the supplementation of current capacities of solid compactable RAW management by reducing its volume using a supercompactor.

Parameters of the technological equipment:

- compaction force min. 20,000 kN
- stroke of the compacting cylinder min. 990mm
- form of compacted waste – 200 L MEVA drum with a max. weight of 400 kg
- drive - hydraulic or an adequate alternative
- a reservoir at the input and output of the compaction chamber, which would allow the preparation of min. 5 MEVA drums at the input and taking of five compacted pieces in batches
- handling, transport and lifting equipment,
- simple, automatic and accessible operation of the equipment
- shielded control centre of the technological equipment
- controllable compaction force and speed
- measurement of the height of compacted pieces
- the possibility to change the diameter of compacted pieces by replacing the matrix of the compactor, etc.
- exhaust of the operating chamber of the supercompactor
- signalling the correct position and placing of MEVA drum in the operating chamber
- signalling the filling of the position in the reservoir at the input and output of the supercompactor
- protection against the overloading of electrical and hydraulic parts
- supercompactor output 15 drums/h
- gamma spectrometry measurement

A thermal-insulated closed shelter or annex building with the building and technological connection to the civil structure 808 of the BRWTC will be constructed within the execution. Building modifications in str. 808 of the BRWTC will include the creation of an entrance gate for entry of trucks, extension or construction of a crane track with lifting equipment with a lifting power of 20t, which will be situated so that in the receiving part of the annex building it will be possible to ensure receiving and unloading of wastes and at the same time, dismantling, assembly and servicing of all supercompactor components will be possible.

By optimising the treatment capacities of supercompaction, a total treatment capacity of supercompaction of 1000 t/year will be achieved.

OPTIMISATION OF RAW INCINERATION CAPACITIES

The change of the proposed activity represents the optimisation of RAW incineration capacities. The subject of optimisation is the parallel operation of incineration technologies PS06 in str.808 of the BRWTC and PS45 in str.809 with an annual treatment capacity of 240t/year for each incineration plant.

By optimising the RAW incineration capacities, a total annual treatment capacity for RAW incineration activities within the NI RAW TCT of 480 t/year will be achieved.

OPTIMISATION OF TREATMENT CAPACITIES FOR METALLIC RAW REMELTING

The change of the proposed activity represents the supplementation of metallic RAW remelting capacities within the NI RAW TCT. The technology of this metallic RAW remelting line will enable to treat metallic RAW including non-ferrous metals efficiently and safely, which will fully meet the requirements for management of various types of metallic RAW by remelting. The facility will include a melting furnace, dosing equipment, all the necessary auxiliary devices and systems, equipment for gas removal and filtration, collection of slag and melted metal, handling equipment, etc. The melting furnace with a capacity of 2 t per one batch will be placed on the structure allowing its tilting so that pouring of melt directly into moulds will be possible.

Ingots in moulds after the pouring will be further placed in the existing areas at the site for cooling down. During the entire process of remelting, furnace gases will be purified from dust and air-borne contamination. Dust and waste gases will go through the constructed system for gas purification with a cyclone separator and autonomous cooling unit followed by a filtration and exhaust system with HEPA filters. The system for gas suction and purification will ensure vacuum in the whole technological system.

After the filtration stage, gases will be continuously chemically and radiologically monitored in order to report chemical parameters and alpha and beta activity of remelting process emissions. Fixed air sampling for laboratory analysis will also be installed to the discontinuous monitoring. In order to minimise the dose load on workers, the process will be remote controlled to a maximum possible extent. The process of dosing of metallic radioactive material and slag-forming additives, of melting itself, removal of slag, casting of melt and taking and cooling down of ingots will take place in vacuum conditions. The equipment for metallic RAW remelting will include all the auxiliary systems and devices necessary for the execution of the whole process of remelting. After the expiry of the service life of furnace lining, it will be possible to push it out of the furnace by means of the supplied technologies and replace by new one.

The place for the metallic RAW remelting line is designed within the structure system of the NI RAW TCT. Within the execution, all the building modifications of this structure and connection to the existing auxiliary systems at the closest point of connection will be carried out.

Optimisation of treatment capacities for metallic RAW remelting includes:

- the supplementation of new technological equipment for remelting with a capacity of 2 t per one batch with the use of the equipment within three-shift operation

- change of operation of equipment in str. 34 with a capacity of 2t/batch from single-shift operation to three-shift operation.

In this way, it will be possible to treat max. 4500 t /year, taking into account the time necessary for the preparation of metallic RAW for remelting and taking into account the observance of guide values of radionuclides determined in the Decision of the PHA SR.

The size of batch was changed by the Proposer in comparison with the submitted plan due to higher economic efficiency of the proposed 2-ton equipment, minimising of secondary RAW production, use of technological procedures and due to comparability of operations of both facilities in terms of operation.

WORKPLACE OF ELECTRIC CABLES MANAGEMENT

Crusher ELDAN Rasper 1207 of the pre-granulation line in combination with the granulation and separation device Mini Module is specially designed for cable waste treatment. Waste is supplied to the crusher Rasper R1207, in which it is preliminarily cut and from where it falls on belt conveyor. Over-belt magnetic separator M1450 is situated above the belt conveyor, it removes the present steel component. Then, the material goes to the Mini Module device and is transported by belt conveyor to the fine granulator FG476, where it is further disintegrated and granulated. Afterwards, the granulated material is transported to the reservoir silo by screw conveyor. From the silo, the granulated material is fed by screw feed conveyor to the separation table C15, which ensures separation of the organic component (insulation) from Al or Cu metals.

The whole system is equipped with suction by fan. The system is equipped with its own electric distribution cabinet and control panel allowing the control of individual devices.

The final metallic component goes from the Mini Module device to belt conveyor. The belt conveyor contains an integrated drum magnet separating the residual small magnetic particles. The Rasper crusher is a device for cutting Al or Cu cables with a diameter of 10 to 50 mm. Cutting is performed by moving and stationary knives.

The recycling line of electric cables is intended for recycling of copper or aluminium electric cables without lead shielding. Therefore, “Bobr” cutter of cable insulation is used to remove lead insulation and shielding. Then, the processed aluminium or copper cables can be separated by means of the recycling line. The capacity of the line for the treatment of contaminated or non-contaminated electric cables is 1,050 kg/h.

RELOCATION OF FRAGMENTATION AND DECONTAMINATION FACILITIES

Technological fragmentation and decontamination facilities were constructed within the BIDSF C7-A3 Project in SO800 V:1. The consist of fragmentation and decontamination workplaces.

RAW decontamination workplace consists of:

- equipment for stainless steel decontamination (two electrochemical and two ultrasound decontamination tanks, one rinsing tank for high-pressure water spraying, seven decontamination titanium baskets and auxiliary devices);
- equipment for mechanical abrasive decontamination of carbon steel (two hanging blast cleaning devices for fragmented parts, one cabin for manual abrasive blast cleaning).

The equipment is equipped with a handling table, electric pulley blocks and suction system with a filtration module.

RAW fragmentation workplace consists of:

- equipment for segmentation during the disassembly of technological assemblies (self-clamping circular saws, circumferential piping cutters, hydraulic shear, rope saw, portable plasma cutting device with mobile suction system, portable flame cutting device with mobile suction system)
- equipment for the fragmentation of dismantled components (hydraulic band saw for transversal cutting, hydraulic band saw for longitudinal cutting, stationary hydraulic shear, hydraulic band saw, stationary plasma cutting equipment with mobile suction and filtration system, stationary flame cutting device with mobile suction system).

After the utilisation in str. SO800 of V:1 and subsequent need to vacate the spaces in the structure in connection with the planned activities of V1 NPP decommissioning, the fragmentation and decontamination equipment will be relocated to the existing structures of the NI RAW TCT for further utilisation.

WORKPLACE OF RELEASE INTO THE ENVIRONMENT

The equipment for releasing decommissioning materials, which is currently situated in the V1 NPP, was supplied within the BIDSF C10 Project.

The equipment includes:

- the instrument for the measurement of large-volume materials FRM-06, which contains scintillation detectors, gamma spectrometry measuring channel, control programme and accessories. The system allows the measurement of material placed in large-volume containers with the dimensions 3.4 m x 1.9 m x 0.5 m with a max. weight of 5 t.
- automated gamma measuring system FRM02c, which contains a measuring chamber with a screen, automatic feeder for pallet relocation, weighing equipment and evaluation workplace.

After the relocation of the fragmentation and decontamination devices from str. SO800 V:1, the workplace of release situated in str. 490 will be relocated to str. 760-II.3,4,5:V1.

SUPPLEMENTATION OF RAW STORAGE CAPACITIES

The subject of the proposed change is the utilisation of the civil structure No. 760-II.3,4,5:V1 for the storage of radioactive materials and radioactive wastes prior to further management. At the same time, the proposed change also represents possible placing of the technological systems of fragmentation and decontamination equipment (BIDSF C7-A3 Project), workplace of electric cables management from V1 NPP, and workplace for releasing materials from institutional control to these spaces so that the storage facilities and premises of operation of the relocated equipment are constructionally separated. The technological connection to auxiliary systems will be executed to the closest point of connection including the removal of gaseous fluid from the premises. Within the civil structure, a twin-shell leakage tank with a capacity of about 10-15 m^3 for LRAW from the operation of decontamination lines will be supplemented, and the access to the control area with piping leading to the network of special sewerage at the site will be constructed.

The supplementation of storage capacities with an area of max. 3740 m^2 for low-level RAW and very low level RAW (in box pallets, 200l MEVA drums, ISO containers, 2 EM-01 containers or other approved packaging means) in structure No. 760-II.3,4,5:V1 will ensure smooth transport of RAW to the premises for further management.

Optimisation of RAW storage capacities also includes the supplementation of RAW storage in packaging sets of solid RAW, such as box pallets 800 x 1200 mm, drums 220 dm^3 or 400 dm^3, or other approved packaging sets within all operated RAW storage facilities of the NI RAW TCT.

II.10. VARIANTS OF THE PROPOSED ACTIVITY

The subject of the activity under assessment is a set of radioactive waste treatment and conditioning technologies of JAVYS, a.s. at Jaslovské Bohunice. The change of the proposed activity was in the Plan "Optimisation of treatment capacities of radioactive waste treatment and conditioning technologies of JAVYS, a.s." in accordance with Act of the National Council of the Slovak Republic No. 24/2006 Coll. on environmental impact assessment as amended prepared in Variant No. 0, Variant No.1 and Variant No.2. Based on the set "Assessment Scope" of the MoE SR, only Variant No.0 and Variant No.1 are further elaborated in the document.

Variant 0:

The variant represents RAW treatment, conditioning and storage in the structures of NI technological equipment "RAW treatment and conditioning technologies" in the scope of environmental impacts assessed so far pursuant to Act No. 24/2006 Coll. as amended.

The following table contains a brief and transparent summary of technological equipment of the NO RAW TCT.

Table A.II.10/01
Variant 0 - Treatment capacities and focus of activity of individual technological lines and workplaces of RAW treatment and conditioning at the NI RAW TCT

Item	Location	Workplace/ technology	Annual treatment capacity	RAW treated	Activity of the RAW treated	Operation or other treatment technology producing the RAW treated	Operation type
1.	BRWTC (str. 808)	Concentration	750 m^3	non-combustible liquid RAW	Volume activity limits for LRAW entry: beta-gamma $4x10^{10}$ Bq/m^3 alpha $6x10^4$ Bq/m^3 Nuclide composition: ^{54}Mn, ^{60}Co, ^{137}Cs, 110Ag, ^{134}Cs	LRAW producers	continuous
2.	BRWTC (str. 808)	Cementation	1,100 m^3	non-combustible liquid RAW (e.g. sorbents, sludge, concentrates, LRAW from laboratories, etc.) + solid RAW	Max. volume activity for: ✓ RA concentrates: beta, gamma $3x10^{11}$ Bq/m^3 alpha $3x10^5$ Bq/m^3 ✓ non-concentrated RA liquids: beta, gamma 2x 10^{11} Bq/m^3 alpha 4.5x 10^8 Bq/m^3 ✓ solid RAW beta, gamma $2x10^{10}$ Bq/m^3 alpha $4.5x10^5$ Bq/m^3 ✓ solidified RAW for cementation beta, gamma $2x10^{11}$ Bq/m^3 Max. mass activity alpha 4,000 Bq/g	RAW and LRAW producers	continuous

3.	BRWTC (str. 808)	Sorting	50 t	solid RAW	Volume $\sum \beta, \gamma$ activity of sorted solid RAW must be lower than $1.5x10^9$ Bq/m^3. Maximum surface (non-fixed) contamination in the ISO container: - for parts loaded in bulk up to 3 Bq/cm^2 - for part in undamaged PE foil up to $3x10^1$ Bq/cm^2	RAW producers	continuous
4.	BRWTC (str. 808, 809)	Incineration	240 t	combustible solid and liquid RAW	Specific mass $\sum\beta,\gamma$ activity of SRAW must not exceed $6x10^6$ Bq/kg. Specific mass $\sum\alpha$ activity of SRAW must not exceed $1x10^5$ Bq/kg. Specific volume $\sum\beta,\gamma$ activity of incinerated LRAW must not exceed $3.7x10^{10}$ Bq/m^3. Specific volume $\sum\alpha$ activity of incinerated LRAW must not exceed $3.7x10^8$ Bq/m^3.	Combustible RAW and LRAW producers	continuous
5.	BRWTC (str. 808)	Supercompaction	420 t	sorted non-combustible but compactable RAW	Volume $\sum \beta,\gamma$ activity of SRAW must be lower than $1x10^9$ Bq/m^3	Compactable RAW producers	continuous
6.	Bituminisation lines (BL, str. 809)	PS 44 and PS100	270 m^3	liquid RAW (concentrates) from the process of nuclear power plant operation and decommissioning	✓ RA concentrates: beta, gamma volume activity max. $1x10^8 Bq/dm^3$ ✓ RA sorbents: beta, gamma mass activity max. $1x10^8$Bq/kg	RAW producers	continuous

7.	Bituminisation lines (BL, str. 809)	Discontinuous BL (DBL)	48 m^3	RA ion exchangers	Maximum limiting value of volume activity for ^{60}Co is $2.08x10^8$ Bq/m^3 (for the other radionuclides, the calculation in the operating regulation).	Producers of RA ion exchangers	continuous
	str. 809	Circulating evaporator	1.5 m^3/h	active WW from NI operation and decommissioning	summary volume activity gamma 10^6 Bq/dm^3	LRAW producers	continuous
8.	str. 41	Waste water cleaning station (WW CS)	3,000 m^3	active WW from NI operation and decommissioning	specific beta, gamma activity does not exceed the value of $3.7x10^6$ Bq/dm3 (i.e. low level LRAW)	LRAW producers	continuous
9.	str. 34	Workplace of metallic RAW treatment	500 t	metallic RAW	specific activity β and γ up to 10,000 Bq/cm^2 , specific activity α up to 1,000 Bq/cm^2	Metallic RAW producers	single-shift
10.	str. 32	Treatment of air-conditioning filters	15 t	air-conditioning filters from NI operation and decommissioning	dose rate up to 10 μGy/h	Producers of RA air-conditioning filters	single-shift
11.	str. 34	Large-capacity decontamination line (LCDL)*	500 t	solid fragmented RAW from NI operation and decommissioning	Specific beta and gamma activity of treated metallic RAW must not exceed the value $1x10^4$ Bq/cm^2. Specific alpha activity of treated metallic RAW must not exceed the value 1,000 Bq/cm^2.	Metallic RAW producers	single-shift
12.	str.34	Metallic RAW remelting facility	1,000 t	metallic RAW	Total activity of ß + γ radionuclides in pre-conditioned metallic RAW for one melting must not exceed $2x10^8$ Bq and the total α activity $2x10^6$ Bq.	A1 NPP, V1 NPP decommissioning	single-shift

13.	str.44/20	Fixed RAW pre-conditioning line	450 t	solid fixed RAW	Total volume activity of SRAW in a received 200 L or 220 L drum must be lower than $9x10^{10}$ Bq/m^3.	RAW producers	single-shift

Table A.II.10/02

Variant 0 – Ratio of treatment capacity of NI RAW TCT technologies to the total capacity of the NI RAW TCT in (%) in 2019-2023 (current state)

Treatment technology of the NI RAW TCT	Assessed capacity of the facility	Unit	RAW treatment plan in **2019**	RAW treatment plan in **2020**	RAW treatment plan in **2021**	RAW treatment plan in **2022**	RAW treatment plan in **2023**	Share of treatment capacity of the NI RAW TCT technology in the total capacity of the NI RAW TCT in (%)
RAW concentration	750	m3	0	0	0	0	0	8,99%
RAW cementation	1100	m3	605,3	587,2	618,1	537,2	537,5	13,18%
RAW sorting	50	t	0	0	0	0	0	0,60%
RAW incineration	240	t	148,2	224,1	224,4	224,8	229,8	2,88%
		m3	17,4	15,9	15,6	15,2	10,2	
RAW compaction	420	t	420	420	420	420	420	5,03%
RAW bituminisation	270	m3	0	0	0	0	0	3,24%
Discontinuous bituminisation line	48	m3	0	0	0	0	0	0,58%
Waste water cleaning station	3000	m3	950	1400	1400	1400	1400	35,96%
RAW fragmentation	500	t	250	250	250	250	250	5,99%
A/C filters treatment	15	t	13,8	16,8	17,3	14,4	15	0,18%
RAW decontamination	500	t	250	250	250	250	250	5,99%
Metallic RAW remelting	1000	t	500	1000	1000	1000	1000	11,99%
Fixed RAW pre-conditioning	450	t	100	206,5	152,25	203,875	236,875	5,39%
Total assessed capacity of the NI RAW TCT	**8343**	**t**	**3 255**	**4371**	**4348**	**4315**	**4349**	**100%**

Note: In order to create a general overview and comparison of utilisation of treatment capacities of the NI RAW TCT, the capacity of LRAW treatment technologies was conservatively considered as 1m3 = 1t. The remaining free treatment capacity in individual years in comparison with the total assessed treatment capacity of the NI RAW TCT includes the area of liquid RAW management and these are not included in the optimisation of treatment capacities.

Fig. A.II.10./01

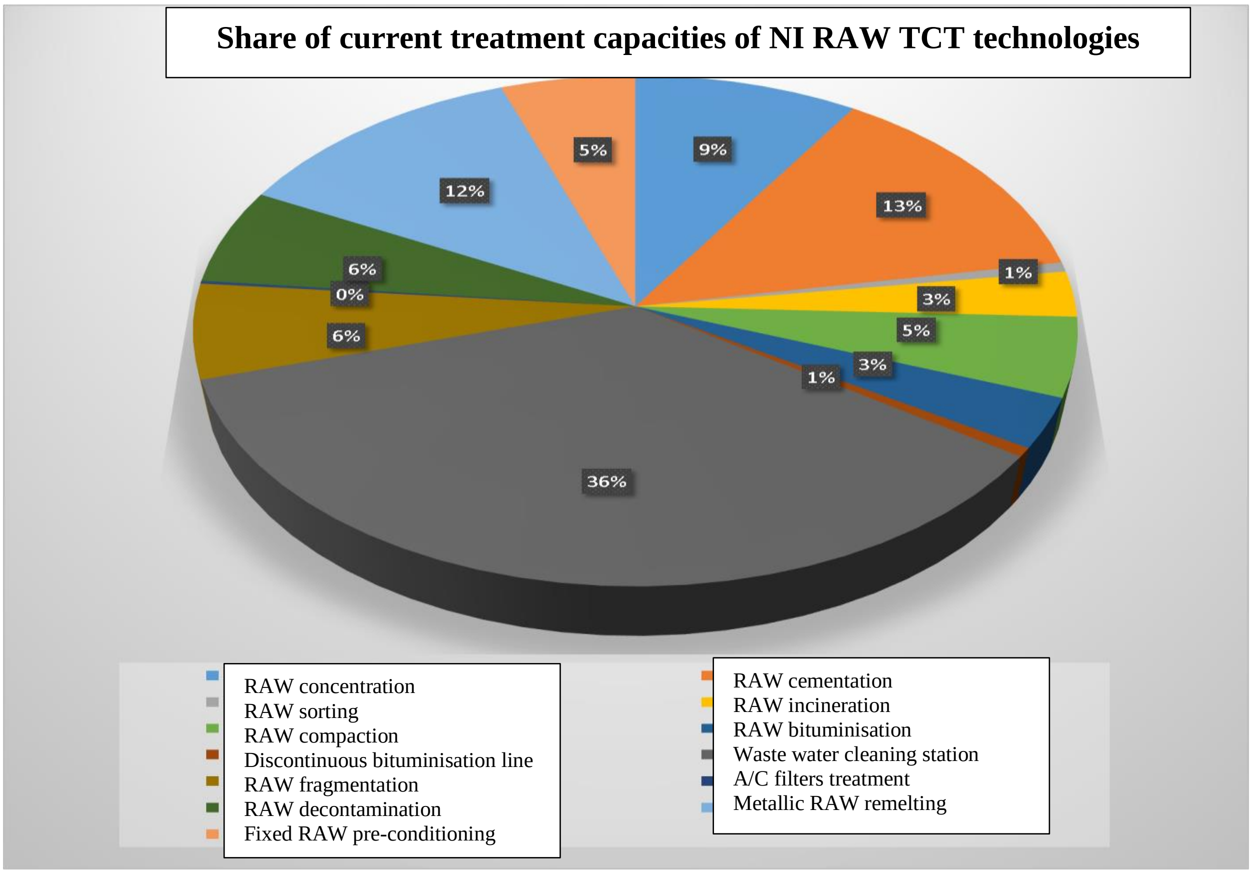
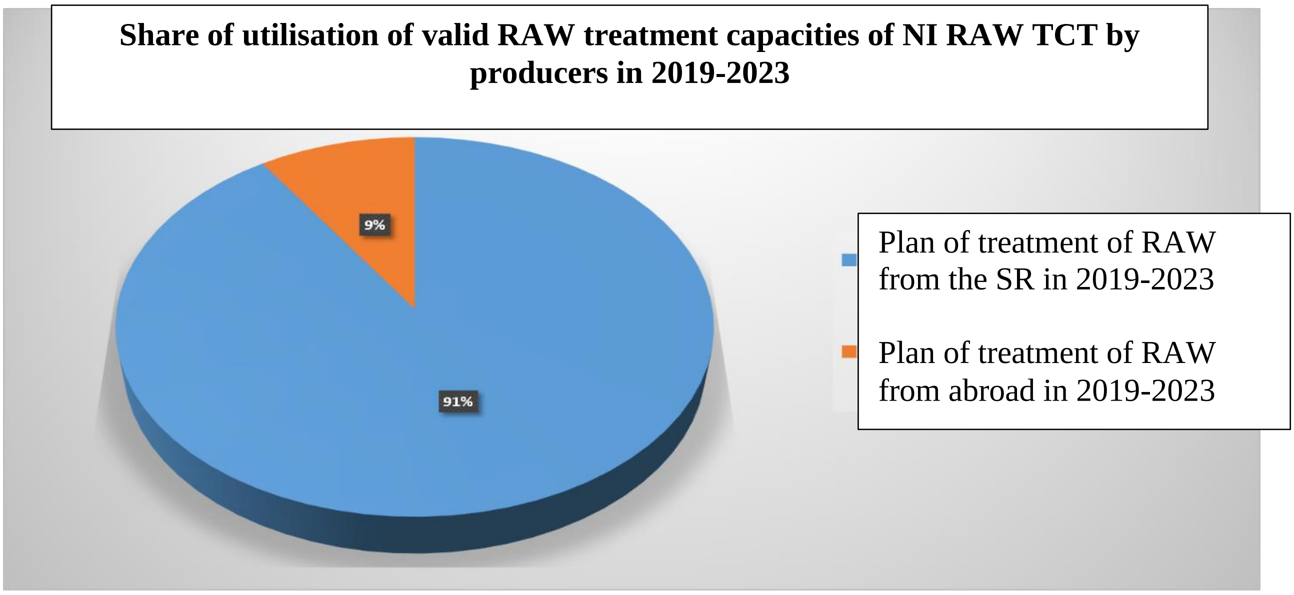


Fig. A.II.10./02



Variant 1:

It represents the optimisation of the capacities of the NI RAW TCT technologies already assessed - RAW incineration, RAW supercompaction, metallic RAW remelting, relocation of the existing fragmentation and decontamination facilities, workplace for electric cables management, and workplace for releasing materials from institutional control of the NI V1 NPP, supplementation of the current capacities of RAW storage, using the existing unused civil structures at the site of the structure system of the RAW TCT and V1 NPP.

OPTIMISATION OF THE RAW SUPERCOMPACTION CAPACITIES

Change to the proposed activity involves the replenishment of the current capacities for management of solid compressible RAW using the method of volume reduction by supercompacting machine located in the SO 808 BPC RAW annex, connected to all the completed and operated systems of the Bohunice Processing Centre. Within BPC RAW, a supercompacting machine as a part of the complex of technological systems for RAW management has been used for compressible RAW management since its commissioning. Optimisation of the compacting capacities includes addition of new and more efficient technological equipment with the following parameters:

- Pressing force of min. 20,000kN
- Press roller stroke of min. 990mm
- Compacted waste form – 200l MEVA barrel with mass max. 400kg
- Drive - hydraulic or adequate alternative
- Reservoir on the input and output from the compacting chamber, enabling the preparation of min. 5 MEVA barrels on the input and removal of 5pc of compacts in batches
- Simple, automatic and accessible equipment operation
- Shielded equipment technology control workstation
- Adjustable compacting power and speed
- Measuring the compact height
- Option to change the compact calibre by changing the compacting machine matrix
- Exhaustion of the supercompacting machine work chamber
- Signalling the correct position and placement of the MEVA barrel in the work chamber
- Signalling the filling of position in the reservoir on the supercompacting machine input and output
- Performance 15 barrels/h

Within implementation of this part of the investment project, the premises and adjacent surroundings of the existing 808 BPC RAW object of the NI RAW TCT object complex will be adjusted with technological connection to any necessary operated auxiliary systems in the object.

Change of the proposed activity will enable to achieve annual supercompacting capacity of the NI RAW TCT at the level of 1,000 t/year.

OPTIMISATION OF THE RAW INCINERATION CAPACITIES

Implementation of the proposed change represents optimisation of the RAW incineration capacities within NI RAW TCT. The existing technological equipment of the operated RAW incinerator with capacity of 240 t/year is located in SO 808 BPC RAW in the location of Jaslovské Bohunice as a part of the NI RAW TCT. In 2018, the process of assessment of the change of the proposed activity with respect to the environment for the investment project "Optimisation of the RAW incineration capacities" which represents the replenishment of the RAW incineration capacities through an innovative and more modern RAW incineration technology in a rotary furnace located in the related object 809, connected both in terms of construction and technology. Through decision No. 2754/2019/zg-R issued in the inquiry procedure of 22/02/2019, the Ministry of Environment SR completed the process of assessment of the change of the proposed activity with respect to the environment without a need of further assessment, with restriction to the already assessed maximum annual RAW incineration capacity of 240t/year.

Optimisation of the RAW incineration capacities involves the increase of the capacities of volume and mass RAW reduction through incineration from 240 t/year to 480 t/year.

OPTIMISATION OF THE METALLIC RAW REMELTING CAPACITIES

Change of the proposed activity represents replenishment of the metallic RAW remelting capacities within NI RAW TCT. Technology of this metallic RAW remelting line enables to efficiently and safely remelt the metallic RAW including non-ferrous metals, whereby the requirements for managing various types of metallic RAW through remelting would be met. The equipment will include a melting furnace, dosing device, any necessary auxiliary devices and systems, equipment for gas outlet and filtration, collection of the cinder and melted metal, handling equipment etc. The melting furnace with capacity of 1t per one batch will be installed on the construction, enabling its tilt, to ensure pouring the melt directly into moulds.

Ingots in the forms after pouring will be further placed in the existing premises within the location to cool down. During the whole remelting process, the furnace gases will be cleaned of dust and air-borne contamination. The dust and waste gases will pass through the built-in gas cleaning system with an installed cyclone separator and autonomous cooling unit, followed by the filtration and exhaust system with HEPA filters. The gas exhaust and cleaning system will provide for necessary underpressure in the whole technological system.

Following the filtration level, the gases will be continuously monitored both chemically and radiologically, for the purpose of reporting chemical parameters as well as alpha and beta activities of the remelting process emissions. For discontinuous monitoring, fixed air sampling will be installed for laboratory analysis. In order to minimise the dose load of the workers, the process will be remote controlled as much as possible. The process of dosing metal radioactive material and cinder-forming additives, the melting itself, cinder removal, melt pouring and ingot collecting will take place under pressure. The equipment for metal RAW remelting will include any auxiliary systems and devices needed to carry out the whole remelting process. After expiration of the furnace lining serviceable life, this will be able to be pressed out of the furnace body using the supplied technologies and replaced by a new one.

Placement of the line for metal RAW remelting is designed within the NI RAW TCT or V1 NPP object system. Implementation shall include all the construction works of this object and connection to the existing auxiliary systems in the closest connection point.

Optimisation of the metallic RAW remelting capacities shall mean:

- Addition of a new technological device for remelting, with capacity of 2t per one batch, using the device in a 3-shift operation
- Change of the operation of the device in object 34 with capacity of 2t/batch, from the 1-shift to a 3-shift operation.

This way, it will be possible to process max. 4500 t/year, when considering the time necessary to prepare metal RAW for remelting and considering the compliance with the guide values of radionuclides determined in the Public Health Authority SR decision.

WORKPLACE FOR ELECTRIC CABLES MANAGEMENT

ELDAN Rasper 1207 of the pre-granulation line in combination with the Mini Module granulation and separation device is designed specifically to process the cable waste. The waste is supplied to the Rasper R1207, where it is pre-chopped and falls on the belt conveyor. There is an overhead M1450 magnetic separator located above the belt conveyor, which removes the steel component found in the material. Then, the material is moved on to the Mini Module device and is transported by the belt conveyor to the FG476 fine granulator, to be further crushed and granulated. Subsequently, the granulated material is discharged by the output screw conveyor to the silo. From the silo, the granulated material is supplied by the screw conveyor to the C15 separation table, which provides for separation of the organic component (insulation) from the Al, or Cu metals.

The whole system is equipped with fan exhaust. The system is equipped with its own electrical junction box and control panel, also operating the individual devices.

The final metal component moves from the Mini Module device to the conveyor belt. There is an integrated drum magnet on the conveyor belt, separating the remaining small magnetic particles. The Rasper is a device for chopping Al or Cu cables with diameter of 10 to 50mm.The chopping is done by mutual interaction of the moving and static knives.

The el. recycling line is intended for recycling copper or aluminium el. cables, where no lead shielding is used. Therefore, a “Bobr” cable insulation chopper is used to remove the lead shielding insulation. The aluminium or copper cables processed this way can be subsequently separated using the recycling line. Capacity of the line for processing both contaminated and noncontaminated el. cables is 1,050 kg/h.

SUPPLEMENTATION OF THE RAW STORAGE CAPACITIES

The proposed change consists in the use of the building object No. 760-II.3,4,5: V1 for the storage of radioactive materials and radioactive waste before their further management. At the same time, the proposed change represents possible installation of the technological systems of RAW supercompaction, RAW remelting, fragmentation and decontamination devices (BIDSF C7-A3 Project), workplace for electric cables management from V1 NPP and the workplace for releasing materials from institutional control into these premises so that the storage spaces and operation spaces of these relocated devices were structurally separated. In terms of technology, the auxiliary systems will be connected to the closest connection point including the air mass exhaust from these spaces. Within the building object, a double-skin catch tank will be installed in volume of 10-15m^3 for liquid RAW from the decontamination line operation and hygienic loop with pipeline to the local special sewerage will be built.

By replenishing the storage capacities in the acreage of max. 3,740 m^2 for RAW with low activity and RAW with very low activity (in box palettes, 200 l MEVA barrels, ISO containers, 2 EM-01 containers or other approved packaging) within the object No. 760-II.3,4,5: V1, smooth transport of RAW to these premises and further management thereof will be provided.

The subject optimisation of the capacities of RAW storage also involve replenishment of the RAW storage options in the packaging sets of solid RAW such as box pallets of 800x1,200mm, barrels of 220dm^3 or 400dm^3, or other approved packaging within all RAW operating storages of NI RAW TCT.

Rationale for the proposed optimization:

Optimization of processing capacities of high-pressure RAW compressing

JAVYS, a.s. currently operates a facility for high-pressure compressing of RAW in the object 808 BSC RAO, whose active operation started in 2001. The purpose of this facility is to significantly reduce the volume of processed RAW by compressing it with a pressing force of 20,000 kN. The total so far assessed and valid capacity of RAW processing by compressing within the JZ TSÚ RAO is 420 MT/year within the continuous operation. Given the fact that the next period is expected to face increase of the production of compressible RAW from decommissioning of A1 and V1 NPPs, we propose to optimize the processing capacity of high-pressure compressing by adding new, more modern, safer and technologically advanced equipment, since the replacement of the equipment currently in operation within the object 808 BSC RAO is not possible without the need for extensive construction work and the implementation of complex technological measures. The addition of new equipment within the framework of the object 808 BSC RAO extension, will also provide the necessary handling space for RAW.

Optimization of processing capacity of RAW incineration

The currently operated RAW incinerator technology within the scope of the object 808 BSC RAO utilizes thermal decomposition of waste in a shaft incinerator with an annual processing capacity of 240 MT/year. In 2019, NRA SR Decision No. 176/2019 permitted construction of a rotary combustion furnace in object 809, with more efficient operation, which is going to be built with utilization of the latest available technological equipment, while maintaining the assessed annual processing capacity of 240 MT/year. Given that the A1 NPP is contaminated with alpha nuclides and the implementation of Phase 3 and 4 of the A1 NPP decommissioning project will continue in the following period, with the assumption of completion of the A1 NPP decommissioning in 2033, parallel operation of both combustion plants is considered, achieving the max. technological capacity of the above mentioned facilities.

Optimization of processing capacities of metallic RAW anatexis

Optimization of the processing capacities of metallic RAW anatexis involves addition of another anatexis technological facility, which will be primarily intended for the treatment of non-ferrous contaminated metal materials and stainless steel, that cannot be processed in currently constructed facility in object 34, or it would require significant technological changes.

Change in use of building object No. 760-II.3,4,5:V1

Building object No. 760-II.3,4,5:V1, previously used as a maintenance staff training center during V1 NPP operation, is currently unused. At the same time, during the implementation of NPP V1 decommissioning, Phase 2, a need was identified to create temporary interim storage facilities for disposal of the contaminated materials prior to their processing on the technological lines of JZ TSÚ RAO, as well as requirement of relocation of operated processing technologies used for NPP V1 decommissioning, located currently in the premises of the V1 objects system, determined for demolition in the following period. Based on these requirements, it was decided to change the use of building No. 760-II.3,4,5:V1, which will include:

- complemented storage capacity of RAW
- relocation of the electrical cable management workplace from V1 NPP
- relocation of fragmentation and decontamination facilities from V1 NPP
- relocation of the environmental release workplace.

Table A.II.10/04
Variant No.1 – Optimised treatment and storage capacities and their focus on RAW treatment and conditioning within the structure system of the NI RAW TCT, NI V1 NPP

Item	**Location**	**Facility**	**Annual treatment capacity after optimisation**	**RAW type**	**Activity of the RAW treated/stored**	**Operation or other treatment technology producing the RAW treated**	**Operation type**
1.	Structure system of the NI RAW TCT, NI V1 NPP	Metallic RAW remelting facilities	4,500 t	metallic RAW	Maximum limit of RAW treated is assumed at the level of limits assessed in safety analyses	RAW from A1 NPP, V1 NPP decommissioning and from external - foreign producers within the provided nuclear services.	continuous
2.	Structure system of the NI RAW TCT, NI V1 NPP	Supercompaction facilities	1,000 t	compactable RAW	Maximum limit of RAW treated is assumed at the level of the existing RAW compaction technology in SO 808	RAW from A1 NPP, V1 NPP decommissioning and from external - foreign producers within the provided nuclear services.	continuous
3.	Structure system of the NI RAW TCT	RAW incineration facilities	480 t	combustible solid and liquid RAW	Maximum limit of RAW treated is assumed at the level of limits assessed in safety analyses	RAW from A1 NPP, V1 NPP decommissioning and from external - foreign producers within the provided nuclear services.	continuous

4.	Structure system of the NI RAW TCT, NI V1 NPP	RAW storage facilities	-	solid and fixed RAW	A max. total limit of stored RAW at a level of $1x10^{15}$ Bq is expected	RAW from A1 NPP, V1 NPP decommissioning and from external - foreign producers within the provided nuclear services.	-
5.	Structure system of the NI RAW TCT, NI V1 NPP	Fragm. and decont. workplaces	500 t (assessed in C7-A2) 650 t (assessed in C7-A3)	metallic RAW	Total specific activity β and γ up to 10,000 Bq/cm^2, specific activity α up to 1,000 Bq/cm^2	RAW from A1 NPP, V1 NPP decommissioning and from external - foreign producers within the provided nuclear services.	continuous
6.	Structure system of the NI RAW TCT, NI V1 NPP	Workplace of electric cables management	1,050 kg/h	electric cables	Total area activity β and γ up to 10,000 Bq/cm^2, area activity α up to 1,000 Bq/cm^2	RAW from A1 NPP, V1 NPP decommissioning and from external - foreign producers within the provided nuclear services.	continuous

Table A.II.10/05

Variant 1 – Ratio of treatment capacity of NI RAW TCT technologies to the total capacity of the NI RAW TCT in (%) in 2019-2023 (after the optimisation of NI RAW TCT treatment capacities)

Treatment technology of the NI RAW TCT	Optimised capacities of the facility	Unit	RAW treatment plan in 2019	RAW treatment plan in **2020**	RAW treatment plan in **2021**	RAW treatment plan in **2022**	RAW treatment plan in **2023**	Share of treatment capacity of the NI RAW TCT technology in the total capacity of the NI RAW TCT in (%)
RAW concentration	750	m3	0	0	0	0	0	5,92%
RAW cementation	1100	m3	609,4	953,4	1114,7	1081,1	1019	8,69%
RAW sorting	50	t	0	0	0	0	0	0,39%
RAW incineration	480	t	254,3	409,1	519,1	355,4	117,9	3,79%
		m3	89,4	90,9	90,9	90,6	10,2	
RAW compaction	1000	t	420	676,3	796,4	827,3	826,8	7,90%
RAW bituminisation	270	m3	0	0	0	0	0	2,13%
Discontinuous bituminisation line	48	m3	0	0	0	0	0	0,38%
Waste water cleaning station	3000	m3	950	1400	1400	1400	1400	23,69%
RAW fragmentation	500	t	500	500	500	500	500	3,95%
A/C filters treatment	15	t	13,8	16,8	17,3	14,4	15	0,12%
RAW decontamination	500	t	500	500	500	500	500	3,95%
Metallic RAW remelting	4500	t	500	1500	1500	1500	1500	35,54%
Fixed RAW pre-conditioning	450	t	100	308	253,725	237,775	0	3,55%
Total optimised capacity of the NI RAW TCT	**12663**	**t**	3936,9	6354,5	6692,125	6506,575	5888,9	**100%**

Note: In order to create a general overview and comparison of utilisation of treatment capacities of the NI RAW TCT, the capacity of LRAW treatment technologies was conservatively considered as $1m^3$ = 1t. The remaining free treatment capacity in individual years in comparison with the total assessed treatment capacity of the NI RAW TCT includes the area of liquid RAW management and these are not included in the optimisation of treatment capacities.

Fig. A.II.10./03

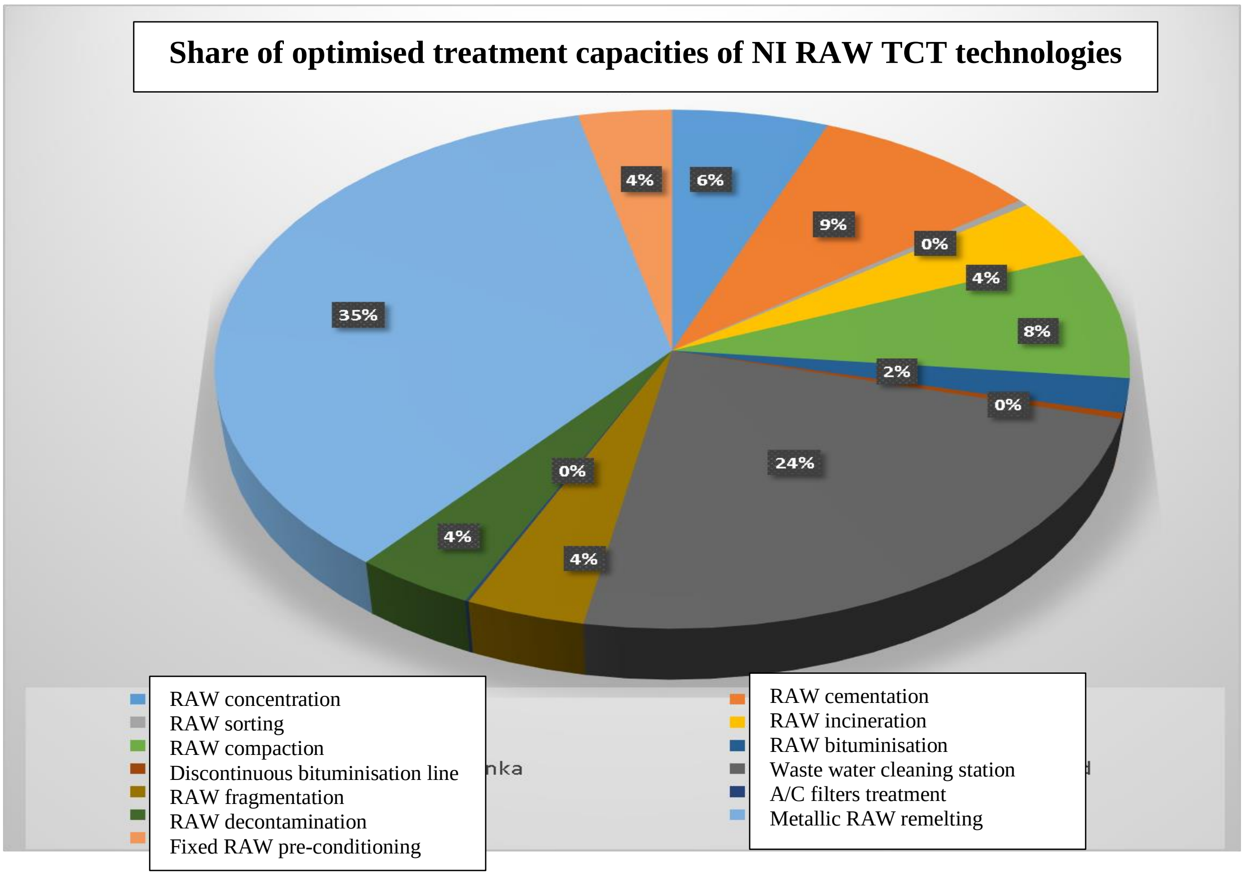
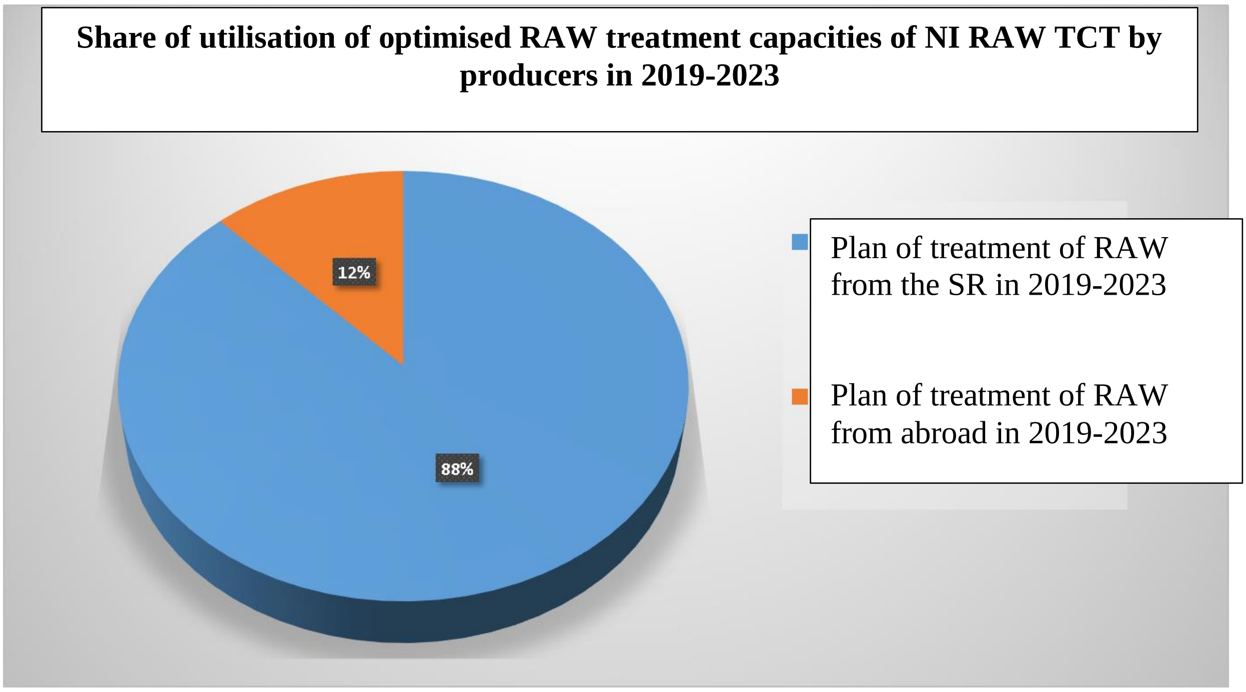


Fig. A.II.10./04



II.11. TOTAL COSTS (INFORMATIVE)

EUR 21,000,000

II.12. AFFECTED MUNICIPALITY

The municipality affected by siting of the project:

Trnava District: Jaslovské Bohunice

The municipalities situated in the territory defined for the needs of this material as affected:

Trnava District: Jaslovské Bohunice, Radošovce, Malženice, Dolné Dubové
Piešťany District: Veľké Kostoľany, Pečeňady, Nižná
Hlohovec District: Ratkovce, Žlkovce

II.13. AFFECTED SELF-GOVERNING REGION

Trnava self-governing region

II.14. AFFECTED AUTHORITIES

Trnava District Office, Environmental Protection Department, Civil Protection and Crisis Management Department
Piešťany District Office, Environmental Protection Department, Civil Protection and Crisis Management Department
Hlohovec District Office, Environmental Protection Department, Civil Protection and Crisis Management Department
RPHA with the seat in Trnava
Regional Fire and Rescue Corps Directorate Trnava

II.15. PERMITTING AUTHORITY

Nuclear Regulatory Authority of the Slovak Republic
Public Health Authority of the Slovak Republic

II.16. DEPARTMENTAL BODY

Ministry of Economy of the Slovak Republic

II.17. TYPE OF REQUIRED PERMIT FOR THE PROPOSED ACTIVITY PURSUANT TO SPECIAL REGULATIONS

The nuclear installation RAW TCT Jaslovské Bohunice as an installation in operation currently holds all necessary permits and consents including:

- ✓ Decision of the NRA SR No. 498/2010 dated 23 December 2010 issuing the permit for operation of the nuclear installation RAW TCT at Jaslovské Bohunice and for RAW management at the nuclear installation RAW TCT Jaslovské Bohunice within the scope according to the Pre-Operational Safety Report of the RAW TCT, Revision No.1, August 2010
- ✓ Decision of the PHA SR No. OOZPŽ/7119/2011 dated 21 October 2011 permitting activities leading to irradiation (release of radioactive substances from administration control by discharging them in air pollutants through ventilation stacks of structures of the A1 NPP, BRWTC, ISFS Jaslovské Bohunice, into the ventilation stack, release of radioactive substances from administration control by discharging them in waste waters to the rivers Dudváh and Váh, release of radioactive contaminated materials from the NI /A1 NPP, RAW TCT, ISFS/)

The operator JAVYS, a.s. also holds all other permits and consents for the activities performed by them within the premises of the NI RAW TCT Jaslovské Bohunice. The following permits will have to be obtained for the execution of the proposed change in the form of optimisation of treatment capacities:

Building permit
The proposed activity is subject to building permit pursuant to Article 55 of Act No. 50/1976 Coll. on land-use planning and building rules (Building Act) as amended and Decree No. 453/2000 Coll. implementing certain provisions of the Building Act.

Consent to execution of change of nuclear installation
Pursuant to Article 4 (2) (f) Point 2 of Act No. 541/2004 Coll. on peaceful use of nuclear energy (Atomic Act) and on the amendment to certain acts as amended.

Decision on building and technological change, decision on siting and construction
pursuant to Act No. 355/2007 Coll. on public health protection, support and development and on the amendment to certain acts as amended.

II.18. STATEMENT ON THE CROSS-BORDER IMPACTS OF THE PROPOSED ACTIVITY

In accordance with Article 40 (1) (b) of Act of the National Council of the Slovak Republic No. 24/2006 Coll. on environmental impact assessment, the subject of the cross-border impact assessment includes the activities proposed in the territory of the Slovak Republic listed in Annex No. 13.

In accordance with Item No.3 of Annex No. 13, the assessment shall include the "Facilities intended exclusively for nuclear fuel production or enrichment, for spent fuel reworking or storage, as well as for radioactive waste disposal and treatment.“

Based on the above characteristics of the described technologies and workplaces, they fulfil the essence of RAW treatment definition in accordance with Decree of the Nuclear Regulatory Authority of the Slovak Republic No. 30/2012 Coll. laying down details on the requirements for nuclear materials, radioactive waste and spent nuclear fuel management, which understands radioactive waste treatment as an activity focused on “separation of radionuclides from radioactive wastes, change of their composition and reduction of their volume with the objective to improve safety and economic efficiency of RAW management“ (Article 7).

The environmental impacts of all NI RAW TCT technologies currently in operation in accordance with Act No. 24/2006 Coll. on environmental impact assessment and on the amendment to certain acts as amended were assessed by international environmental impact assessment, the operation was recommended by the issuance of the final opinion of the MoE SR No. 2276/2014-3 4/hp.

According to Annex No. I to the Convention on Environmental Impact Assessment in a Transboundary Context (hereinafter the “Espoo Convention”) and Annex No. 13 to the Act, **the proposed activity is among the activities subject to mandatory international assessment** in terms of transboundary environmental impacts. Based on the above fact, after the delivery of the plan, the MoE SR provided information on the beginning of process of transboundary assessment of the proposed activity to the following affected foreign parties: Czech Republic, Republic of Austria, Hungary, Republic of Poland, and Ukraine.

Based on the expected environmental and human health impacts of the submitted plan, only **Hungary and the Republic of Poland** are going to participate in the process of transboundary assessment of the proposed activity**.**

RAW import and export from abroad and abroad for purposes of its treatment and conditioning is subject to permitting process by authorities of individual countries, through which transportation will be carried out.

B. DATA ON THE DIRECT IMPACTS OF THE PROPOSED ACTIVITY ON THE ENVIRONMENT INCLUDING HEALTH

I. REQUIREMENTS FOR INPUTS

I.1. LAND

Land occupation
Variant 0, 1

In both variants, the technologies and workplaces of RAW treatment and conditioning are situated on the premises of JAVYS, a.s. at Jaslovské Bohunice. Thus, the activity concerned does not require new land occupation, i.e. the occupation of lands from PPF or LPF, either.

I.2. WATER

Water consumption

Drinking water

Variant 0:
At the time of operation of RAW treatment and conditioning technologies at Jaslovské Bohunice, ***drinking water*** consumption is related to employees' needs for drinking and hygienic purposes. Drinking water supplies to employees on the premises of the Proposer's company are provided through the drinking water distribution systems owned by the Proposer. In 2018, the total drinking water consumption at Jaslovské Bohunice by the Proposer amounted to 51,157 m^3.

Variant 1:
As drinking water consumption is related in particular to employees' needs for hygienic purposes, drinking water consumption higher by about 2000 m^3 is expected in comparison with the zero variant.

Fire-fighting water

Variant 0, 1:
If necessary, fire-fighting water is taken from the fire-fighting water pipeline on the premises of the company. For both variants, the same consumption of fire-fighting water is considered for purposes of fire protection of buildings.
The consumption of fire-fighting water is calculated according to STN 92 0400. The capacity and pressure conditions of the point of supply are sufficient to solve the required fire protection for all the variants.
One wall-mounted hydrant needs Q=0.3 L/s of fire-fighting water. Fire-fighting water point of supply will be on the main piping DN200. The pressure conditions in the network of the fire-fighting water supply line are provided by fire pumps ensuring a head of approx. H=60-90 m; 0.6-0.9 MPa; Q=90 L/s.

Cooling water, demineralised water, heating water

Variant 0:

Service water consumption during the activities of RAW treatment and conditioning is connected, for example, with:

- ✓ chemical additives treatment, for example, during bituminisation, rinsing (decontamination) of equipment, the needs of laboratories, etc. (demineralised water)
- ✓ cooling, for example, of air-conditioning, condensers, certain operating tanks, flue gases from the incineration plant, metallic RAW remelting, etc. (cooling water)
- ✓ heating, for example, of tanks with concentrates, bitumen, etc. (hot water or steam)

Cooling waters and demineralised water are supplied from the V1 NPP, hot water is supplied from the heat-exchanger station (VS) of the Stand-By Boiler Room (str. No. 441), steam is supplied from the V2 NPP through the heat-exchanger station 441 of the V1 NPP.

Demands of the solved technologies for the above media are defined in the following table.

Table B.I.2/01
Demands of the solved technologies for the supplies of demineralised water, steam, hot water, and cooling waters

Item	Workplace/technology	Demand for media			
		Demineralised water	Cooling water	Hot water	Steam
1.	Concentration	X	X	-	X
2	Cementation	-	X	-	-
3.	Sorting	-	-	-	-
4.	Incineration	X	X	-	X
5.	Supercompaction	-	X	-	-
6.	PS 44 and PS100	X	X	-	X
7.	Discontinuous BL (DBL)	X	X	-	X
8.	Waste water cleaning station (WW CS)	X	X	-	X
9.	Workplace of metallic RAW treatment*	-	-	-	-
10.	Treatment of air-conditioning filters	-	-	-	-
11.	Large-capacity decontamination line (LCDL)*	X	-	-	X
12.	Metallic RAW remelting facility	-	X	-	-
13.	Fixed RAW pre-conditioning line	-	-	-	-

In 2018, cooling service water consumption within the NI RAW TCT amounted to **12,034 m^3** (of which at the BRWTC **4,328 m^3**, at the BL+DBL **0 m^3**, **at the LCDL 2,231 m^3**, at the str. 41 WW CS **5,475 m^3**).

In 2018, total demineralised water consumption within the NI RAW TCT amounted to **922 m^3** (in 2017: 1,884 m^3), of which at the BRWTC 505 m^3 (2017: 514 m^3), at the BL+DBL 0 m^3 (2017: 0 m^3), at the str. 41 WW CS 11 m^3 (2017: 12 m^3), at the LCDL 12 m^3 (2017: 88 m^3), and for auxiliary circuits 71 m^3 (2017: 1,049 m^3).

Consumption of heat from steam or hot water supplies is described in Chapter I.4.

Variant 1:

Table B.I.2/02
Demands of the optimised technologies for the supplies of demineralised water, steam, hot water, and cooling waters

Item	Workplace/technology	Demand for media			
		Demineralised water	Cooling water	Hot water	Steam
1.	Incineration	X	X	-	X
2.	Supercompaction	-	-	-	-
3.	Metallic RAW remelting facility	-	X	-	-
4.	Fragmentation and decontamination workplaces	X	-	-	X
5.	Workplace of electric cables treatment	-	-	-	-
6.	RAW storage facilities	-	-	-	-

Based on a qualified estimate, an increase in cooling service water consumption by about 3,000 m^3/year should be considered after the execution of optimisation of treatment capacities of supercompaction, metallic RAW remelting, and RAW incineration.
Based on a qualified estimate, an increase in demineralised water consumption by about 500 m^3/year should be considered in case of utilisation of the whole treatment capacity of the solved technologies.
The relocation of fragmentation and decontamination facilities will not require an increase in cooling service water and demineralised water consumption, as already assessed because the consumption of the raw materials was included and assessed in a separate process of assessment (BIDSF C7-A3 Project).

I.3. RAW MATERIALS

Raw material sources

Variant 0:

At the time of operation of the facility, main inputs of activities include RAW produced currently during the operation of the NI at Jaslovské Bohunice, for solid RAW also at Mochovce, as well as historical RAW from these activities, RAW from A1 NPP decommissioning, V1 NPP decommissioning, IRAW, RAW from external producers.

Available information on treatment capacities of the solved technologies and quantities of RAW treated in the documented year 2018 are provided in the following table.

Table B.I.3/01
Treatment capacities of the solved technologies and RAW quantities treated in 2018

Item	Workplace/technology	Annual treatment capacity (designed)	2018
1.	Concentration	750 m^3	0 m^3
2	Cementation	1,100 m^3	622.019 m^3
3.	Sorting	50 t	2.3 t
4.	Incineration	240 t	118.247 t of SRAW and 13.257 m^3 of LRAW
5.	Supercompaction	420 t	420 t
6.	PS 44 and PS100	270 m^3	0 m^3
7.	Discontinuous BL (DBL)	48 m^3	0 m^3
8.	Waste water cleaning station (WW CS)	3,000 m^3	1,200.3 m^3
9.	Workplace of metallic RAW treatment	500 t	290.986 t
10.	Treatment of air-conditioning filters	15 t	14.909 t
11.	Large-capacity decontamination line (LCDL)	500 t	233.732 t
12.	Metallic RAW remelting facility	1,000 t	0 t
13.	Fixed RAW pre-conditioning line	450 t	0 t

Within the framework of the already assessed treatment capacities of the NI RAW TCT, the following consumption of auxiliary materials and raw materials was considered in comparison with the real consumption in 2018:

Table B.I.3/02
Auxiliary substances and raw materials for treatment technologies

Item	Auxiliary substances and raw materials	Application/Purpose	Consumption	
			When the whole treatment capacity is used	2018
1.	Concentration			
	Liquid sodium hydroxide 40%	pH modification	18 t	0 t
	Anti-foaming agent	to prevent concentrate foaming	800 dm^3	0 dm^3
	Nitric acid 60%	pH modification	490 kg	0 kg
2.	Cementation			
	PCI Barrafix EP A+B	FCC lid sticking	1000 kg	618 kg
	Pozzolana cement CEM II	for FCC grouting	594 t	293.58 t
	Calcium hydroxide (packed)	for FCC grouting	35,000 kg	10,000 kg
	Grouting material Masterflow 648 L	FCC sealing	190 packages	77 packages
	Citric acid	cleaning of sediments	500 kg	500 kg
	FCC from the FCC PP	for compacted material insertion	380 pcs	256 pcs
3.	Sorting			
	Galvanised drums with lid and rim	LRAW storage	660 pcs	660 pcs
4.	Incineration			
	Natural gas	supporting fuel	150,000 m^3	126,708 m^3
	Nitric acid 60%	modification of pH in scrubber 1	150 kg	134 kg
	Technical urea	treatment of water in scrubbers (NO_x)	250 kg	0 kg
	Propane-butane 10 kg	High-lift trucks	12 pcs	3 pcs
	Paraffin in granules	ash fixation	750 kg	675 kg
	Diesel oil **	supporting fuel	220 dm^3	200 dm^3
	Ash drums	ash capture	40 pcs	100 pcs
5.	Supercompaction			
	Hydraulic oil	compactor filling	2500 dm^3	2500 dm^3

6. + 7.	PS 44 and PS100 + Discontinuous BL (DBL)			
	Road asphalt	for LRAW fixation	121.51 t	0 t
	HNO_3	pH modification	4508 kg	0 kg
	Flocculant Sokoflok GP51	grouping sorbents in liquid	25 kg	0 kg
	Polyethylene SA 70-21	improving the quality of bitumen product - additive	1939 kg	0 kg
	Drums	for filling with fixed RAW	847 pcs	0 pcs
8.	Waste water cleaning station (WW CS)			
	Anti-foaming agent	preventing foaming during evaporation	400 L	400 L
	HNO_3	pH modification	2,000 L	420 L
	ion exchanger	vapour condensate cleaning	1,000 L	500 L
9.	Workplace of metallic RAW treatment			
	Abrasive for blast cleaning – steel grit	dry decontamination	20 t	1.5 t
	Galvanised drums with lid and rim	insertion of non-decontaminable RAW	2,200 pcs	2,200 pcs
	PE bags	insertion of used PPE	1,500 pcs	500 pcs
	Acetylene	thermal methods of fragmentation	1.35 m^3	0.4 m^3
	Oxygen	thermal methods of fragmentation	6 m^3	2 m^3
	Argon	small repairs of equipment	0.15 m^3	0.05 m^3
10.	Treatment of air-conditioning filters			
	Galvanised drums with lid and rim	insertion of separated parts of filters	300 pcs	290 pcs
	Bags	packing of separated parts of filters	1,200 pcs	270 pcs
	Sodium chloride, sodium carbonate, mixture	prevention of micro-organism creation in crushed filters	1,700 kg	700 kg
11.	Large-capacity decontamination line (LCDL)			
	Sodium hydroxide	preparation of decontamination solutions	3,400 kg	1,020 kg
	Nitric acid		5,000 kg	1,500 kg
	Formic acid		2,000 kg	600 dm^3

	Syntron B		400 kg	120 dm^3
	Citric acid		1,000 kg	300 kg
	Ammonium nitrate		500 kg	150 kg
12.	Metallic RAW remelting facility			
	Heat-resistant material furnace (alternatively)	acid	2.7 kg/t	0
		neutral	2.05 kg/t	0
	Heat-resistant material sink and repairs		2.1 kg/t	0
	Insulation material	acid	0.18 kg/t	0
		neutral	0.09 kg/t	
	Hydraulic oil		0.16 L/t	0
	PE cartridges (60 pieces)	filtration	0.6 pcs/t	0

The solved technologies also need compressed air for the activities performed at the following workplaces:

- Treatment of air-conditioning filters
  consumption in 2018: about 12,000 m^3/year
  design consumption: 15,000 m^3/year
- Workplace of metallic RAW treatment (in a separate process of assessment)
  consumption in 2018: about 73,000 m^3/year
  design consumption: 220,000 m^3/year

Variant 1:

Table B.I.3/03
Treatment capacities and quantities of RAW of the optimised RAW management technologies

Item	Technological equipment	Annual treatment capacity (designed)
1.	RAW incineration	480 t
2.	RAW supercompaction	1,000 t
3.	RAW remelting	4,500 t
4.	Fragmentation and decontamination lines	1,150 t
5.	Workplace for electric cables treatment	1,050 kg/h

The following consumption of auxiliary materials and raw materials is considered within the framework of total treatment capacities of the NI RAW TCT after optimisation:

Table B.I.3/04
Auxiliary substances and raw materials for optimised treatment technologies

Item	Auxiliary substances and raw materials	Application/Purpose	Estimated consumption if treatment capacity is utilised
1.	Incineration		
	Natural gas	supporting fuel	300,000 m^3
	Nitric acid 65%	modification of pH in scrubber 1	250 kg
	Technical urea	treatment of water in scrubbers (NO_x)	250 kg
	Paraffin	ash fixation	1,500 kg
	Ash drums	ash capture	200 pcs
	Sodium bicarbonate ($NaHCO_3$)	filtration of flue gases	17 kg/h
	Active carbon	filtration of flue gases	0.2 kg/h
	Ammonia solution	filtration of flue gases	10 L/h
	Sodium hydroxide solution	filtration of flue gases	0.1 L/h
2.	Supercompaction		
	Hydraulic oil	compactor filling	5,000 dm^3
3.	Metallic RAW remelting facility		
	Heat-resistant material furnace (alternatively)	acid	2.7 kg/t
		neutral	2.05 kg/t
	Heat-resistant material sink and repairs		2.1 kg/t
	Insulation material	acid	0.18 kg/t
		neutral	0.09 kg/t
	Hydraulic oil	hydraulic mechanisms	0.16 L/t
	PE cartridges	filtration	120 pcs

4.	Fragmentation workplace and DL		
	Sodium hydroxide	preparation of decontamination solutions	3,400 kg
	Nitric acid	removal and supply of soils to the workplace	5,000 kg
	Formic acid		2,000 kg
	Syntron B		400 kg
	Citric acid		1,000 t
	Ammonium nitrate		500 kg

I.4. ENERGY SOURCES

Energy sources

Variant 0:

As regards equipment with natural gas consumption for energy purposes, a stand-by boiler room operated by the Proposer during the interruption of heat supplies from the EBO V2 NPP is related to the solved technologies of the NI RAW TCT. In 2018, natural gas consumption in the stand-by boiler room was **6,732 m^3.**

In general, in accordance with the available data (the level of detail of the data provided is limited by the scope of monitored operating indicators), it can be stated that in **2018**, consumption of ***heat for heating and hot service water*** supplied from the V2 NPP to the site of the A1 NPP was **15,437,543 kWh** (in 2017: 15,193,597 kWh), of which the BRWTC consumed **2,081,548 kWh** (2017: 2,027,799 kWh), BL+DBL **1,843,455 kWh** (2017: 1,703,760 kWh), and str.41 WW CS **481,212 kWh** (2017: 740,526 kWh).

Consumption of ***heat for technologies*** supplied from the V2 NPP to the site of the A1 NPP was in the documented year **2018** – **6,108,385 kWh** (in 2017: 5,771,995 kWh), of which BRWTC consumed **2,055,293 kWh** (2017: 1,958,904 kWh), BL+DBL **0 kWh** (2017: 0 kWh), str.41 WW CS **1,891,683 kWh**, (2017: 1,827,792 kWh), and LCDL **1,091,399 kWh** (2017: 1,001,400 kWh).

Additional consumption of natural gas is related to operation of the incineration plant of the BRWTC. In **2018,** annual consumption of natural gas amounted to **- 75,053 m^3.**

Supplies ***of electric energy*** are necessary for the operation of most treatment facilities installed, including the supporting activities, such as control systems, air-conditioning (including local heating to prevent condensation), lighting, monitoring, decontamination, etc.

Electric energy is supplied by separate 6 kV supplies from the switchgear of A1 NPP internal consumption.
in **2018**, consumption of electric energy at the A1 NPP was **10,576,912 kWh.**

Natural gas

Variant 1:

Natural gas consumption in Variant No.1 is related to optimisation of RAW incineration capacities in str. 809. The technical solution will include the construction of a connection line from the existing distribution system at the site. The operation of the installed gas torches represents total demands for gas consumption of about 100 m^3/h. According to the number of operating hours of the incineration plant PS06, an increase in annual consumption of natural gas by about 150,000 m3/year to a total amount of 300,000 m^3/year is expected.

Heat for heating and hot service water:

Variant 1:
In Variant No.1, utilisation of the existing civil structures is considered, with full use of systems of water supply and sewerage in the structures of the NI RAW TCT. Consequently, no increase in the demands for heat for heating and hot service water is considered.

Heat for technologies:

Variant 1:

The operation of optimised capacities of supplemented technologies does not require increased heat supplies, or the increase is negligible in comparison with Variant No.0.
Electric energy

Variant 1:

For Variant No. 1, expected consumption of electric energy is considered at the level of comparable operated technological systems within the BRWTC, which for 2018 amounts to approximately 10,600,000 kWh. Based on a qualified estimate, with the use of supplemented treatment capacities of solved technologies, an increase in the above consumption by about 850,000 kWh can be expected.

I.5. DEMANDS FOR TRANSPORT AND OTHER INFRASTRUCTURE

Variant 0:

For the ***operation***, the road connection of the NI premises at Jaslovské Bohunice is solved from two directions – through Jaslovské Bohunice to Trnava, and through the municipality Žlkovce to the Class I road Bratislava – Trenčín. The connection with the railway track is solved as an independent siding 8.1 km long, which was originally built for the needs of the A1 NPP and today, it serves for the whole

premises. The siding is connected to the railway track in the direction Piešťany – Trnava – Bratislava and is terminated in the railway station Veľké Kostoľany with a holding track for its operation. Passenger and material freight transport to the Proposer's premises at Jaslovské Bohunice is carried out on the above roads and tracks.
Frequency of freight transport (both road and railway) related to operation of the RAW treatment and conditioning technologies at Jaslovské Bohunice is provided in the following table.

Table B.I.5/01
Transport demands (freight transport) in 2018

Transportation	*Trucks*	*Railway carriages*
Supply of auxiliary substances and raw materials, such as cement, lime, bitumen, chemicals, ..	98 (supplier)	0
Supply of packaging: drums	1 (supplier)	13 carriages
Removal of non-active waste	91 trucks	10 carriages
RAW supply from Mochovce to J. Bohunice	5 – LRW FTF operation 10 – SE EMO operation	0
Removal of RAW from J.Bohunice to LRW FTF	8	0
Removal of matured FCCs to the NRWR Mochovce	158	0
Removal of VLLW to NRWR	330	0
Supply of RAW for treatment from abroad	13	0
Removal of treated foreign RAW	2	0

Note: For RAW transportation, 40 drums or 2 FCCs per one truck can be considered, for railway transportation four carriages are available, where three FCCs can be loaded on one carriage.

Passenger transportation is connected with transportation of employees and visitors of the Proposer, and its estimated frequency on business days is about 400 passenger cars; however, it is not possible to unambiguously specify a share related to the solved technologies.

In terms of technical infrastructure, RAW TCT operation is connected to the existing technical infrastructure of the A1 NPP, for example, electric energy distribution systems, drinking water distribution systems, sink and rain water sewerage, natural gas distribution systems.

Variant 1:

After the optimisation of treatment capacities of the NI RAW TCT and thus achievement of full increased treatment capacity of solved technologies, based on qualified estimate, it is possible to expect total transport demands higher by about 200 trucks per year for the transportation of raw materials, packaging and RA wastes, and by about 80 transits of FCCs to the NRWR.
If we take into account about 250 working days per year and with the mentioned transport demands of the solved technologies, in 2018 freight transport had an average frequency of 1-2 trucks per day.

With the conservative approach (i.e. taking into account max. transport demands), the frequency will rise to about 2-3 trucks per day.

I.6. MANPOWER DEMANDS

Variant 0:

Operation of the respective facilities/workplaces, including the supporting activities, such as monitoring, maintenance etc., is provided through about 240 employees that are grouped into departments providing activities for the whole complex of the solved technologies:

Maintenance Department	25 employees
Chemical Regime Control Department	26 employees
Dosimetry Department	35 employees
Department of NI Machine Technology and Constructions	15 employees
Department of Operation Management and Preparation	13 employees
RAW Transportation	13 employees

Other employees carry out their job duties in relation to individual workplaces of RAW treatment and conditioning:

Str. 41 (Waste water cleaning station)	13 employees
Bituminisation line	15 employees
Large-capacity and decontamination line and fragmentation	19 employees
BRWTC	60 employees

Optimisation of technologies for RAW management in the area of metallic RAW remelting:

Variant 0	Number of workers in single-shift operation
Operation of melting equipment	2
Operation of casting field and moulds	2
Total:	**4**

Note: The numbers do not include technical-economic workers (system engineer and technologist)

Annual working time fund will be 250 days/worker, which means 7,500 working hours per year with single-shift operation and a shift lasting 7.5 hours.

Variant 1	Expected number of workers in three-shift operation (during the working week)
Operation of melting equipment	10
Operation of casting field and moulds	10
Technician of chemical regimes	1
Total:	**21**

Annual working time fund will be 250 days/worker, which means 39,375 working hours per year with three-shift operation and a shift lasting 7.5 hours.

Optimisation of technologies for RAW management in the area of RAW supercompaction:

Variant 0	Number of workers in two-shift operation
RAW compaction technician	4
SEZ of RAW compaction and transports	4
Total:	**8**

Annual working time fund will be 250 days/worker, which means 15,000 working hours per year with two-shift operation and a shift lasting 7.5 hours.

Variant 1	Expected number of workers in three-shift operation
RAW compaction technician	10
SEZ of RAW compaction and transports	10
Total:	**20**

Annual working time fund will be 250 days/worker, which means 37,500 working hours per year with three-shift operation and a shift lasting 7.5 hours.

Optimisation of technologies for RAW management in the area of RAW incineration:

Variant 0	Number of workers in three-shift operation
RAW incineration technician	10
RAW incineration SEZ	5
Total:	**15**

Annual working time fund will be 250 days/worker, which means 28,125 working hours per year with three-shift operation and a shift lasting 7.5 hours.

Variant 1	Expected number of workers in three-shift operation*
RAW incineration technician	20
RAW incineration SEZ	5
Radiation safety technician	5
Total:	**30**

** expected number of workers in three-shift operation of incineration plants 808 BRWTC and at SO 809*

Annual working time fund will be 250 days/worker, which means 56,250 working hours per year with three-shift operation and a shift lasting 7.5 hours.

Operation of relocated fragmentation and decontamination lines

Variant 1	Expected number of workers in three-shift operation
Fragmentation, mechanical technologies	5
Fragmentation, thermal technologies	5
Fragmentation, transport	5
Decontamination, decontamination line operation	5
Decontamination, operation of blast cleaning technologies	5
Transport	5
Total:	**30**

Annual working time fund will be 250 days/worker, which means 56,250 working hours per year with three-shift operation and a shift lasting 7.5 hours.

Operation of the workplace for electric cables treatment:

Variant 0	Number of workers in single-shift operation
Energy equipment mechanic for treatment technologies	3
Decontamination technician	3
Total:	**6**

Annual working time fund will be 250 days/worker, which means 11,250 working hours per year with single-shift operation and a shift lasting 7.5 hours.

Variant 1	Expected number of workers in single-shift operation
Treatment technician	5
SEZ – for treatment technologies	5
Total:	**10**

Annual working time fund will be 250 days/worker, which means 18,750 working hours per year with three-shift operation and a shift lasting 7.5 hours.

Variant 1:
Staffing in support activities

Variant 1	Expected number of workers in three-shift operation
Radiation safety technician	5
Chemistry technician	5
Total:	**10**

Annual working time fund will be 250 days/worker, which means 18,750 working hours per year with three-shift operation and a shift lasting 7.5 hours.

II. DATA ON OUTPUTS

II.1. AIR

II.1.1. POINT SOURCES

Variant 0:

The operation of RAW treatment and conditioning technologies at Jaslovské Bohunice is not directly connected with any air pollution source with respect to categorisation in accordance with air protection legislation, which is not related to nuclear installations, but requirements for nuclear installations are applied.
The background of RAW treatment technologies is also connected with the operation of several air pollution sources as follows:

- emergency/stand-by energy sources:
  - Stand-by boiler room (str. 441:V1 - originally Start-Up and Standby Boiler Room “NaRK“) providing steam production and supply on the premises of JAVYS, a.s. in case of V2 NPP steam supply interruption, containing two combustion devices: ***double-flame gas boiler K3*** (rated heat input 26.6 MW), ***boiler K4 LOOS*** (rated heat input 2.78 MW) - medium-size air pollution sources categorised as 1.1.2. Technological units containing combustion facilities including gas turbines and stationary reciprocating internal combustion engines with rated installed capacity in MW: ≥ 0.3 and < 50)[1]
  - Diesel generator Caterpillar Olympian (rated heat input 0.58 MW) supplying EE to fire-fighting water pumps,
  - Diesel generator Martin Power MP 1700 (rated heat input 1.5 MW) supplying EE for equipment of the NI RAW TCT and NI A1 NPP during the outage of the 110 kV switchgear.
- production of fibre-concrete mixture/fibre-concrete containers (str. of the FCC producing plant No. 641:V1)
  - small APS categorised as 3.13. Industrial production of concrete, mortar or other construction materials with a design production capacity of up to 10 m^3/h represented by the discharge duct of the cloth filter of the silo of the input raw material.

These sources are connected with intermittent emissions of common pollutants from natural gas /diesel oil combustion (in particular CO, NO_x, TOC, PM, and SO_2) and with PM emissions from dusty material handling during the production of fibre-concrete containers (an intermittent source of filtered gaseous fluid from material reservoir filling).

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[1] The Proposer also disposes of further stand-by diesel generators, however, their operation is not directly connected with operation of the RAW TCT: Diesel generator Martin Power MP 400 (2 x rated heat input 0.94 MW) - emergency power supply for str. 713:V1 (medium-size APS), Diesel generator Caterpillar 3306 (rated heat input 0.28 MW) – emergency power supply for operation of the NI ISFS (small APS).

The construction and emission characteristics of sources relevant in terms of impact on the immission situation at the site are included in the Dispersion Study for the proposed activity (Ing. V. Carach, 05/2019) attached to the Assessment Report.
Total annual emissions of pollutants from these sources are provided in the following table.

Table B.II.1/01
Summary of emissions of common pollutants from the related air pollution sources (in 2018)

Pollution source	Number of operating hours/year	Pollutant quantity (kg)				
		PM	SO_2	NO_X	CO	TOC
NaRK	9	0.512	0.061	11.256	3.773	0.480
LOOS boiler	113	0.656	0.079	12.785	5.163	0.861
DG Caterpillar Olympian	7	0.515	0.007	1.814	0.290	0.026
DG Martin Power MP 1700	10	2.830	0.040	9.967	1.595	0.219
Production of fibre-concrete mixture*	-	31.5	-	-	-	-

Explanatory notes:
** 372 pieces of fibre-concrete containers were produced in 2018*

The set of technologies intended for RAW treatment produces:

A) the gaseous fluid exhausted from the operating premises of individual workplaces (from the controlled area) and led through the air-conditioning system to discharges (ventilation stacks) in accordance with Table No. B.II.1./02,
B) flue gases from the RAW incineration plant and then removed to the ventilation stack of str. No. 808,
C) tail gases from the furnace/metallic RAW remelting line, which are purified and then led to the ventilation stack of str. 46, Part A.

Arrangement of waste gaseous fluid flow and quantities are provided in the following table.

Table B.II.1/02
Discharges into the atmosphere

Discharge	Terminated air-conditioning systems of structures No.	Quantity of removed gaseous fluid - design capacity	Quantity of removed gaseous fluid 2018 [m^3/h]	Quantity of removed gaseous fluid, 2018 [m^3]
Stack 46, Part A	28, 30, 32, 34	$3.8x10^5$ m^3/h	about 103,519 m^3/h	$9.07x10^8$

Stack 46, Part B	809, 41	1.5x10^5 m^3/h	about 42,529 m^3/h	3.73x10^8
Stack 808	808, 44/10, 44/20	98,600 m^3/h	about 44,670 m^3/h	3.91x10^8

Note: Str. 46 is a ferroconcrete monolithic stack with a height of 100 m, a diameter of mouth of 4.25 m, divided by a vertical partition wall.
The stack of structure 808 is constructed from steel, with circular section Φ2150 mm, with the upper edge of the stack at a level of +40.00 m above the terrain.

A) Active gaseous fluid

As regards the gaseous fluid exhausted from individual workplaces in the controlled area, the change of the NI RAW TCT and V1 NPP causes contamination in particular in case of presence of radionuclides. Certain common pollutants can also be present (e.g. VOC released during bitumen heating and handling, PM during dusty material handling during cementation, produced in grinding and fragmentation of metallic RAW and concretes, etc.).

Any removed gaseous fluid with expected activity or relevant quantities of common pollutants is filtered to reduce them before termination at the ventilation stacks using optimum-design filtration equipment, e.g. air-conditioning of str. No. 809 – special air filters FAH and FAV with expected filtration efficiency for aerosols with a size of 0.3 micro meters of 99.95 % (two-stage filtration); equipment for the treatment of air-conditioning filters – regenerative filtration equipment KEMPER 8000 + for gaseous fluid from the operating premises of treatment of air-conditioning filters, fragmentation and decontamination workplaces, removed by systems O34F/1,2 (pocket filter HI-FLO MG6), compact pre-filter VARI PAK and high-performance HEPA filter, etc.

Activity of discharged gaseous fluid in the nuclear installations of the Proposer is monitored for purposes of balancing and evaluation of impact on dose load to the following extent:

- at the ventilation stacks of the A1 NPP and RAW TCT (i.e. str. 46 and 808):
  - ✓ aerosols – a mixture of radionuclides with long half life (^{54}Mn, ^{57}Co, ^{60}Co, ^{65}Zn, ^{94}Nb, ^{110m}Ag, ^{125}Sb, ^{134}Cs, ^{137}Cs, ^{144}Ce),
  - ✓ strontium ^{90}Sr in aerosols,
  - ✓ the radionuclides emitting alpha radiation ^{238}Pu, $^{239+240}$Pu, ^{241}Am,
  - ✓ tritium H^3 (only for the purposes of balancing and evaluation of impact on the dose load - no guide value has been set),
- at the ventilation stack of the V1 NPP:
  - ✓ aerosols – a mixture of radionuclides with long half life (^{54}Mn, ^{55}Fe, ^{57}Co, ^{60}Co, ^{65}Zn, ^{94}Nb, ^{110m}Ag, ^{125}Sb, ^{134}Cs, ^{137}Cs, ^{144}Ce),
  - ✓ strontium ^{90}Sr in aerosols,
  - ✓ the radionuclides emitting alpha radiation ^{238}Pu, $^{239+240}$Pu, ^{241}Am,
  - ✓ activity of tritium and ^{14}C in organic and inorganic forms (only for the purposes of balancing and evaluation of impact on the dose load - no guide value has been set),
- at the stack of the ISFS (str. 840) – it is not affected by the solved changes:
  - ✓ aerosols – a mixture of radionuclides with long half life (^{51}Cr, ^{54}Mn, ^{59}Fe, ^{57}Co, ^{58}Co, ^{60}Co, ^{65}Zn,^{90}Sr,^{95}Nb, ^{95}Zr,^{103}Ru, ^{106}Rh, ^{110m}Ag, ^{124}Sb, ^{134}Cs, ^{137}Cs, ^{141}Ce, ^{144}Ce, ^{238}Pu, $^{239+240}$Pu, ^{241}Am),

- ✓ activity of tritium, ^{90}Sr and radionuclides ^{238}Pu, $^{239+2340}$Pu and ^{241}Am (only for the purposes of balancing and evaluation of impact on the dose load - no guide value has been set).

Removal of aerosol filters for activity analysis and their replacement is carried out in accordance with the respective operating regulation (15-INŠ-705).

For discharges into the atmosphere for individual nuclear installations of JAVYS, a.s., Decisions of the PHA SR (Decision No. OOZPŽ/7119/2011 dated 21 October 2011) determine the following guide values[2] (limits). For the sake of completeness, we also provide the guide values of the nuclear installations A1 NPP and ISFS, which are not affected by the proposed changes.

Table B.II.1/03
Limits (guide values) of activity for discharges into the atmosphere

Nuclear installation	**RAW TCT + A1 NPP**			**V1 NPP**	**ISFS**
Ventilation stack	str. 46 Part “A”	str. 46 Part “B”	str. 808	..	str. 840
aerosols – a mixture of radionuclides β,γ	6.58×10^{8} Bq	1.41×10^{8} Bq	1.41×10^{8} Bq	8.0×10^{10} Bq	3.0×10^{8} Bq
aerosols - ^{90}Sr	1.96×10^{7} Bq	4.2×10^{6} Bq	4.2×10^{6} Bq	1.4×10^{8} Bq	
aerosols – a mixture of radionuclides alpha	6.16×10^{6} Bq	1.32×10^{6} Bq	1.32×10^{6} Bq	2.0×10^{7} Bq	

In addition to the above guide values, all the decisions also contain further set investigation and intervention levels[3].

In 2018, the activities provided in Table B.II.1/04 were measured in individual operations terminated in air-conditioning systems.

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[2] *In accordance with Government Order of the SR No. 345/2006 Coll. on basic safety requirements for the protection of health of employees and inhabitants against ionising radiation, guide value means an indicator or criterion for the assessment of radiation protection, whose exceeding or not-fulfilling usually signals the suspicion that radiation protection is not optimised.*

[3] *Intervention and investigation levels are reference levels.*

Intervention level means a value of avertible equivalent dose, avertible effective dose or other intervention level derived therefrom, whose exceeding means that an intervention should be considered. Avertible dose means the part of an expected individual effective or equivalent dose caused by a radiation accident or persisting irradiation, which can be averted by the intervention. It is set or estimated prior to intervention execution and only applies to the irradiation paths affected by the intervention. Simply said, it signals an extraordinary event or radiation incident and stimulates immediate warning and taking steps for the protection of people and environment according to the emergency rules of the workplace.

Investigation level means the value indicating investigation as a consequence of exceeding of set levels determined in general as the upper limit of usually occurring values. If it is exceeded, it is the reason for further investigation of reasons and possible consequences of the found deviation of the monitored quantity from the long-term average.

Table B.II.1/04
Data from measurements and evaluations of radioactive discharges from the JAVYS, a.s. sources to the atmosphere – 2018

Discharge type	**Str. 46/A** discharge	% of annual limit	**Str. 46/B** discharge	% of annual limit	**Obj. 808** discharge	% of annual limit	**MSVP** discharge	% of annual limit	**V1** discharge	% of annual limit	**JAVYS**
Air quantity [m^3]	**9,06E+08**	**-**	**3,73E+08**	**-**	**3,91E+08**	**-**	**5,03E+08**	**-**	**3,75E+09**	**-**	**5,92E+09**
Strontium ^{90}Sr [kBq]	**9,72E+01**	0,50%	**7,08E+00**	0,17%	**8,52E+00**	0,20%	**9,26E+00**	-	**4,59E+00**	0,003%	**126,62**
Carbon ^{14}C $_{org}$ [GBq]	-	-	-	-	-	-	-	-	**5,36E-01**	-	0,54
Carbon ^{14}C$_{anorg}$ [GBq]	-	-	-	-	-	-	-	-	**5,35E+00**	-	5,35
Tritium ^{3}H [GBq]	**3,19E+01**	-	**9,13E+00**	-	**2,01E+00**	-	**5,82E-01**	-	**9,80E+00**	-	**53,46**
aerosols: [MBq]											
^{51}Cr	-		-		-		1,05E-02		-		0,011
^{54}Mn	3,42E-03		9,81E-04		2,09E-03		2,18E-03		1,30E-02		0,022
^{59}Fe	-		-		-		2,91E-03		-		0,003
^{57}Co	2,59E-03		7,00E-04		1,31E-03		6,81E-04		4,00E-03		0,009
^{58}Co	-		-		-		1,31E-03		-		0,001
^{60}Co	5,01E-03		1,01E-03		3,17E-03		1,78E-02		4,39E+00		4,415
^{65}Zn	5,35E-03		2,59E-03		2,91E-03		4,06E-03		3,90E-02		0,054
^{94}Nb	3,11E-03		9,94E-04		1,38E-03		-		3,30E-02		0,038
^{95}Nb	-		-		-		4,19E-03		-		0,004
^{95}Zr	-		-		-		1,75E-03		-		0,002
^{103}Ru	-		-		-		1,22E-03		-		0,001
^{106}Rh	-		-		-		1,60E-02		-		0,016
^{110m}Ag	5,46E-03		8,55E-04		1,52E-03		1,52E-03		1,60E-02		0,025
^{124}Sb	-		-		-		1,24E-03		-		0,001
^{125}Sb	9,57E-03		1,34E-04		2,76E-03		-		2,20E-02		0,036
^{134}Cs	2,61E-03		9,43E-04		1,50E-03		1,27E-03		9,00E-03		0,015
^{137}Cs	3,35E+00		4,76E-02		1,31E-01		1,72E-02		9,52E+00		13,068
^{141}Ce	-		-		-		1,24E-03		-		0,001
^{144}Ce	2,09E-02		5,83E-03		1,05E-02		5,79E-03		3,60E-02		0,079
^{55}Fe	-		-		-		1,604		1,60E+00		1,604
Sum of aerosols [MBq]	**3,408**	0,52%	**0,063**	0,04%	**0,158**	0,11%	**0,091**		**15,686**	0,020%	**19,406**
Alpha aerosols: [kBq]											
^{238}Pu	1,17E+00		1,18E-01		1,17E-01		1,64E-01		7,13E-01		2,282
$^{239+240}$Pu	9,41E+00		1,06E-01		1,17E-01		1,25E-01		2,064E+00		11,822
^{241}Am	1,41E+01		1,14E-01		1,19E-01		1,26E-01		2,51E+00		16,973
sum of Alpha aerosols [kBq]	**24,680**	0,40%	**0,338**	0,03%	**0,353**	0,03%	**0,415**		**5,291**	0,026%	**31,077**
***Sum of ISFS aerosols* [MBq]**							**0,101**	0,03%			

Notes: Percentage is calculated from limit values (valid from 20 July or 21 October 2011).

Discharges into the atmosphere from the V1 NPP in 2018 can be evaluated as very low, well below the set limit values. Discharges into the atmosphere from the ventilation stacks of the NI RAW TCT and A1 NPP (ventilation stack str. 46 Part A, ventilation stack str. 46 Part B, ventilation stack str. 808 and ventilation stack str. 840) were at equally low levels in 2018, well below the set limit values and without extraordinary events.

B) Flue gases from RAW incineration

1. BRWTC incineration plant (str. 808)

Flue gases from the existing RAW incineration plant also contain, in addition to radionuclides (solved above in the text), common pollutants produced during waste and supporting fuel incineration as follows: PM, NO_x, SO_2, HCl, HF, TOC, CO, heavy metals and PCDD/F-type substances. Before the termination in the common air-conditioning system, flue gases are separately purified on the self-regenerating sleeve filter, in two wet scrubbers and on HEPA-filters, which capture radioactive particles with an efficiency of 99.9 %. To reduce NO_x emissions, the incineration plant is also equipped with a DeNOx system on the principle of water injection with the NOx-Out reducing agent.

As in terms of air protection legislation, the plant can be adequately considered an air pollution source categorised in accordance with Annex No. 1 to Decree of the MoE SR No. 410/2012 Coll. as 5.1.2 Waste incineration plants a) incinerating hazardous waste with a design capacity of hazardous waste ≤ 10 t/day (in accordance with the principle of precaution, the incinerated waste is considered to be hazardous waste), despite the fact that the conditions of plant operation, scope of monitoring, as well as emission limits of common pollutants are determined by the Decision of the NRA SR for the plant, they are partially based on the air protection legislation valid in the past.

Thus, the emissions of common pollutants are monitored within the following scope and frequency – the automatic monitoring system continuously monitors PM, NO_x, SO_2, HCl, HF, TOC, CO, O_2, humidity, pressure, temperature, and volume flow of flue gases, heavy metals and PCDD/F-type substances are monitored discontinuously; the outputs of continuous monitoring (the installed automatic monitoring system is subject to mandatory inspection of conformity with required frequency of three years) are evaluated in the form of weekly and monthly protocols, emissions of heavy metals and PCDD/F-type substances are set with the frequency once per three years.
The PCDD/F concentrations monitored discontinuously are measured on the contractual basis. The emissions of heavy metals monitored discontinuously (in gaseous and solid phase) are determined by means of equipment for isokinetic offtake (owned by the Proposer) and based on the methodology worked out by a member of the authorise measuring group (MM Team) Ing. Martin Motaj "Offtake and determination of metals in waste gas from the BRWTC waste incineration plant".
The outputs of continuous monitoring and one-off measurements and information on the discharged quantities of pollutants is sent exclusively to the NRA SR as a supervisory authority.

Emission limits for individual pollutants from the above plant in accordance with Decision of the NRA SR No. 312/2017 dated 21 August 2017 are provided in Table No. B.II.1./05.

Table B.II.1/05
Limits for common pollutants from waste incineration

Pollutant	*Emission limit* (mg/m³)*	*Corresponding mass flow (kg/h)***
PM	30	0.108
TOC	20	0.072
HCl	30	0.108
HF	2	0.0072
SO_2	300	1.08
NO_x	500	1.8
CO	100	0.36
Hg, Tl, Cd total	0.2	0.00072
As, Ni, Cr, Co total	1	0.0036
Pb, Cu, Mn total	5	0.018
PCDD/F	0.1 ng/m^3	0.00036 mg/h

Note:
** limits valid for nominal operation of the incineration plant, for dry gas under standard conditions 101.32 kPa, 0 °C and with oxygen content in flue gases 11 % by volume*
*** conservatively converted to maximum volume of dry flue gases 2,400 Nm^3/h with operating oxygen 6 vol.%; under real operating circumstances, standard volume of dry flue gases is at a level of about 1,800 Nm^3/h, temperature of flue gases ranges from 90°C to 106°C, operating humidity volume is about 33 %, and operating oxygen from 6 to 8 vol. %*

The above limit values are considered observed if during a calendar year, at the same time:

- for continuous measurement:
  - no 24-hour mean value exceeds an emission limit,
  - 97 % of all half-hour mean values do not exceed 1.2 times the emission limit,
  - no half-hour mean value exceeds 2 times the emission limit.
- for one-off measurements:
  - the arithmetic average of individual emission values does not exceed the value of emission limit,
  - all individual emission values are lower than or equal to 1.2 times the emission limit.

If the set limits are not observed, the respective operating regulation 10-TPP-806 BRWTC Incineration Plant approved by the NRA SR imposes “ban on any work causing the exceeding of the set emission limits“.

However, based on all measurements of common pollutants performed at the existing RAW incineration plant (including the measurements of heavy metals and PCDD/F-type substances) it can be stated that the set limits are safely observed.

Trends of total annual emissions from the RAW incineration plant in recent years are documented in the following table.

Table B.II.1/06
Quantities of common pollutants from the BRWTC incineration plan t (kg/year)

Pollutant	*2018*	*2017*	*2016*	*2015*	*2014*
HCl	0.450	0.870	1.460	1.740	9.520
HF	6.660	4.260	2.700	2.230	1.510
Hg+Tl+Cd	0.233	0.248	0.265	0.227	0.128
As+Ni+Cr+Co	1.332	1.301	1.232	1.053	0.616
Pb+Cu+Mn	0.832	0.929	1.056	0.903	0.523
SO_2	91.960	38.000	86.670	46.730	150.32
NO_X	666.280	681.710	642.570	456.450	362.37
CO	86.400	71.030	80.770	79.840	64.930
PM	1.590	1.620	1.610	1.380	3.320
$C_{org.}$	6.260	8.670	11.990	12.760	6.760
Operating hours/year	6697	7,017	6,857	5,659	3,796

2. Rotary kiln incinerating plant of solid and liquid RAW (PS 45)

During the screening process, in June 2019, construction of a new RAW incineration plant in str. 809 was recommended in order to optimise RAW incineration capacities on condition of observing of the originally assessed incineration capacity 240 t/year. Description of incineration plant technology is provided in Chapter A.II.9.
Before flue gases termination in the joint air-conditioning system, flue gases from the incineration plant will be purified on HEPA filter for purposes of activity reduction.
Flue gases will be discharged into the atmosphere through str. 46 Part B.

The emission characteristics of emitted flue gases will be identical as in the case of the existing incineration plant, i.e. the emitted flue gases will contain radionuclides (solved as part of activity contribution in the respective text above in the chapter), PM, NO_x, SO_2, HCl, HF, TOC, CO, heavy metals and PCDD/F-type substances, where the representation of individual pollutants in flue gases will depend on the composition of RAW incinerated and on the above described process of incineration and supporting fuel used, which is natural gas as an optimum option in terms of air protection.

As in terms of air protection legislation, the plant can be adequately (the equipment will not be permitted as an air pollution source in accordance with the legislation of air protection but as part of a nuclear installation, identically as in the case of the existing incinerating plant) considered an air pollution source categorised in accordance with Annex No. 1 to Decree of the MoE SR No. 410/2012 Coll. as 5.1.2 Waste incineration plants a) incinerating hazardous waste with a design capacity of hazardous waste ≤ 10 t/day (in accordance with the principle of precaution, the incinerated waste is considered to be hazardous waste), for air quality protection emission limits and conditions and requirements for operation in accordance with Annex No.5 to Decree of the MoE SR No. 410/2012 Coll. can be applied.

The resulting proposed emission limits as well as expected maximum mass flows of pollutants at the level of emission limits as the most adverse acceptable emission scenario are provided in the following table.

Table B.II.1/07
Proposed emission limits of common pollutants for the new RAW incineration plant and their expected maximum mass flows

Pollutant	Emission limit [mg/m^3]				Expected max. mass flow (kg/h)*
	Daily average	30-minute averages		10-minute average	
		97 %	100 %	95 %	
PM	10	10	30		0.07
NO_x	200	200	400		1.00
SO_2	50	50	200		0.50
TOC	10	10	20		0.05
HCl	10	10	60		0.15
HF	1	2	4		0.01
CO	50		100	150	0.25
Cd+Tl and their compounds	0.05 mg/m^3				0.0001
Hg and its compounds	0.05 mg/m^3				0.0001
Sb+As+Pb+Cr+Co +Cu+Mn+Ni+V and their compounds	0.5 mg/m^3				0.0012
PCDD/F	0.1 ng of TEQ/m^3				0.00025 mg/h

Conditions of EL validity:

EL apply to normal status conditions and dry gas with the reference content of oxygen in waste gas of 11%.

Explanatory notes:

** The provided mass flow is calculated conservatively for the max. volume of dry flue gases 2,490 Nm^3/h with reference oxygen 11 vol.% and with the application of EL for half-hour averages, which cannot be exceeded by any of the measured values; under usual operating circumstances, flue gases will have the following characteristics: about 10% of humidity, temperature about 117 ^{o}C, oxygen content 11.6 vol. %*

These days, the RAW incineration plant is under construction, therefore, no pollutants are released into the air from this operation. Annual quantities of emitted pollutants will depend on the utilisation of the total annual treatment capacity of the new incineration plant.

In relation to technical conditions and requirements of operation of the new RAW incineration plant in accordance with Part II of Annex No. 5 to Decree of the MoE SR No. 410/2012 Coll., compliance can be adequately stated (with respect to the special intention of the plant, for example, requirements for incinerated waste storage and handling, requirements for quality, handling and management of incineration residues, requirements for the utilisation of the produced heat, etc. cannot be fully applied) because the proposed plant:

- will dispose of automatically controllable additional natural gas torch,
- the plant is designed so that the temperature of flue gases after the last supply of combustion air will reach a temperature of 900 – 1200 °C for at least two seconds in a controlled way and uniformly even during the most adverse conditions.

The design of monitoring of pollutant emissions for purposes of proving of the observance of set emission limits is also considered to an adequate extent in accordance with Decree of the MoE SR No. 411/2012 Coll., continuous monitoring for PM, NO_x, SO_2, HCl, HF, TOC, CO, O_2, humidity, pressure, temperature and volume flow of flue gases, discontinuous monitoring for heavy metals and PCDD/F-type substances. An automatic monitoring system will be installed for continuous monitoring, procedures of determination also used for the existing incineration plant will be applied to discontinuously monitored substances. It is expected that the procedures of evaluation and reporting of monitoring outputs will also copy the current state (with respect to special requirements of the permitting authority NRA SR and involved government authorities for air protection administration submitted during the approval process).

C) <u>Waste gases from metallic RAW remelting</u>

As regards the tail gases from the metallic RAW remelting line (medium-frequency induction vertical pot furnace with a capacity of 2 t/batch – the line is under construction) intended for the treatment of ferromagnetic materials, the main emissions are PM – individual components of metallic RAW may reach gaseous form depending on their partial pressures at the temperature of melting (1,600°C), however, later they condense and become part of carried solid particulate matter (gas temperature after leaving the furnace about 300˚C, at the input to the filter less than 80˚C).
For purposes of dedusting of exhausted gaseous fluid (capacity of exhaustion is about 20,000 m^3), the facility will be equipped with a filtration unit, where carried PM will captured by PE filtration cartridges with an efficiency of 99.997 % (guarantee at the output 20 mg/Nm^3). Only then, purified gases will be taken to a common ventilation system treated before termination by filtrating the gaseous fluid on HEPA filters with efficiency of 99.95%. Waste gaseous fluid is released into the air through the stack str. 46 Part A.

With respect to the character of the facility, it can be considered, in terms of air protection with respect to requirements and conditions of operation and emission limits of common pollutants, adequately in accordance with Point 8, Part B, Annex No. 7 of Decree of the MoE of the SR No. 410/2012 Coll., as “Production of ferro alloys by electro-thermal and metallothermic procedures”, which in such cases requires to monitor only PM (it does not specify any special conditions and requirements for facility operation), for which it sets an emission limit at a level of 5 mg/Nm^3 (dry gas, standard state conditions of gas). Monitoring of emissions of pollutants can also be governed adequately by Decree of the MoE of the SR No. 411/2012 Coll., which determines frequency/continuance of measurements for technological equipment in Article §8 depending on the expected mass flow.

However, just as in the case of RAW incineration plant, the conditions of operation, scope of monitoring, as well as emission limits will be specified for the technology as part of nuclear installation in the decision of the NRA SR (the technology is under construction).

Non-point pollution sources

For the activity, non-point pollution sources may include dusty material handling during cementation, grinding and fragmentation of RAW, etc. However, gaseous fluid from the controlled area is exhausted and released into the municipal air through point sources only after purification (see above). Nor the operation of activities in the NIs concerned is connected with significant transport area with static transport. Thus, non-point pollution sources are not considered further.

Line and mobile sources

In connection with operation of the technologies concerned, there is a need of supplies of raw materials (e.g. cement, bitumen,..), auxiliary substances and materials (e.g. packaging) for the treatment of RAW, as well as removal of finished FCCs to the NRWR or produced non-active wastes to the place of destination. Demands for supplies are connected with RAW supply for treatment from other sites. The transportation represents a source of common pollutants from fuel combustion in engines (mostly NO_x, PM, VOC). In 2018, the average frequency of freight transport (with about 250 business days) was about 1 -2 trucks per day, with conservative approach (utilisation of the whole treatment capacity of the set of technologies) the frequency would be 2-3 trucks per day.

Variant 1

Point sources of air pollution

In connection with the proposed changes, nothing changes in the background of RAW treatment technologies in accordance with the description of Variant 0 (e.g. LOOS boiler etc.).
The following changes are expected within the set of technologies intended for RAW treatment:

A) Active gaseous fluid

The supplementation of new workplaces/optimisation of capacities of the existing workplaces will affect the existing discharges/ventilation stacks as follows:

- Structure 46 A – optimisation of treatment capacities of RAW remelting
- Structure 46 B – optimisation of RAW incineration capacities
- Structure 808 – optimisation of treatment capacities of RAW supercompaction
- stack of V1 NPP – relocation of certain fragmentation and decontamination devices (still within the V1 NPP nuclear installation), or a new point source can be created, depending on the overall way of utilisation of SO 760-II.3,4,5. If a new source is added, the currently valid guide values for discharges will not be increased (the existing ones will be redistributed).

Optimisation of the proposed activity will not require any change of guide values for the release of radioactive substances into the air set for individual stacks in the permits of the Public Health Authority of the Slovak Republic.

The jointly removed gaseous fluid will still be filtered before the release into the air using the end filtration device (HEPA filters) of individual ventilation systems, which do not require any modifications or expansion for the proposed change. The new RAW remelting line will have its own HEPA filter in addition to its own regenerative filter for PM separation.

Optimisation of incineration capacities – an increase in the capacity of RAW incineration plants (str. 808 and str. 809) from 240 t/year to 480 t/year. Mass flow of individual pollutants listed in Variant 0 is not changed and the contribution of increase in the capacity for individual pollutants in the air is from 0.001 to 0.004 $\mu g/m^3$ (Dispersion Study).
Variant 1 in the proposed solution will not cause a significant impairment of the existing quality of air in the assessed area.

Scenarios of annual activity released into the air from RAW incineration – calculation according to ESTE AI programme.

The following table contains three scenarios that can be really used within the optimisation of incineration capacities and within the observance of guide values of discharges from the BRWTC ventilation stack.

Scenario No. 1 expects the weight of RAW incinerated 240 t/year with maximum activity of $6x10^6$ Bq/kg, where the resulting share of annual limit per inhabitant amounts to 0.003%.

Scenario No. 2 expects the weight of RAW incinerated 480 t/year with maximum activity of $6x10^6$ Bq/kg, where the resulting share of annual limit per inhabitant amounts to 0.006%.

Scenario No. 3 expects the weight of RAW incinerated 480 t/year with maximum activity of $8.23x10^7$ Bq/kg, where the resulting share of annual limit per inhabitant amounts to 0.115%.

It results from the above-mentioned that even an absolutely maximum scenario considering the incineration of 480 t/year with activity of $8.23x10^7$ Bq/kg (which is almost 14 times the specific activity of RAW entering the process of incineration in comparison with the currently maximum limit $6x10^6$ Bq/kg) will participate in the dose load per inhabitant living in the surroundings of the NI RAW TCT up to a level of 0.115% and the impact on inhabitant is negligible.

Table B.II.1/08
Scenarios of annual activity released into the air from RAW incineration – calculation according to ESTE AI programme

Scenarios	**Scenario No.1**	**Scenario No.2**	**Scenario No.3**
Indicators	incineration of material with an activity of **$6x10^6$ Bq/kg**	incineration of material with an activity of **$6x10^6$ Bq/kg**	incineration of 480 t of material with maximum admissible activity
weight of material [kg]	**240,000**	**480,000**	**480,000**
specific activity of incinerated material [Bq/kg]	$6.00x10^6$	$6.00x10^6$	**$8.23x10^7$******
activity of burnt material [Bq]	$1.44x10^{12}$	$2.88x10^{12}$	$3.95x10^{13}$***
released activity per year [Bq]	$3.60x10^6$*	$7.20x10^6$*	$9.87x10^7$ (70% of the guide value of the PHA SR****)
released activity per month [Bq]	$3.00x10^5$	$6.00x10^5$	$8.23x10^6$
individual dose [Sv] (sector Ratkovce)	$9.70x10^{-10}$	$1.94x10^{-9}$	$3.70x10^{-8}$
use of the limit $32x10^{-6}$ Sv	0.0030 %	0.0061%	0.115%

* *lower than the guide value of the PHA ($1.41x10^8$ Bq for the stack of str. 808)*
** *average mass activity of the material, with the observance of the guide value and weight of 480 t*
*** *maximum activity of material incinerated per year, with the observance of the guide value*
**** *based on allocation of 30% of capacity for the other technologies terminated in the stack of str.808*

Metallic RAW remelting facility

For purposes of optimisation of the capacity of metallic RAW remelting, installation of another remelting line with a medium-frequency induction melting furnace equipped with a frequency converter with a capacity of 2 t/batch is under consideration, it should be operated in three-shift operation. The service area of the workplace (e.g. after-cooling of moulds, preparation of material), and the exhaust opening of the lid of the induction furnace will be exhausted into a regenerative filter and then to the HEPA filter. The purified air will be led to the central exhaust system with another filtration on HEPA filters, and then, it will be led to the existing joint air-conditioning system with release into the air through the stack of str. 46 Part A (identically as in the case of the remelting line, which is under construction).

The facility will serve to remelt sorted decontaminated and fragmented metallic RAW, which consists mostly of stainless steel, to a smaller extent of copper and aluminium.

The proposed optimisation will include the change of single-shift operation for the remelting line under construction to three-shift operation. The total annual treatment capacity of remelting technologies will increase from 1,000 t/year to max. 4,500 t/year of metallic RAW.

In terms of identification of present/monitored pollutants and acceptable rate of their emissions, the proposed facility can be adequately considered (with respect to treated materials and the way of their treatment) as a facility of the remelting line under construction, i.e. the provisions of Point 8, Part B, Annex No. 7 of Decree of the MoE of the SR No. 410/2012 Coll. for "Production of ferro alloys by electro-thermal and metallothermic procedures" can be applied. Based on the above-mentioned, only PM represents the monitored pollutant, for which an emission limit of 5 mg/Nm^3 has been determined (dry gas, standard status conditions of gas). The provision does not determine any special technical requirements and conditions of facility operation.
In relation to monitoring of emissions of pollutants, the provisions of Article 8 of Decree of the MoE of the SR No. 411/2012 Coll., which determines frequency/continuance of measurements for technological equipment depending on the expected mass flow, can be applied to the proposed technology to an adequate extent. In its wording, continuous monitoring of a pollutant is only determined if the mass flow of the pollutant from the source can be higher than ten times the limit mass flow for the existing equipment (unless otherwise stipulated by a special regulation or permit), which, with respect to the proposed capacity of air-conditioning for indicated areas and the level of mass concentration in discharged tail gases at a level of max. 5 mg/Nm^3, can be excluded.
However, just as in the case of remelting under construction, the conditions of operation, monitoring, as well as emission limits will be specified for the technology as part of nuclear installation in the decision of the NRA SR.
Contribution to radioactive discharges is expected, which is comparable with the currently constructed technology in str. 34. The furnace gases will be removed by the air-conditioning system with filtration stations, which will ensure the observance of the currently valid guide values for individual radionuclides.

Table B.II.1/09
Expected discharged radioactive contaminants from metallic RAW remelting into the atmosphere

Radionuclide	**Expected discharges into the atmosphere after the purification on filters with the assessed capacity of 1,000 t/year [Bq/year]**	**Expected use of guide values for stack 46/A [%]**	**Expected discharges with a capacity of 4,500 t/year [Bq/year]**	**Expected use of guide values for stack 46/A [%]**
^{60}Co	$3x10^5$	0.05	$1.35x10^6$	0.225
^{94}Nb	$6x10^5$	0.09	$2.70x10^6$	0.405
^{125}Sb	$3x10^5$	0.05	$1.35x10^6$	0.225
^{137}Cs	$1.2x10^7$	1.82	$5.40x10^7$	8.19
^{90}Sr	$6x10^5$	3.10	$2.70x10^6$	13.95
^{239}Pu, ^{241}Am	$4x10^3$	0.07	$1.80x10^4$	0.315

Table B.II.1/10
Expected impacts on the population resulting from metallic RAW remelting

Expected impact on the population	**capacity 1,000 t/year**	**capacity 4,500 t/year**
individual dose [Sv] (sector Ratkovce)	1.01×10^{-9} Sv	1.01×10^{-8} Sv
use of the limit 32×10^{-6} Sv	0.007%	0.032%

Operation of new compactor - does not produce any air pollutants.

The supplementation of storage capacities in structure 760-II. 3,4,5:V1 will not cause the production of any air pollutants.

Relocation of fragmentation and decontamination facilities from str. 800 to str. 760-II. 3,4,5:V1 - will not mean a change in the evaluation of contribution of this activity to air discharges.

During operation of all treatment facilities of Variant No. 1, air pollutants will be released into the atmosphere; in accordance with the valid decision of the PHA SR and set guide values for discharges of air pollutants, JAVYS, a.s. will not request any increase in guide values or increase in the set effective dose per a representative person from the population from discharges into the air and liquid discharges. Based on the summary value of guide values, real use of guide values in the previous year, and estimated contributions of treatment technologies in Variant No.1, it can be estimated that the use of the total guide value will be in the order of ones of percent.

With a high probability, the quantity of released activity will depend on the quantity of treated material.
Emissions (dust produced during modifications of structures), emissions from the operation of construction mechanisms or vehicles transporting construction materials and technological equipment will be produced during construction modifications of the existing structures and installation of equipment.
During operation of any treatment facilities included in variant No. 1, it will not be necessary to request for an increase in the currently valid guide values of activities of radioactive substances released into the environment through ventilation stacks. Thus, it will not be necessary to apply for any change for the limit of the effective dose per a representative person from the population. For liquid radioactive discharges, creation of radioactive liquid discharges at a level of about 3% for other fission and corrosion products is expected.
As it is obvious from the above, the change will cause an increase in activity only for the discharges from structures 46 Part A and B. Even despite the increase of activity, the limits (guide values) will be used with a large reserve and the provided estimate can be considered strongly conservative (e.g. for RAW incineration in the new incineration plant, activity of the treated waste was considered at the limit of maximum permitted activity of RAW incinerated in the whole volume of treated RAW), i.e. the operating reality will be most probably even more favourable.

Non-point pollution sources

The proposed variant is not connected with any change or creation of new non-point pollution sources.

Line and mobile sources

No new transport demands will be created in the proposed variant for the Proposer's operation. However, for the existing transport, in connection with an increase in the volume of transported materials, an increase in the frequency of freight transportation is expected (from 1-2 trucks per day to about 2 – 3 trucks per day); it represents the source of common pollutants from fuel combustion in engines (in particular NO_x, PM, VOC).

After the optimisation of treatment capacities of the NI RAW TCT and thus achievement of full increased treatment capacity of solved technologies, based on qualified estimate, it is possible to expect total transport demands higher by about 200 trucks per year for the transportation of raw materials, packaging and RA wastes, and by about 80 transits of FCCs to the NRWR.
If we take into account about 250 working days per year and with the mentioned transport demands of the solved technologies, in 2018 freight transport had an average frequency of 1-2 trucks per day. With the conservative approach (i.e. taking into account max. transport demands), the frequency will rise to about 2-3 trucks per day.

II.2. WASTE WATERS

Variant 0

A system of separate sewerage network is available to the Proposer in the premises of ***operation*** of RAW treatment and conditioning technologies.

Water from the surface run-off from structure roofs. roads and hard surfaces is removed from the company's premises through the rainwater sewerage. After the dosimetry control, they are released through the open Manivier channel, beyond the municipality Žlkovce in river km 10.1, into the river Dudváh.

Sink waters are removed from JAVYS structures through the foul sewer to the mechanical and biological waste water treatment plant MB WWTP of V1 NPP (BIOCLAR). The treated waste waters are discharged to the piping collector SOCOMAN.

Industrial waters that can be polluted by oil substances are led to the central gravity deoiler and after treatment, water is led to the treatment of additional cooling water by clarifying at SE, a.s.- EBO V2.

The technological (special sewerage) is led to collecting tanks of the structures for active water treatment for the respective area (for RAW TCT and A1 NPP, to str. 41, 809), and after it has been treated and checked, waste water is discharged along with sink waters through the SOCOMAN sewerage collector to the water body Váh (river km 101.8).
Waste water from remediation drawing of ground waters in A1 NPP is also discharged into Váh.

Active waste waters from the RAW TCT include:

- ✓ used decontamination solutions
- ✓ rinsing waters
- ✓ special sewerage removal *(contaminate waste waters from floors of individual operations - rooms, condensate drainage from air conduits, coolers and filters of ventilation systems, condensate drainage from the stack, showers, wash-basins and laboratory washing tables)*
- ✓ emergency discharge of evaporator distillate
- ✓ emergency discharge of scrubbing water (scrubber of smoke gases)
- ✓ leakage sumps of emergency tanks
- ✓ emergency discharge of tanks in individual elementary systems
- ✓ pumping of leaks
- ✓ etc.

The collected active waste waters are treated in str. 41, 809 by the technology of evaporating with after-cleaning of vapour condensates on the ion exchanger filtration station (radioactive concentrates from the evaporator are pumped for treatment by bituminisation).
The types of waste waters produced in individual workplaces and places of collection, treatment, and discharge of the waters meeting the limit for the release into the environment, as well as the quantities released in 2018, are provided in the following table. As it is obvious from the table, waste waters can be released into the SOCOMAN channel only from structures No. 809 and 41 (from str No. 808 only exceptionally).

Table B.II.2/01
Waste waters from individual workplaces and places of collection, treatment, and discharge

No.	Workplace /technology	Waste water types /LRAW	Place of collection (structure No.)	Place of treatment (structure No.)	Release into the environment m^3/2018
1.	Concentration	vapour condensate	808, 41	808, 41	-
2.	Cementation	flushing water of mixer	808	808	-
3.	Sorting	decontamination solutions	808	808	-
4.	Incineration	scrubber liquid	808	808	-
5.	Supercompaction	decontamination solutions	808	808	0
6.	PS 44 and PS100	vapour condensate, condensate of heating steam	809	809, 41	0
7.	Discontinuous BL	vapour	809	809, 41	-

	(DBL)	condensate, sludge liquor			
8.	Waste water cleaning station (WW CS)	vapour condensate, condensate of heating steam	41 41	41 809	1,257.50 2,204.50
9.	Workplace of metallic RAW treatment	-	-	-	-
10.	Treatment of air-conditioning filters	-	-	-	-
11.	Large-capacity decontamination line (LCDL)	decontamination solution	34	809, 41	-
12.	Fixed RAW pre-conditioning line	-	44/20	-	-
13.	Metallic RAW remelting facility	-	34	-	-

In 2018, total 440,414 m^3 of waste waters were discharged into the river Váh from all Proposer's operations at Jaslovské Bohunice; only waters from the surface run-off are discharged into Dudváh.

Of the waters discharged through the sewerage system SOCOMAN – water body Váh, about 3,462 m^3 of waste waters represented technological waters from the RAW TCT operation (see table above). Based on a qualified estimate, waste water production of about 5,500 m^3/year can be considered in case of utilisation of the whole treatment capacity of the solved technologies.

Waters from remediation drawing of ground water for the A1 NPP from the borehole N-3, with a quantity of 186,094.79 m^3 in 2018, are also led to SOCOMAN.

Characteristics of the waters and their comparison with the limits set in the permit of the District Office Trnava for discharging them are provided in the following table.

Table B.II.2/02
Average concentration of chemical pollution released into water body VÁH – 2018

Chemical indicators of pollution	Average concentration of released pollution (for 2018)	Maximum permitted concentration (Decision OU-TT-OSŽP2-2013/00026/Gl)
	mg/l	mg/l
Acidity, alkalinity - pH	8.053	9.00
biochemical oxygen demand -BOD_5	2.442	8.00
chemical oxygen demand – COD_{Cr}	10.097	30.00
insoluble substances - NL	15.000	20.00
soluble substances - RL	382.528	1,000.00
ammonia - $N\text{-}NH_4^+$	1.315	4.00
nitrates - NO_3^-	17.022	50.00
sulphates - SO_4^{2-}	24.272	150.00
chlorides - Cl^-	17.590	100.00
non-polar extractable substances - NES	0.022	0.35
total phosphates – $P_{tot.}$	0.402	2.00
iron - Fe	0.087	2.00
detergents - SAS	0.099	0.50

For the discharges into the hydrosphere, the Proposer must monitor the following for purposes of dose load monitoring and evaluation (Decision of the PHA SR No. OOZPŽ/7119/2011 date 21 October 2011):

a) radionuclides ^{3}H, ^{54}Mn, ^{57}Co, ^{60}Co, ^{65}Co, ^{65}Zn, ^{94}Nb, ^{110m}Ag, ^{125}Sb, ^{134}Cs, ^{137}Cs, ^{144}Ce
b) strontium ^{90}Sr
c) the radionuclides emitting alpha radiation ^{238}Pu, $^{239+240}Pu$, ^{241}Am

The Decision sets the following guide values for:

Váh

a) tritium
annually 1.0×10^{13} Bq, quarterly 2.5×10^{12} Bq
b) other fission and corrosion products
annually 1.2×10^{10} Bq, quarterly 3.0×10^{9} Bq

Dudváh

a) tritium
annually 3.7×10^{10} Bq, quarterly 9.25×10^{9} Bq
b) other fission and corrosion products
annually 1.2×10^{8} Bq, quarterly 3.0×10^{7} Bq

Discharges in 2018 and their activity are provided in Table No. B.II.2./03

Table B.II.2/03

Summary of liquid discharges of radioactive substances – water body Váh in 2018

Discharge type		Water body Váh				
		RAW TCT+A1 NPP	% of annual limit	V1 NPP(ISFS)	% of annual limit	JAVYS
Water quantity	[m³]	1,90E+05		4,00E+03		193800
Gamma spectrometric analysis	[MBq]					
^{54}Mn		1,08E-01		3,42E-02		0,142
^{55}Fe		-		1,64E+00		1,641
^{57}Co		7,19E-02		1,49E-02		0,087
^{60}Co		4,54E+00		5,16E-01		5,056
^{65}Zn		1,54E-01		7,93E-02		0,233
^{94}Nb		7,25E-02		2,61E-02		0,099
^{110m}Ag		7,41E-02		3,84E-02		0,112
^{125}Sb		5,04E-02		7,66E-02		0,127
^{134}Cs		7,17E-02		2,84E-02		0,100
^{137}Cs		1,01E+01		6,87E+00		16,972
^{144}Ce		3,90E-01		8,47E-02		0,475
Sum	[MBq]	**15,633**		**9,412**		**25,045**
Remediation drawing (^{60}Co)	[MBq]	1,605E+00		-		**1,605**
Alpha sepctrometric analysis						
^{238}Pu		4,53E-02		4,50E-04		0,046
$^{239+240}$Pu		5,13E-02		4,33E-04		0,052
^{241}Am		3,73E-02		1,23E-02		0,050
Sum	[MBq]	**0,134**		**0,013**		**0,147**
^{90}Sr	[MBq]	**3,91E-01**		**1,86E+00**		**2,246**
Corrosion and fission products	[MBq]	**17,790**	0,15%	**11,281**	0,09%	**29,071**
Tritium ^{3}H	[GBq]	**460,40**	4,60%	**2,378**	0,12%	**462,78**

Variant 1:

During operation of the incineration plant in str. 808, production of waste waters from flue gas wet purification is expected, i.e. waste waters from wet purification of waste gases of about 10 L/h (240 L/day, 24 m^3/years) will be produced. No waste water will result from the operation of the rotary kiln incineration plant in str. 809 as the purification of flue gases will use dry method. No waste water production from the remelting technology is expected, no waste water is produced during compaction or change of utilisation of str. 760-II.3,4,5:V1 for RAW storage. Expected production of waste waters provided in the Assessment Report for the C7-A3 Project "Construction of New Fragmentation and Decontamination Equipment of V1 NPP" will not be changed because of relocation of decontamination facilities from str. 800 to str. 760-II.3,4,5:V1, i.e. during yearly operation, service water consumption of about 50 m^3/year for the decontamination line and about 200 m^3/year for the decontamination of construction parts is expected. Activity of waste waters from the process of wet decontamination was expected at a level of 3.3×10^4 Bq/year.

II.3. WASTES

Variant 0:

The RAW TCT operation produces reasonable quantities of common (inactive) operating wastes, such as mixed municipal waste, various packaging wastes (e.g. mixed packaging, plastic packaging, paper and cardboard, packaging containing HS), administration wastes (e.g. waste printing toner), wastes from maintenance of equipment and rooms (e.g. absorbents, filtration material, rags containing HS, waste oils), etc. The Proposer manages all the wastes in accordance with the respective legislation with the emphasise on production prevention and preferable recycling. The following table provides informative production of wastes for 2018 (it is not always possible to exactly define an unambiguous share of solved technologies in the total quantity of waste produced by JAVYS, a.s.).

Table B.II.3/01
Production of inactive wastes, category "other", 2018

Catalogue No.	Waste type	Waste name	Quantity (kg)	Recovered	Disposed
170201	O	Wood	500	✓	
170604	O	Insulation materials other than those mentioned in 170601 to 03	2,000		✓
200301	O	Mixed municipal waste	9,000		✓
total quantity (kg)			**11,500**	**500**	**11,000**
total quantity in (%)			**100%**	**4.3 %**	**95.7 %**

Table B.II.3/02
Production of inactive wastes, category "hazardous", 2018

Catalogue No.	Waste type	Waste name	Quantity (kg)	Recovered	Disposed
150110	N	Packaging containing residues of HS, contam. HS	50	✓	
200121	N	Fluorescent tubes and other mercury-containing waste	80	✓	
160506	N	Laboratory chemicals consisting of HS, containing HS	20		✓
total quantity (kg)			**150**	**130**	**20**
total quantity in (%)			**100%**	**86.67 %**	**13.33 %**

Radioactive wastes or materials contaminated by radioactive substances are specific wastes produced during the activity. The wastes produced in direct relation to the performed activities are listed in the following table.

Table B.II.3/03
Production of active (secondary) wastes

Item	*Workplace/ technology*	*Waste types*	*Method of treatment/conditioning*	*Production*	
				for the use of whole treatment capacity	*2018*
1.	Concentration	protective equipment	incineration at the BRWTC	165 kg	120 kg
2	Cementation	protective equipment samples of cement products	incineration supercompaction, cementation	400 kg 2,000 kg	316 kg 378 kg
3.	Sorting	personal protective equipment air-conditioning filters	incineration,	1,500 kg 6,000 kg	890kg 0 kg
4.	Incineration	ash and fly ash, HEPA filters protective equipment	supercompaction, cementation PS 009 workplace treating used air-cond. incineration	16,000 kg 192 pcs 560 kg	8,569 kg 24 pcs 510 kg

5.	Supercompaction	protective equipment	incineration at the BRWTC	250 kg	480 kg
6.	PS 44 and PS100	protective equipment, active carbon, Vapex, saturated ion exchangers	incineration, incineration, compaction, bituminisation	2,600 kg 900 kg 900 kg 600 kg	0 kg 0 kg 0 kg 0 kg
7.	Discontinuous BL (DBL)	protective equipment	incineration	about 500 kg	0 kg
8.	Waste water cleaning station (WW CS)	saturated sorbents RA sludge protective equipment	bituminisation cementation incineration	2 m^3 1 m^3 1.5 m^3	0.48 m3 0 m3 100 kg
9.	Workplace of metallic RAW treatment	Swept up material, dust Metallic shavings Filling for blast cleaners Vacuum-cleaned dirt, filters from vacuum cleaners Protective equipment Filtration cartridges	Supercompaction Supercompaction cementation incineration Supercompaction	2000 kg 800 kg 2500 kg 1000 kg 2500 kg 500 kg	1,400 kg 500 kg 1,480 kg 500 kg 1500 kg 270 kg
10.	Treatment of air-conditioning filters	filters from vacuum cleaners personal protective equipment	Supercompaction Incineration	900kg 400 kg	450 kg 120 kg
11.	Large-capacity decontamination line (LCDL)	saturated decontamination solutions sludge from the sedimentation tank	special sewerage-concentration-bituminisation cementation	114 m^3 3.5 m^3	25 m3 0 m3
12.	Metallic RAW remelting facility	slag, fly ash from filters and operating waste - furnace lining, used filters, etc.	incineration, supercompaction, cementation	10,700kg	0 kg
13.	Fixed RAW pre-conditioning line	used filters protective equipment	incineration, supercompaction, cementation		400 kg 200 kg 0 kg

During RAW TCT operation, RAW is also produced by various supporting and service activities, for example,

- ✓ during decontamination work,
- ✓ repairs or maintenance of equipment in contact with RAS,
- ✓ operation of the whole air-conditioning system (filters), etc.

These materials are managed depending on their properties in the respective operations of RAW TCT. Their quantities are as minor included in the treated quantities of RAW, see Table B.I.3/01.

Variant 1:

Production of the following secondary RAW is expected from the operation of the incineration plant PS06 in str. 808:

- ash: 16 t/year
- flue gas purification filters: 192 pieces, about 12 t/year
- protective equipment: 0.5 t/year

Production of the following secondary RAW is expected from the operation of the rotary kiln incineration furnace PS 45 in str.809:

- ash and slag: 0.9 t/year
- solid waste from gas purification (cloth filter): 21.2 t/year
- solid waste from gas purification (capacity dioxin filter, active carbon): 0.75 t/year

The total estimated annual production of secondary wastes from parallel operation of incineration plants is 51.35 t.

Treatment of produced secondary wastes:

- ash and slag will be fixed in paraffin in the ash homogeniser. From there, it will be transported by high-lift truck for placing into FCCs.
- flue gas purification filters will be treated in the workplace of treatment of used air-conditioning filters PS009
- protective equipment and cloth filters will be incinerated
- solid waste from mechanical purification of gases will transported by worm conveyor to the after-cooling chamber and then fixed with ash and slag.
- contaminated active carbon will be incinerated in furnace in quantities of about 50kg/h, i.e. the whole quantity of these secondary wastes will be incinerated for about 15 hours.

Secondary RAW will be produced by metallic RAW remelting, such as: worn heat-resisting material from the pot, lining material, small quantities of slag, solid wastes from gas purification, etc. and metallic ingots releasable as usable material.
Non-active wastes: wastes from equipment maintenance, such as waste oils (hydraulic oil from compactor maintenance).

Operation of the relocated technologies of F and D equipment to str. 760-II.3,4,5:V1 will produce secondary wastes: liquid RAW, sludge, blast cleaning material, working equipment, filters and material with radioactive contamination.

The following secondary wastes are produced by the current operating activities of fragmentation:

- RAW produced by blast cleaning decontamination about 5.5 t/year.
- Production of other solid secondary RAW (cutting materials) expected in the amount of 1 t/year.

For the placing of technologies of optimisation of treatment capacities, modification of construction surfaces will be necessary, which can result in small amount of construction debris and construction materials. Useless assembly material from assembly will also contribute to waste production. The following categories of wastes are expected:

Table B.II.3/04
Expected construction-type waste

Catalogue No.	Waste type	Waste name	Waste description
170107	O	Mixtures of construction materials not containing hazardous substances	Concrete, bricks, tiles etc.
170405	O	Iron and steel	Residues from steel structure modifications
170407	O	Mixed metals	Sheeting (e.g. galvanised sheet)
070411	O	Cables other than provided in 170410	Cu, Al cables
170904	O	Mixed wastes other than provided in 170901, 170902, 170903	Other waste from buildings and demolitions

II.4. NOISE AND VIBRATIONS

Variant 0:

During operation of RAW TCT technologies, several technological devices represent the sources of noise, such as pumps, blenders, fragmentation equipment, air-conditioning, etc. However, all the equipment is closed in internal premises of structures, thus, they have no impact on external areas.

In relation to external areas, the service freight transport in the area and out of it with irregular frequency used exclusively in day hours of business days also represents a relevant source of noise. Conservative estimate is that transportation out of the premises will reach about 2-3 trucks per day, in the area about 460 transports can be expected depending on the rate of utilisation of individual technologies (if converted into business days, it means about 1-2 transports per day).

Vibrations of adequate intensity are again connected with the operation of some technological devices (e.g. the travelling equipment for FCCs, etc., only in the close surroundings) and related transport for the operation (when trucks with semi-trailers are used).

Variant 1:

Variant 1 will be connected with a time-limited period of stage of execution, which will consist in the execution of construction modifications or construction of new structures; these activities will cause noise in the vicinity of modified or constructed structures (construction and transportation mechanisms).

II.5. RADIATION AND OTHER PHYSICAL FIELDS

Variant 0:

The subject of activity of the RAW TCT technologies is treatment and conditioning of RAW containing various radionuclides with various activities (see more details in Chap. II.8.). As a consequence of performed activities, the technologies also produce waste gaseous fluid and waste waters with the content of RAS released into the environment (see more details in Chap. IV.2.1 and IV.2.2.). Materials from decommissioning, whose activity allows it (e.g. soils, concrete, metallic waste, ...) are also released into the environment.

In this connection, the internal areas, where RAW TCT technologies are situated, are affected by ionising radiation.

In general, radiation protection of the population is governed by Act No**.** 87/2018 Coll. on radiation protection and on the amendment to certain acts.
The annual limit of irradiation of **32 μSv/year** for a representative person from the population from discharges of radioactive substances (discharges into the atmosphere and hydrosphere) from the premises of JAVYS, a.s. Jaslovské Bohunice was set by decisions of the state supervision - PHA SR No. OOZPŽ/3760/2011 and No. OOZPŽ/7119/2011.

For the documented year 2018, based on real meteorological measurements and real discharges, the ESTE AI programme identified jointly for all the Proposer's facilities on site the uninhabited sector 181 to the north-west of the Proposer's premises as a sector with the highest calculated impacts, where the potential critical group would be the age category of 16 and more years. The calculated total effective dose and committed effective dose by all considered paths would be $3.01.10^{-7}$ Sv. Sector 75 (Pečeňady) was identified as an inhabited sector with the highest total individual dose, where the critical group is the age category of 16 and more years. For this category, a total effective dose and committed effective dose by all considered paths was calculated for a representative person - $1.95.10^{-7}$ Sv. The main contribution is from the atmosphere, the total effective dose and committed effective dose from hydrosphere in this sector is 0 Sv. As it is obvious from the above mentioned, the values are lower by order than the basic limit value only for the solved part of the Proposer's equipment at the site.

Radiation protection of employees is also governed by Act No. 87/2018 Coll. on radiation protection and on the amendment to certain acts.

Infrared (IR) radiation will occur in the close vicinity of melted metal and near the open, hot parts of the furnace bath and pouring ladle, and when charging RAW and slag-forming additives through the handling opening of the furnace.
Presence of electromagnetic field is not expected.
With respect to the remelting of scrap metal with the RAW character, the original radioactivity will be divided among three products. Remelted metal, created slag, and created outlet of solid particles captured by filters. Metal will contain accumulated radioactivity from radioisotopes of heavy elements,

light ash from light, volatile elements, and the slag from elements divided according to its adjusted composition and division coefficients. Thus, the slag melt is the only part, which can regulate the division of radioisotopes among the melting products.

Variant 1:
The operations of added technologies will produce radioactive substances released into the environment in the form of gaseous and liquid discharges, while observing all set guide values so that the limit of effective dose of a representative person from the population is observed.
Radiation protection of employees will also be governed by Act No. 87/2018 Coll. on radiation protection and on the amendment to certain acts.

With both RAW incineration plants in operation with a capacity of 480 t and activity of input RAW $6x10^6$ Bq/kg, discharges of radionuclides were calculated with activity $7.2x10^6$ Bq/year, which represents an individual dose for a representative person from the population of $1.94x10^{-9}$ Sv (use of limit 0.0061%).

The change of use of structure 760-II.3,4,5 (relocation of technologies of fragmentation and decontamination, monitoring workplaces, cable treatment workplace) will not change the quantity of radioactive substances released into the air in comparison with Variant 0.

For both metallic RAW remelting facilities in operation with a total capacity of 4500 t/year, discharges of radionuclides with total activity of $6.21x10^7$ Bq/year were calculated (the values of discharges of individual radionuclides are provided in Table No. B.II.1./04), which represents an individual dose per representative person of the population of $1.01x10^{-8}$ Sv (limit used 0.032%).

II.6. SMELL AND OTHER OUTPUTS

RAW TCT technologies are no relevant sources of emissions of pollutants to the municipal environment changing the smell situation in their surroundings.

The technologies do not represent sources of heat emissions into the external environment exceeding common values, either.

II.7. ADDITIONAL DATA

The activity in the assessed form is present in the affected territory, thus, its operation does not require any interventions in the affected landscape.

C. COMPLETE CHARACTERISTICS AND ENVIRONMENTAL IMPACT ASSESSMENT INCLUDING HEALTH IMPACTS

I. SPECIFICATION OF THE BOUNDARIES OF THE AFFECTED TERRITORY

In terms of characteristic of natural conditions, the affected (assessed) territory means a circle with a radius of about 5 km, with its centre approximately at the site of location of RAW treatment and conditioning technologies. In terms of socio-economic characteristics and population characteristics, the affected territory means united cadastral territories of the municipalities, whose residential area is situated in the affected territory defined above.

II. CHARACTERISTICS OF THE CURRENT STATE OF THE ENVIRONMENT IN THE AFFECTED AREA

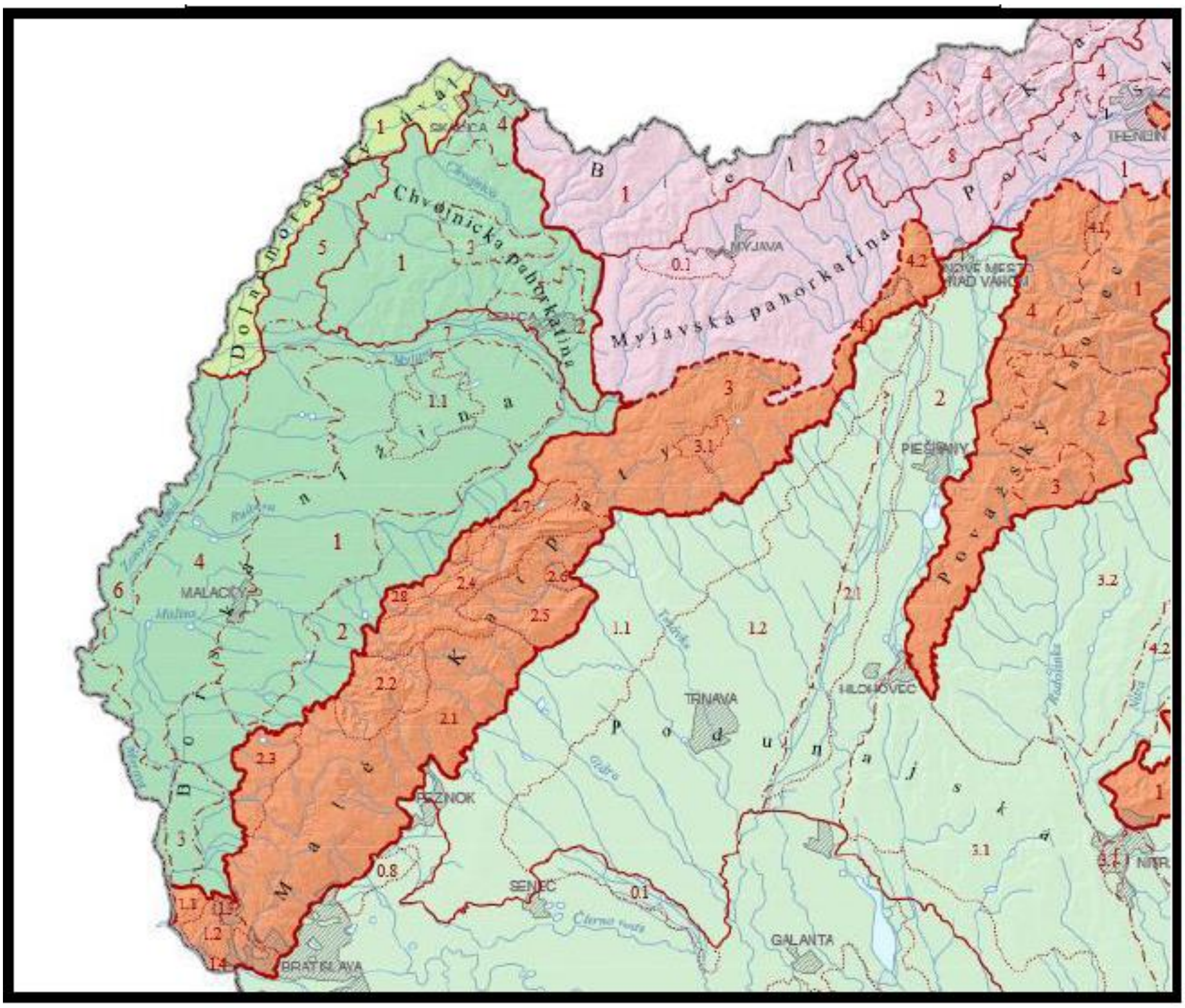
II.1. GEOMORPHOLOGICAL CONDITIONS

According to the geomorphological division of Slovakia (Landscape Atlas of the SR, 2002), the territory of the proposed activity belongs to the geomorphological units provided in the following table.

Table C.II.1/01
Geomorphological division of the territory of interest

System	Alpine-Himalayan
Subsystem	Pannonian Basin
Province	Western Pannonian Basin
Subprovince	Small Danube Basin
Area	Danube Lowland
Unit	Danube Upland
Subunit	Trnava Upland
Part	Trnava Table

Figure C.II.1.



Geomorfological units of wider territory (SR country atlas, 2002)

The area under assessment is located in the Trnava Uplands. The slightly undulating relief of the Trnava Uplands forms a morphological depression between the Little Carpathians (in the east) and Považský Inovec (in the west). The river Váh, with its floodplain on its lower course (Váh is in the distance of about 8 km from the site of nuclear facilities), also participates in the relief modelling. The uplands relief to the south vanishes and gradually passes into the Danube plain.

Slight modulation of the relief is conditioned by the presence of sediments of aeolian origin - loess and loess-like loams, which were deposited by wind here in the interglacial times (middle and upper Pleistocene), and which reach the thickness of up to 20 m. The layers of loess and loess-like loams smooth out terrain unevenness, caused by tectonic movements and erosion. This part of the Trnava Uplands is therefore referred to as the Trnava Loess Slab. The altitude at the SW location is around 172-173.5 meters above sea level.

II.2. GEOLOGICAL CONDITIONS

GEOLOGICAL STRUCTURE

According to regional geolog. division of Slovakia, the affected area is classified as follows:

First order unit (area, sector)	intramotane basins and kettle depressions
Second order unit (sub-area, zone)	Danube Basin
Third order unit	Trnava-Dubnica Basin
Fourth order unit	Blatné Depression

From the geological point of view, the area under assessment is located in the northern tip of the Danube Basin, in the Blatné Depression.
We rank the Blatné Depression as a tertiary sedimentary basin, because its filling is dominated by Tertiary sediments of marine origin.
Quaternary cover consists mainly of humous clays, loesses and loess-like loams (Trnava Loess Slab), alluvial clays and terraces around the river Váh. Humous clays are usually up to 1.5 m thick, occasionally up to 5 m thick. Loesses and loess-like loams reach max. up to 20 m, 5 - 15 m around SW. Where the loess is deposited on the older buried terraces of Váh (eastwards), the thickness of the Quaternary sediments may exceed even 30 m.

Fig. C.II.2./01
Map of engineering geological zoning

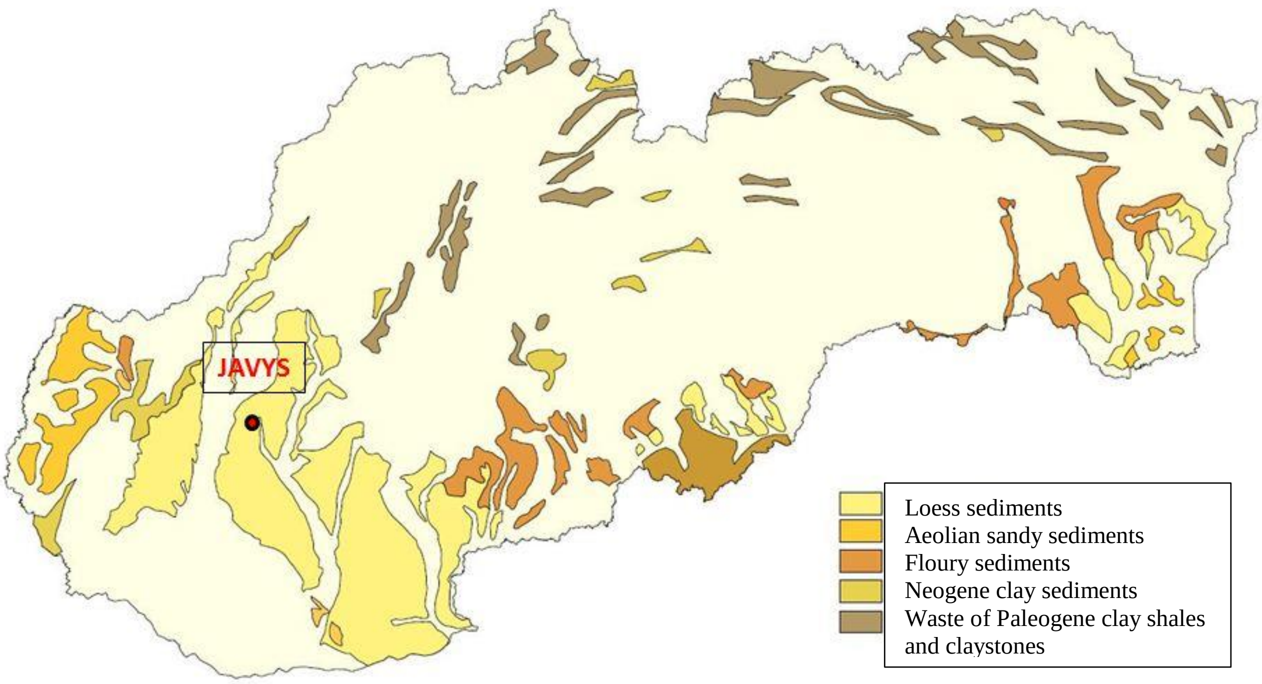
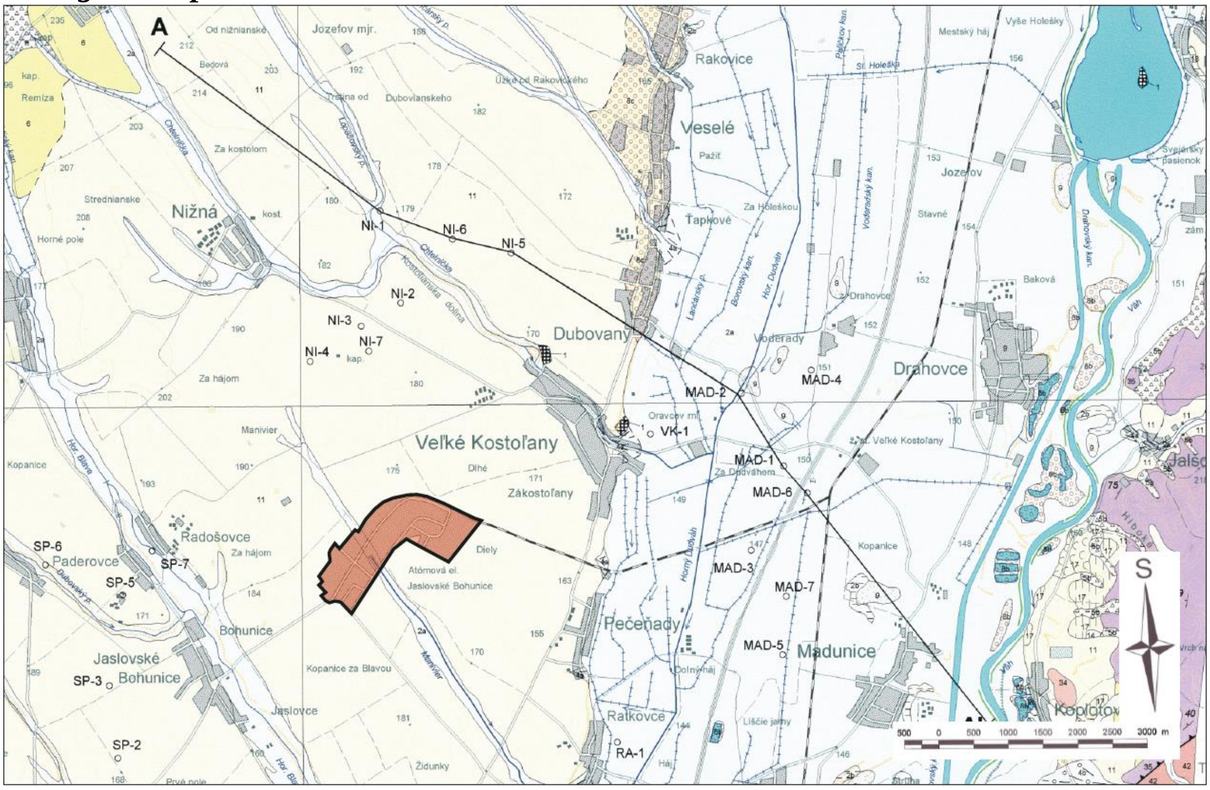
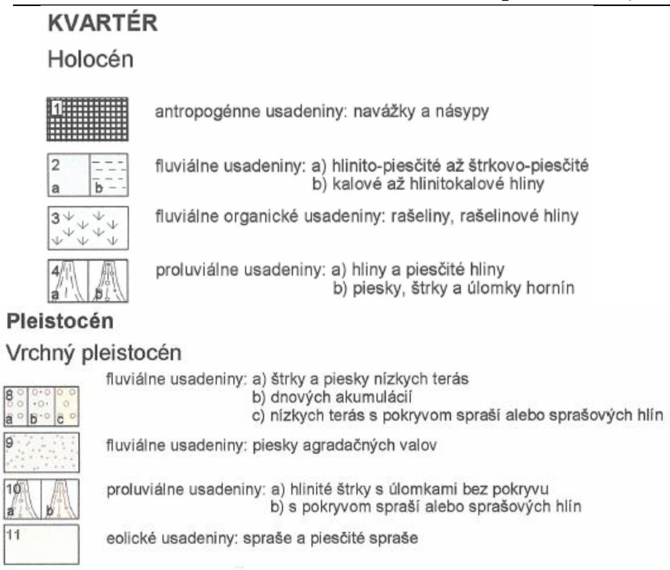
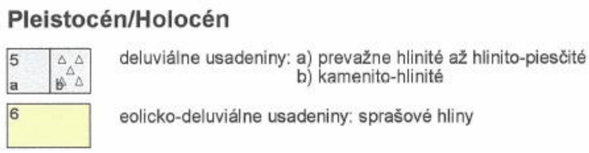


Figure C.II.2./02
Geological map section



Explanation (selected items):





Source: I. Kováč et al. in J. Schwarz et al., 2004 (Set of regional maps of geological environmental factors of Trnava Uplands region, ENVIGEO, 2004)
Comment Area of the NF Jaslovské Bohunice is marked in red

Under the Quaternary cover there are Tertiary sediment layers (from top to bottom):

- predominantly river sediments of younger Neogene (Pliocene) character of gravel positions (around 100 m thick in the vicinity of Jaslovské Bohunice),

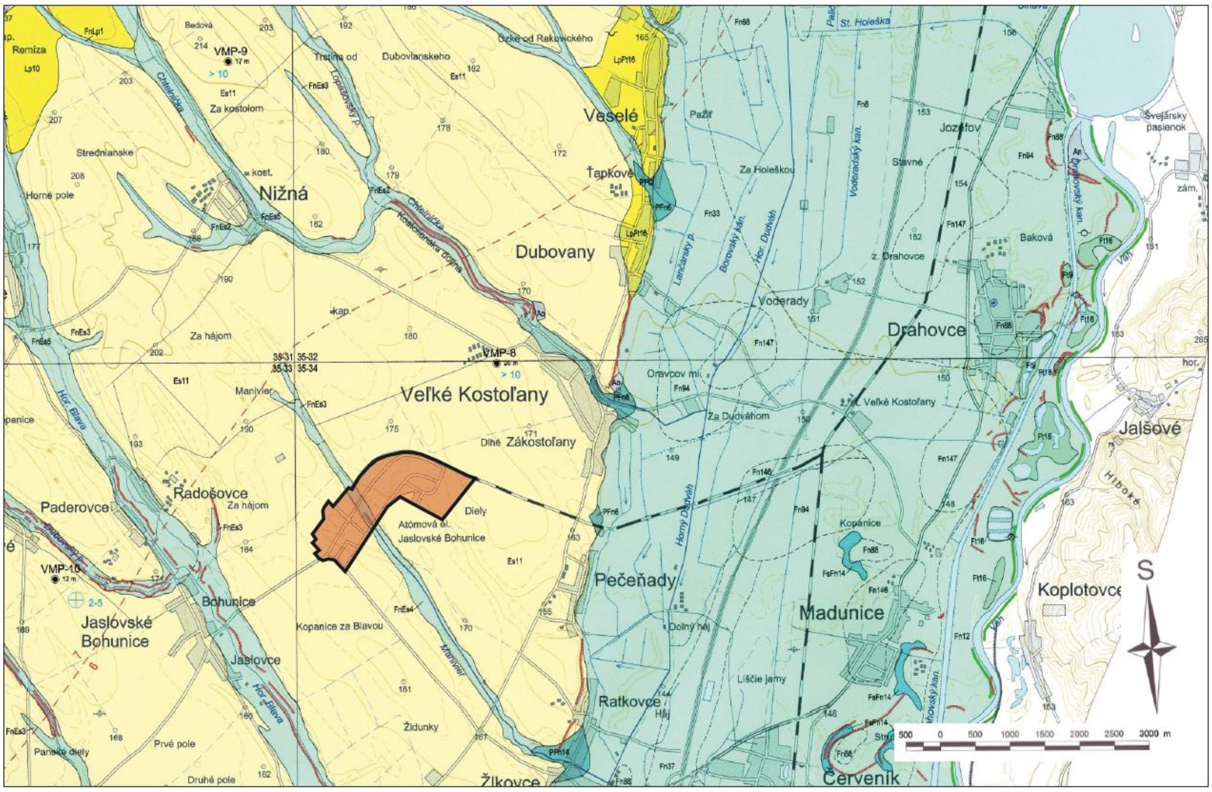
- lacustrine and alluvial sediments of Pannonian - Pont, with character of colourful clays and sands, with lignite positions (up to 300 m thickness),
- predominantly marine sediments of the older Neogene (Miocene), namely the Sarmatian shallow-marine clays and sands, polymictic Badenian sands and conglomerates, sands, sandstones and conglomerates of Otnang and Carpathian, and also the ones of Egenburg. These marine deposits are mostly classical (i.e. formed by fragments of flooded rocks - clays, sands, gravel and their cemented equivalents), monotonous, reaching large thickness (altogether, the Blatné depression, filled by Tertiary sediments reaches a thickness of almost 2,000 m).

Tectonic faults divide the sediment layers into individual blocks, descending towards the center of the depression. The faults in the NE-SW direction were active in Sarmatian and Pannonian ages, the faults of the NW-SE in the Pliocene, the activity of which still fades-away.

ENGINEERING-GEOLOGICAL CONDITIONS

The engineering-geological characterization of the territory is conditioned by the geological structure of the area at the level of foundations. For the area of the NF complex Jaslovské Bohunice, the determining characteristic is the presence of a thick (10 - 15 m) layer of eolic sediments - loess and loess-like loams.
The territory of Trnava Loess Slab with the thickness of eolic sediments over 5 m, in which the whole area of NF Jaslovské Bohunice is located, is classified in the engineering-geological area of aeolian loess Es11.
From a hydrogeological point of view, this area is built by poorly permeable soils and continuous groundwater horizons are rarely developed. Usually, the groundwater is concentrated into the environment forming the sublayer of aeolian loess. As long as the ***geodynamic phenomena*** are concerned, the area is particularly susceptible to surface subsidence, creation of the gully erosion, erosion of banks of watercourses and reservoirs.
According to the classification of STN 73 1001 standard, the area is built predominantly by fine-grained soils of classes F6 and F5. According to STN 73 3050 standard, we classify the soils in the 2nd class of mineability. The soils are suitable for embankments and are suitable for embankment sealing elements.
Engineering-geological conditions for construction in the area are influenced by collapsibility, frequently frost-susceptible character, and the susceptibility of the territory to erosive processes. The area is conditionally suitable for waste disposal.

Figure C.II.2./03
Engineering geological mapping section



Legend: *Es - Aeolian loess area (Es11 - loess thickness over 5 m)*
FnEs - lowland alluvial deposits area on aeolian loess (FnEs3 - fine-grained alluvial soils up to 2 m; FnEs4 - fine-grained alluvial soils 2 - 5 m; FnEs5 - alluvial gravel 2 - 5 m)
Fn - lowland alluvial deposits area (the numerical indices indicate different lithological character and thickness of alluvial deposits)

Source: A. Ilkanič in J. Schwarz et al., 2004 (Set of regional maps of geological environmental factors of Trnava Upands region, ENVIGEO, 2004)

<u>SEISMICITY</u>

Initial seismological data for the NF Jaslovské Bohunice locality were elaborated in the period 1969 - 1970, and the seismic loading of buildings was set using 7-grade MCS scale (Mercalli - Cancani - Siebert). According to initial studies, the supposed probable strongest earthquake in Jaslovské Bohunice could be an earthquake with a magnitude of 6 - 6.5 grade on MCS, corresponding to the value of 4.2 on the Richter scale.

Table C.II.2./01

Modified MCS (Mercalli - Cancani - Siebert) scale[4] to determine the intensity of the earthquake

Earthquake intensity	Earthquake
I.	No one can feel the earthquake except for sensitive people (in favourable circumstances).
II	Only a few people feel it in peace; objects suspended not very strongly swing.
III	It can be perceived inside the buildings. Standing cars may shake.
IV	Generally, it is perceived inside, sleepers are waking up, cars are shaking, windows are creaking.
V	Everybody feels it, plaster falls in places, crockery and windows break, pendulum clock stops.
VI	Everybody feels it - many people are scared. Chimneys and plaster are damaged, furniture is moving, objects are turning over.
VII	Everyone runs out. The earthquake is perceived even in moving cars. Buildings are slightly damaged.
VIII	General alarm. Weak buildings are heavily damaged, walls and furniture capsize, wells change water levels.
IX	Panic. Weak buildings are completely destroyed, extensive damage is also on well-built buildings, foundations and underground pipelines, the ground is full of fissures and cracked.
X.	Panic. Only the strongest buildings persist, the ground is very cracked, the rails are bent, the water spills over the river banks.
XI	Panic. Only few buildings can survive, there are wide cracks in the ground, breaking scarps emerge, underground pipelines do not serve any more. The rails are heavily bent.
XII	Panic. Total destruction, visible waves on the ground, field of vision and horizon are disturbed, objects flying in the air.

Source: http://sk.wikipedia.org/wiki/Modifikovan%C3%A1_Mercalliho_stupnica

The terrain of this area is flat with a maximum slope of 1°, which corresponds to favourable conditions excluding secondary earthquake phenomena, in particular the danger of gravitational burrows.
It was determined that in the 200-year period, the earthquake at Jaslovské Bohunice is most likely to reach 6.5° of MCS. Subsequently, it was determined that the earthquake in this area is a rare phenomenon and, according to the analysis, there were no seismic issues preventing the use of this area as a construction site for a nuclear power plant.
The original bases for the seismic assessment were revised in 1986 and subsequently in several steps, in line with the development of methodologies, data and safety requirements. Based on the seismic risk

[4] *is similar to the MSK-64 scales (used in the former Eastern Bloc), as well as the EMS-92 and EMS-98 (established by the European Seismological Commission in Europe)*

assessment (1989), a seismic hazard calculation (1997) was prepared and the main seismic characteristics were determined as follows:

- probability of an earthquake occurring once every 10,000 years,
- intensity 8º on MSK-64 scale[5],
- maximum horizontal acceleration of 0.25 m/s^2 and a vertical acceleration of 0.13 m/s^2,
- duration of decisive movements 10 s.

For the design value of the earthquake with probability of 10^{-2} years (100 years), the intensity of the 7 on MSK-64 scale, with half of the values of the earthquake acceleration, was determined. The reaction was represented by the projects of seismic improvement of selected nuclear power plant equipment, implemented since 1998 to this day.

RADON RISK

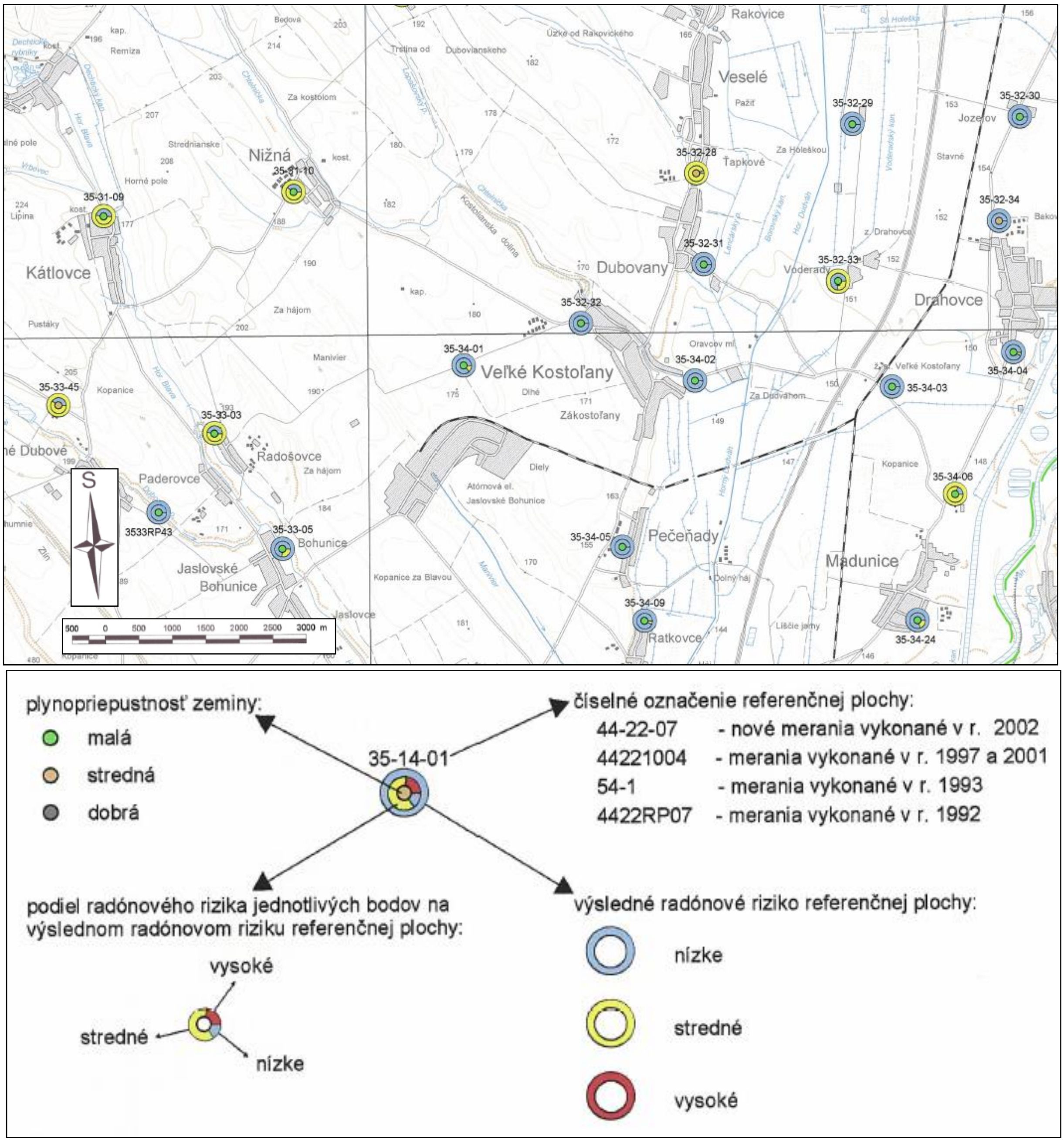
Radon (^{222}Rn) in our territory is one of the most important sources of natural origin radiation, i.e. radon is not generated by NPP activities. The danger is that radon itself is a gas that can be inhaled, but the daughter products of its decay (polonium, bismuth and lead) are solids that can get caught in the body and cause cancer after some time and exposure.
Radon originates at considerable depths, from where it reaches the surface along important tectonic lines. In the buildings built on such zones with insufficient sealing of the basement premises, accumulation of radon may occur in cellars and basements, representing a risk to human health. Therefore, several regional surveys of radon content in soil air were conducted.

This chapter draws on a survey from r. 2003 (J. Hricko, F. Suchý, I. Zeman, 1993 in J. Schwarz et al., 2004), following several earlier measurements.

Generally, we can say that the values of the radon content in the vicinity of the NF Jaslovské Bohunice area are low, moderate in places, the level of radon risk is the same as in the lowland regions of Slovakia, thus it is mostly low.

[5] *Scale Medvedej (USSR) - Sponheuer (GDR) - Kárník (ČSSR), 12-degree from 1964, for the purposes of this report, it may be considered equivalent to the MCS scale*

Figure C.II.2./04
Radon risk map section



Source: J. Hricko, F. Suchý, I. Zeman, 2003 in Schwarz et al., 2004: Set of regional maps of geological environmental factors of Trnava Uplands region

The closest point with a high radon risk is in the town of Piešťany, which is related to the deep-seated tectonic lines, along which the thermal springs in the Piešťany spa also emerge.

MINERAL DEPOSITS

On the territory of the Trnava District, the District Mining Office in Bratislava (as of 31 December 2018) registers 12 protected deposit areas of reserved minerals, 9 mining areas (as of 20 January 2017) and one deposit of non-reserved minerals.

Table C.II.2./02
Protected deposits of Trnava district territory

Name PDT	Mineral
Boleráz	brick loams
Buková	limestones and dolomitic limestones
Cífer	natural gas
Dechtice	building stone (limestone)
Dechtice I	dolomitic sands
Dechtice III - Lažteky	high grade limestone
Horná Krupá	natural gas
Križovany nad Dudváhom	technically usable natural gas
Lošonec	melaphyre
Nižná - Špačince	natural gas
Trstín	dolomite and calcareous dolomite
Trstín I	dolomite suitable for chemical-technological processing

Table C.II.2./03
Mining areas in Trnava district

Name of the MA	Mineral
Boleráz	brick loams
Buková	limestones and dolomitic limestones
Dechtice	building stone
Dechtice I	dolomitic sands
Horná Krupá	natural gas
Lošonec	melaphyre
Špačince	natural gas
Trstín	dolomite and calcareous dolomite
Trstín I	dolomite

Table C.II.2./04
Deposits of non-reserved minerals in Trnava district

Name	Mineral
Zemianske Šúrovce	pit-run gravels

The most important mineral deposits of the affected territory and its immediate surroundings are deposits of flammable natural gas, linked to sediments of marine origin of the Badenian age of the Trnava Gulf of the Danube Basin.

About 2 km north of the NF Jaslovské Bohunice area, there is a protected deposit area of the Nižná reserved deposit, between the villages of Nižná and Dubovany, covering an area of about 30 ha. The location of Badenian sands containing natural gas (a mixture of C_1 - C_4 hydrocarbons, in particular methane, nitrogen and CO_2) is located at a depth of about 650 - 670 m, the next one up to 850 m. They were found by a survey from 1982 (Moravské naftové doly, k.p.). In terms of quantity and quality of natural gas, this deposit is currently considered unprofitable.

A similarly protected deposit area is located 4 km southwest of the Jaslovské Bohunice area, and is called Špačince. It lies between Špačince and Jaslovské Bohunice villages, and has an area of about 6 ha (250 x 250 m). Natural gas was verified at a depth of 2.2 km and 2.7 km, also by a survey from 1982. Similar to the Nižná deposit, this deposit is currently considered to be unprofitable (M. Rajec, 1992 in "Regional Mineral Resources Study of the Districts of Slovakia", 1993, actualized 1996).

As long as the other mineral deposits are concerned, the building stone deposits to the west in the foothills of the Little Carpathians, the following are worth of mentioning: Trstín (limestone) - about 17 km crow-fly distance from NF Jaslovské Bohunice, and Dechtice (dolomite) - about 11 km from the NF.

Several pit-run gravel deposits, exploiting the gravels of the river Váh, e.g. in Drahovce or Červeník, are also worth of mentioning.

II.3. SOIL CONDITIONS

Soil types, grades and value

Parts of the affected area, incorporated into the Trnava Slab, form the soil-forming substrate of the loess. Therefore, a wide range of soils can be found throughout the affected area, from muck to ilimerized soils and in the Váh bottom land a series of hydromorphic soils. Almost the whole area of NF Jaslovské Bohunice is located originally on black-brown earth, in the places of construction changed to an anthro-earth (the original soil was transformed by construction activity).

Another group is the soils of the built-up area (municipalities, NF Jaslovské Bohunice area), where the soils are affected by a long-term anthropogenic and intensive activity. The original soil types have been altered, rebuilt, and have the character of ground in places. Human intervention in natural soil-forming processes has resulted in anthropogenic soils, which are soils that have been intensively cultivated, or degraded in a long-term period, or completely destroyed. From the point of view of anthropogenic and anthropogenically affected soils, there is predominantly characteristic anthropogenic earth, charging stock form and anthropogenically affected agricultural soil, in the affected area and its surroundings.

Pleistocene and Holocene rocks form the majority of pedogenitic substrates. In parts of the affected area, which is included in the Trnava Slab, the pedogenitic substrate is formed by loess, and by loess-like loams in the Little Carpathian Uplands. The bottom land of the river Váh is formed by another pedogenitic substrate - carbonate alluvial deposits. Therefore, a wide range of soils can be found throughout the affected area, ranging from black soils to illimerized soils, and a number of hydromorphic soils in the Váh bottom land.

The following soil types are found in the territory concerned:

1. Brown earths, climatically bound to a warm area with an average temperature of 9 - 10 ºC. The substrate is formed by a loamy loess, less of the loess blankets and deluvia. The humus content of topsoil is most often between 1.1% and 1.5%. Brown earths are found in places where the original growth consisted of thermophilic oaks and oak-hornbeam forests for a long time. The forests were gradually cut down and today, the whole area (except for small groves) is agricultural land.
2. Black earths, bound to a warm area with an average temperature of 9 - 10 ºC and an average rainfall of 550 - 600 mm. The humus content is from 1.5% to 2.5%. The development of black earths was determined by steppe and forest steppe vegetation. There was a large production of organic matter in the soil and humidification prevailed during the transformation. This process resulted in creation of a largely deep humus horizon, predominated by valuable substances with a well-developed granular structure.
3. Flood-plain soils, where the continuous or periodic impact of groundwater on the soil profile has been applied. The capillary supported moisture periodically reaches the soil surface. In the presence of calcium carbonate, a higher content of stable substances of favourable quality accumulates in the soil and there is a moderate to deep overproduction in the humic profile. The humus content is from 2.5% to 3.5% of favourable quality, with a neutral to basic reaction.
4. The alluvial soils are the youngest in development. Their turfy type soil-forming process was often disrupted by floods with alluvial accumulation, associated with a weak gleyey process with periodic excessive profile wetting by the capillary-supported water and flood waters. Layers of alluvial soils of varying thickness, granularity and humus content can be observed in the alluvial soil profile. The humus content ranges from 3.5% to 4.4%.
5. Another group is the soils of the built-up area (municipalities, NF area, workplaces in its neighbourhood in Jaslovské Bohunice). These are mainly urban cultivated soils in the gardens of the family houses and adjacent grounds on the outskirts of municipalities, or urban soils degraded at social fallow lands, road protection zones, production areas and other built-up areas.

Most of the affected territory, belonging to the Trnava Uplands, is characterized by soils belonging to black earth (central part of the affected area). These are mainly typical black earths and degraded black earth. The southern part of the affected area intersects an islet of the carbonate black earth. Black earths border on the west side a brown soil area that covers the entire north-western part of the affected area. The south-western part of the affected territory partially intersects in the north-west-south-east direction a band of carbonate flood-plain soil, stretching along the Blava watercourse. Also in the eastern part of the affected territory, at the end of the Trnava Slab, or the Trnava Uplands, and where the affected territory reach into the bottom land Lower Váh, there is found a carbonate flood-plain soil and gley soil.

Land evaluated soil-ecological units (BSEU) are relatively homogeneous soil-climatic units which are further subdivided on the basis of slope, slope exposure, skeletal composition, soil depth and granular composition of the surface horizons. BSEU apply only to agricultural land. The soils of the affected territory are among the five main BSEUs (12001, 12601, 12701, 13901 and 14401), all of which are categorized as high-production arable land, or as our most productive arable land.

Most of the affected territory includes land evaluated soil-ecological units (BSEUs) belonging to the 2nd and 3rd soil quality groups, i.e. soils with high production capacity (high land evaluation), some of the soils represent BSEUs belonging to the 6th soil quality group, i.e. soils with medium production ability.

Despite the high degree of agricultural activity in terms of *soil pollution* caused by agriculture, the affected territory is one of the least polluted areas on a nationwide scale.

Degree of susceptibility to mechanical and chemical degradation

The mechanical degradation of soils depends on several endogenous (cohesiveness, adhesiveness and consistency) and exogenous factors (relief, vegetation cover, atmospheric precipitation and wind). Chemical degradation of soils in the affected territory can be caused by several factors (acidification of the soil fund, contamination of soils with heavy metals, organic substances, fertilizers and pesticides). Urbanized areas are characterized by significant anthropogenic alteration of the soil.

In terms of soil characteristics of the affected territory, i.e. their skeletal and adhesive properties (gley soils, illimerized, non-skeletal and weak-skeletal soils) in the affected territory, can be considered as well resistant soils to mechanical and chemical degradation. Among the exogenous factors, the influence of relief, precipitation and wind are important factors in terms of mechanical soil degradation.

The relief in the affected territory is mostly flat (bottom land of Dudváh, bottom land of the Blava creek, slab and uppermost positions of the uplands), without any manifestation of water erosion, and partially slightly sloping with the possibility of manifestation of water erosion (western border and north-western part of the affected territory). Smaller erosion can also occur near water courses where washing and accumulation processes are more intense. The flat terrain of the bottom land of Dudváh, the swamping and soil leaching threatens at high water levels in the streams.

The problem of the affected territory is deflation of arable land. The uncovered terrain of the area with predominantly cultivated arable land (85.5% of the cadastral area of the affected municipalities) provides conditions for wind erosion, especially in the extra-vegetative period. Reduction of the deflation depends on the quality, intensity and correct timing of agrotechnical practices.
Chemical soil degradation can be caused in the affected territory, or in its wider surroundings, by several factors, e.g. soil acidification, contamination of soils, in particular with heavy metals, other inorganic and organic substances from industrial activities and industrial fertilizers and pesticides from agricultural activities.

Soil acidification has been determined in the affected territory from long-distance transmission, from emission sources of the wider surroundings, especially from industrial sources of the towns of Trnava, Leopoldov, Hlohovec, Piešťany and from transportation. The acidification is caused mainly by SO_2, NO_x imission fallout, or fluorine from the Johns Manville Trnava plant. The decline in pesticide and industrial fertilizer contaminants was mainly due to a substantial reduction in their use due to the worsening economic situation of virtually all agricultural cooperatives in the territory.

Quality and degree of soil pollution

The decline in pesticide and industrial fertilizer contaminants was mainly due to a significant reduction in their use due to the worsening economic situation in agriculture in the area of interest. Large-scale breeding farms have disappeared or have been reduced, primarily reducing the risk of pollution and environmental damage. There are no areas of significant anthropogenic activity or economic activities within the affected territory, which could result in contamination of the agricultural land.

Based on geochemical monitoring of soils in Slovakia in 1991-1995, we can state that none of the monitored heavy metals exceeded the limit values set pursuant to the Decree of the Ministry of Agriculture of the Slovak Republic on the maximum permissible values of harmful substances in soil and on determination of organizations authorized to investigate the real values of these substances (No. 531/1994-529, rem. currently not valid limits).

Contamination of soils by radionuclides

Within the framework of Bohunice NI radiation monitoring, the soil activity in the surroundings is monitored, as well. The soils are sampled once a year. The regular monitoring of the surroundings of the NPP by the operator and by supervisory authorities confirms the conclusion that the terrain in the surroundings of the NPP is not contaminated by artificial radionuclides to an extent permitting to identify the contamination at the level of background.

II.4. CLIMATIC CONDITIONS

In general, according to climatic division of Slovakia (Landscape Atlas of the SR, 2002), the site of nuclear installations Jaslovské Bohunice belongs to warms, very dry district with moderate winter in warm climatic area with an average number of warm days 50 and more per year. In accordance with long-term statistics, average temperatures in January do not drop below -6 °C and average temperatures in July are about 21 – 22 °C. Average summary of precipitations ranges from 450 to 640 mm. North-west winds prevail and average wind speed ranges from 3 to 4 m/s.

Table C.II.4./01
Average monthly (annual) air temperatures in °C at Jaslovské Bohunice station for years 2016 to 2018

Station	Year	I.	II	III	IV	V	VI	VII	VIII	IX	X.	XI	XII	Ø
Jaslovské Bohunice	2016	-1.3	5.1	5.7	10.2	15.2	19.5	21.3	19.1	17.8	9	4.3	-0.3	10.4
	2017	-6.1	2.1	7.9	9.1	15.6	20.9	21.6	22.4	14.7	10.5	5	1.8	10.5
	2018	2.7	-1.1	2.8	15.2	18.6	20.2	21.8	23.4	16.6	12.6	6.9	1.4	11.8
	Ø	-1.6	2.0	5.5	11.5	16.5	20.2	21.6	21.6	16.4	10.7	5.4	1.0	10.9

Source: Yearbooks of Climatic Observations of SHMI for the period 2016-2018, SHMI

Table C.II.4./02
Average monthly (annual) precipitation totals in mm at station Jaslovské Bohunice for years 2016 to 201 8

Station	Year	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Σ year
Jaslovské Bohunice	2016	46.2	79.1	9.1	28.7	92.2	17.4	157.3	49.5	28.9	58.3	43.8	25.6	636.1
	2017	15.9	16.4	18.6	37.9	30.9	21.1	63.7	43	57.1	45.7	51	49	450.3
	2018	34.7	29.5	32.8	20.1	66.6	46.3	34.7	21.2	184.7	13.5	17.4	59.1	560.6
	Ø	32.3	41.7	20.2	28.9	63.2	28.3	85.2	37.9	90.2	39.2	37.4	44.6	549.0

Source: Yearbooks of Climatic Observations of SHMI for the period 2016-2018, SHMI

Table C.II.4./03
The average monthly (annual) wind speed in m/s at Jaslovské Bohunice station for years 2016 – 2018

Station	Year	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Ø
Jaslovské Bohunice	2016	2.5	3.7	3.6	3.5	2.9	2.3	3.1	2.8	1.9	3.1	3.5	3.1	3
	2017	3	2.7	3.6	4.3	3	3.2	3	2.8	3.1	3.3	3.2	3.8	3.3
	2018	3.2	4.6	4.1	4.5	3.3	3.7	3.5	3.4	3.2	4.1	4	3.9	3.8
	Ø	2.9	3.7	3.8	4.1	3.1	3.1	3.2	3.0	2.7	3.5	3.6	3.6	3.4

Source: Yearbooks of Climatic Observations of SHMI for the period 2016-2018, SHMI

In terms of the frequency of individual wind directions occurrence, the north-west wind is significantly, along with the north and south-east winds, and winds with a lower average wind speed are the south-west, east and south wind, with the lowest occurrence.

Table C.II.4./04
Average wind speed in m/s for each direction at Jaslovské Bohunice station over the years 2016 – 2018

Station	Year	N	NE	E	SE	S	SW	W	NW
Jaslovské Bohunice	2016	2.6	1.9	2.6	3.2	2.3	2.2	3.9	4.3
	2017	3	1.9	2	3.4	2.9	2.6	4.2	4.7
	2018	4	3.1	3.1	4.5	3.7	2.6	3.9	4
	Ø	3.2	2.3	2.6	3.7	3.0	2.5	4.0	4.3

Table C.II.4./05
Relative frequency of occurrence of wind directions in ‰ at the station Jaslovské Bohunice for the years 2016 - 2018

Station	Year	N	NE	V	SE	S	SW	W	NW	Calm
Jaslovské Bohunice	2016	154	84	59	153	63	51	115	250	71
	2017	135	74	56	137	74	66	129	256	72
	2018	226	96	75	174	61	55	79	222	12
	Ø	172	85	63	155	66	57	108	243	52

Graphic representation for the years 2016 - 2018

Figure C.II.4./01
Average wind speed in m/s for individual directions at Jaslovské Bohunice station for years 2016 - 2018

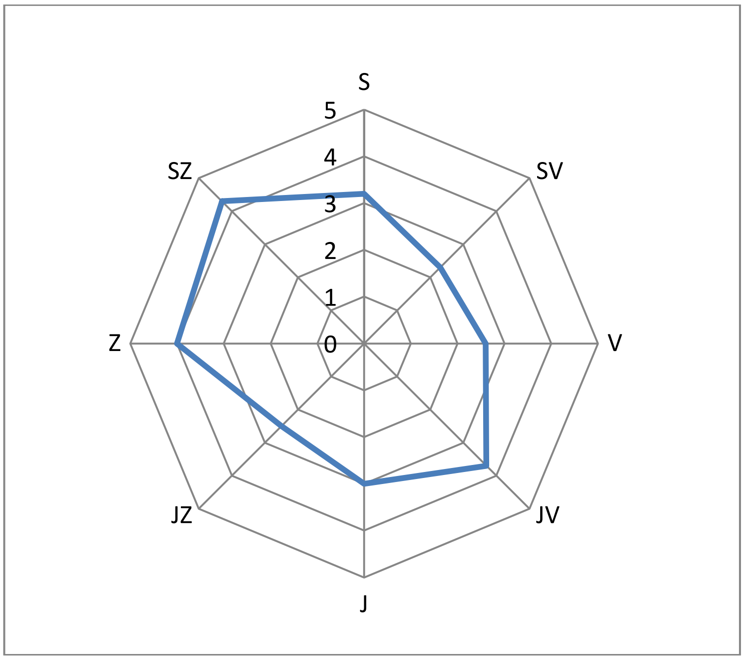
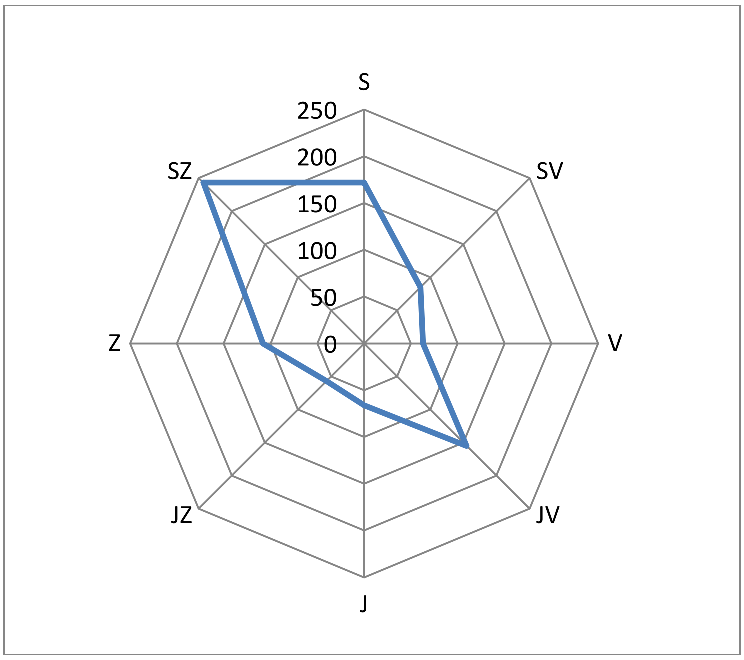


Figure C.II.4./02
The relative frequency of wind directions occurrence in ‰ at Jaslovské Bohunice station for years 2016 – 2018



II.5. AIR

AIR POLLUTION CONDITION

Several APSs are operated directly on the premises of the company JAVYS, a.s. in Jaslovské Bohunice:

- medium sources:
  - **Reserve boiler room (boilers K3 and K4)** - object No. 441
  - **diesel generator Caterpillar Olympian** - object No. 585d:V1 - emergency power supply,
  - **diesel generator Martin Power MP 1700 -** object No. 32.1 - emergency power supply,
  - **diesel generator Martin Power MP 400** (2 pcs.) **-** object No. 713:V1- emergency power supply,
- small sources:
  - **diesel generator Caterpillar 3306 -** at object No. 840:M (MSVP) - emergency power supply,
  - **production of fiber concrete mix (FCM)**

Radioactive waste incineration plant, which is not categorised as an air pollution source in accordance with the Act on Air (agreed after the meeting of individual government authorities) is a specific establishment.

Table C.II.5/01
Summary of emissions of common pollutants from certain sources directly on the premises of the NI Jaslovské Bohunice (2018)

Pollution source	**Fuel**	**Number of operating hours**	**Pollutant quantity (kg)**				
	Natural gas (th. of Nm^3)	**h/year**	**PM**	**SO_2**	**NO_X**	**CO**	**$C_{org.}$**
NaRK	6.73	9	0.512	0.061	11.256	3.773	0.480
LOOS boiler	8.63	113	0.656	0.079	12.785	5.163	0.861
	Diesel oil (t)	**h/year**	**PM**	**SO_2**	**NO_X**	**CO**	**$C_{org.}$**
DG Caterpillar Olympian	0.362	7	0.515	0.007	1.814	0.290	0.026
DG Martin Power MP 1700	2.069	10	2.830	0.040	9.967	1.595	0.219
DG1 Martin Power MP 400	0.1008	2	0.286	0.004	1.008	0.161	0.022

DG2 Martin Power MP 400	0.1008	2	0.286	0.004	1.008	0.161	0.022
DG Caterpillar 3306	1.2	20	1.704	0.024	6.000	0.960	0.137
Production of fibre-concrete mixture	-	-	31.5	-	-	-	-
Total pollutants from all APS (kg)			38.29	0.22	43.84	12.10	1.77

In terms of air pollution within the territory of the SR, the site of the nuclear installations itself and its surroundings belongs to territories with lower load, characterised as "moderate pollution". Thanks to favourite orographic and climatic conditions, the territory is well ventilated, which ensures sufficient dispersion of emitted pollutants. In addition to remote transmission of pollutants, air quality is in particular affected by emissions from large industrial sources situated in the examined territory. Therefore, increased concentration of pollutants can be seen in particular in the surroundings of great settlements (mainly Trnava and Hlohovec). The territory is also affected by a line air pollution source, which is D1 Highway corridor.

The basic starting point for the assessment of air quality in Slovakia are the results of airborne pollutants concentrations measurements, carried out by SHMI at stations of the National Air Quality Monitoring Network (NAQMN).

There are 3 NAQMN stations in Trnava region, one of them is the rural EMEP. The results of the monitoring in 2016 at these stations, presented in the "Report on air quality and contribution of individual sources on its pollution in the Slovak Republic", are presented in the following table.

Table C.II.5./02
Evaluation of air pollution according to the limit values for the protection of human health in 2016

		Health protection								
	pollutant	**SO_2**		**NOx**		**PM10**		**PM2.5**	**CO**	**Benzene**
Agglomeration Zone	**Averaging time**	1 hour	24 hours	1 hour	1 year	24 hours	1 year	1 year	8 hour	1 year
	Limit value (number of exceeded cases)	350 (24)	125 (3)	200 (18)	40	50 (35)	40	25	10,000	5
Trnava region	**Trnava, Kollárova St.**			0	37	15	27	18	1982	0.3
	Topoľníky, Aszód, EMEP	0	0	0	7	15	23	15		

Exceeding of legislative limits for human health protection pursuant to Decree No. 244/2016 Coll. on air quality as amended is not indicated in the affected territory.

The sources of ***gaseous discharges of radioisotopes*** in the air in the affected territory:

- NPP V2 belonging to Slovenské elektrárne (SE, a.s. plant EBO (NPP V-2)),
- Nuclear installations of the Nuclear and Decommissioning Company:
  - NPP V1 - 2nd decommissioning phase,
  - NPP A1 - 3rd decommissioning phase,
  - TTC RAW (Technology for Radioactive Waste Treatment and Conditioning),
  - IR RAW (Integral repository of radioactive waste)
  - ISFSF (Interim Spent Fuel Storage Facility in Jaslovské Bohunice).

Impacts of operation of nuclear installations are monitored through gaseous and liquid discharges, for which annual limits have been determined. The objective of limit values of discharges is to ensure that summary discharges of radioactive substances into the surroundings from all sources at the site with normal and specific operating conditions are such that the operation of nuclear installations including planned activities of decommissioning will not cause the exceeding of the annual limit of irradiation 0.25 mSv/year for an individual from the critical group of inhabitants as a consequence of radioactive discharges into the atmosphere (Act No. 87/2018 Coll. on radiation protection and on the amendment to certain acts).
However, the operator of nuclear installation, in addition to fulfilling the duty of not exceeding the set guide values, also must ensure that the discharges from the nuclear installation are kept as low as reasonably achievable taking into account the social and economic aspects (ALARA principle).
Gaseous emissions are monitored and evaluated in all cases in relation to the determined guide values (annual limits). Information for the operation of SE-EBO is (together with evaluation of liquid radioactive discharges) regularly published on the following website: http://www.seas.sk/sk/spolocnost/zivotne-prostredie/vplyv-prevadzok/atomove-elektrarne-bohunice.
The proposer's sources are also monitored and evaluated, whereby the outputs are also published on the proposer's website.

Table C.II.5/03
Annual guide values of discharges of radioactive substances from ventilation stacks of JAVYS

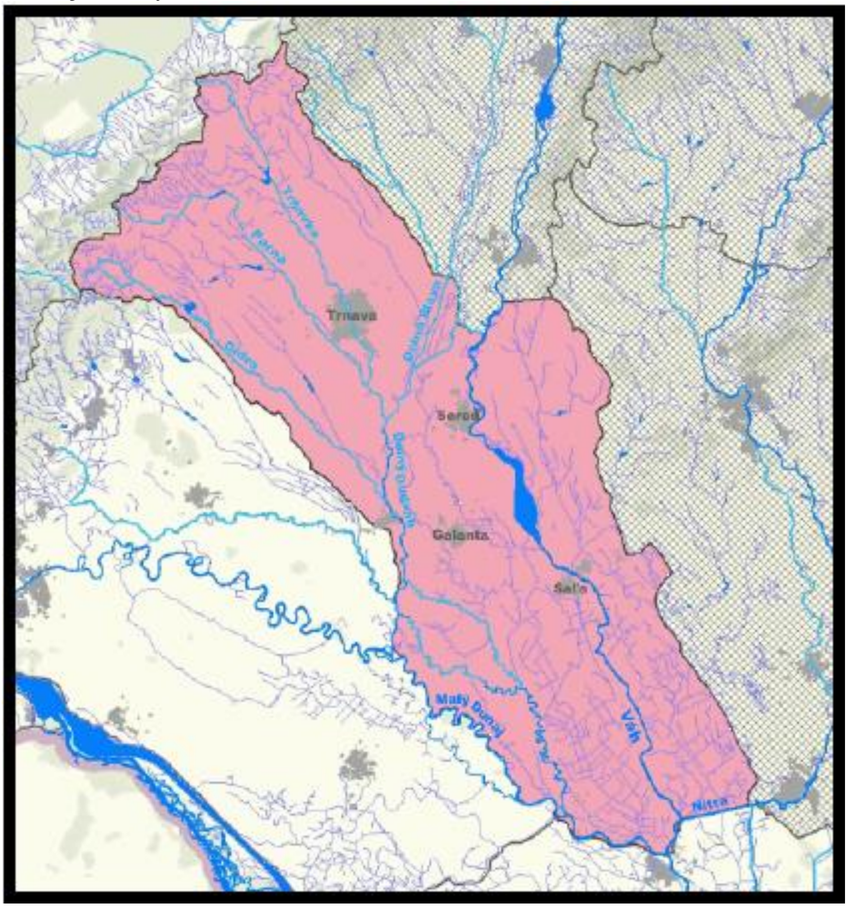
Ventilation stack	**Mixture of radionuclides with long half life in aerosols**	**Mixture of ^{89}Sr and ^{90}Sr in aerosols**	**Mixture of radionuclides emitting alpha radiation (^{238}Pu, $^{239+240}$Pu and ^{241}Am)**
	[Bq.year^{-1}]	**[Bq.year^{-1}]**	**[Bq.year^{-1}]**
VS V1 NPP	$8x10^{10}$	$1.4x10^{8}$	$2.0x10^{7}$
VS str. 46 Part “A“	$6.58x10^{8}$	$1.96x10^{7}$	$6.16x10^{6}$
VS str. 46, Part “B”	$1.41x10^{8}$	$4.2x10^{6}$	$1.32x10^{6}$
VS str. 808	$1.41x10^{8}$	$4.2x10^{6}$	$1.32x10^{6}$
VS str. 840 (ISFS)	$3.0x10^{8}$		

Discharges into the atmosphere from all NIs of JAVYS, a.s. (V1 NPP, A1 NPP, RAW TCT, ISFS, IRAWS) in 2018 can be assessed as very low, well below the set limit values and without extraordinary events.

The general evaluation along with other monitored indicators prove only a minimum impact of the SE, a.s. EBO plant and JAVYS, a.s. premises on the environment.

II.6. HYDROLOGICAL CONDITIONS

Figure C.II.6.
The catchment area of Dolný Váh



<u>*SURFACE WATERS*</u>

The site of Jaslovské Bohunice and premises of JAVYS, a.s. are situated in the lower part of Upper Dudváh basin. The municipality of Jaslovské Bohunice lies in the lower part of the Horná Blava water basin, on its right bank. The Horná Blava stream is a right-hand tributary of the Horný Dudváh river and flows into it in its river km 7.6. The catchment area of Horná Blava at the mouth to Horný Dudváh is 131.26 km^2. Under the village Bučany, approx. 0.5 km from the mouth to Horný Dudváh, there is a separating object, diverting part of the flow to Dolná Blava stream. The length of the stream from the separating object to the spring is 27.5 km.

The area of the company JAVYS, a.s. is located outside of the catchment area of Horná Blava. The premises of JAVYS, a. s. are situated in two basins, the basin of the Manivier channel and the basin of the Pečeňady channel. Both channels can be considered water courses of Order IV with a character of lowland stream.
The artificially created Manivier channel flows to the south-east and debouches into the Upper Dudváh in its river km 13.2. The area of the basin in the mouth is 18.152 km^2. The length of the stream is 5.5 km. The basin is longitudinal to elongated, the shape of the basin is 1:8. The highest point in the water basin lies at an altitude of 205 meters above sea level. The lowest point is the mouth to Horný Dudváh, about 142 meters above sea level. The maximum height difference in the water basin is 63 m.

The artificially built Pečeňady flume drains water from the Horný Dudváh interbasin, whereby it flows from the North to the South and flows into Horný Dudváh at its 13.45 river km. The stream bed is situated outside the area, and the JAVYS, a.s. buildings and equipment cannot be affected by its throughputs. The total area of the interbasin drained by the Pečeňady flume is 17,398 km^2. The highest point in the water basin is at an altitude of 187 m above sea level, the lowest point is at the mouth to the Horný Dudváh - 142 m above sea level, which means that the maximum height difference in the river basin is 45 m.
Taking into account the distance of the rivers, terrain and elevation of the sites, it can be said that the NF complex cannot be directly endangered by floods from the surrounding watercourses and waterworks.

WATER AREAS
The nearest water reservoir representing also a source of cooling water for the Jaslovské Bohunice NPP is the reservoir Sĺňava on the river Váh near Piešťany (about 10 km beeline).
Several artificial reservoirs - gravel pits are along the Drahov flume near the village Drahovce.
In the foothills of the Little Carpathians, east of the NF Jaslovské Bohunice area, there are several water reservoirs as a source of water for irrigation, eventually for recreation (water reservoir Dubová - 6 km from NPP; water reservoir Boleráz - 14 km), or breeding ponds (Hornokrupské ponds - 10 km).

GROUND WATER
Ground water is accumulated in the collector consisting of gravels and sands. The body of fine-grained soils in the hanging wall of gravels and the body of soils of Neogene subgrade represent hydrogeological insulators. Free surface of ground water is at a level of about 150 ~ 151 m a.s.l. or around 22 ~ 23 m under the terrain surface. The level is slightly set below the level of the border line between gravels and alluvial clays of the hanging wall.

Springs and areas of seepage
At present, the groundwater in the area of interest are are used for the needs of the population only individually - mainly for irrigation. For other uses of water from individual sources, groundwater from deep drilled and pierced wells can be used without much risk, but the water from the dug wells is not recommended for use, due to the vulnerability of groundwater to sources of pollution such as agriculture.
Due to the implementation of one of the measures in the protection zone of nuclear facilities Jaslovské Bohunice - to ensure the supply of residents in this area from public water supply pipelines from independent sources of drinking water - the supply of the population in the area of interest is currently ensured through group water supply pipelines (GVS) mainly operated by the company TAVOS, a.s.,

with the headquarters in Piešťany, whereby the group water supply pipelines are interconnected by the superior system of Veľké Orvište - Vrbové - Piešťany - Hlohovec - Trnava, using groundwater sources in the area of Dobrá Voda, Dechtice and Trnava, taking about 550 $l.s^{-1}$, water sources Veľké Orvište and Rakovice - about 300 $l.s^{-1}$, water source in the area of Leopoldov with 100 $l.s^{-1}$ and other smaller water sources. At the same time, the water system in question is able to ensure a smooth supply of quality drinking water for all consumers.
Currently, a public water supply network is available in almost all municipalities of the affected districts of Trnava, Piešťany and Hlohovec, with the exception of Sasinkovo (Hlohovec district), the municipalities of Bašovce and Šípková (Piešťany district) and two municipalities in the area of interest belonging to Trnava district - Bíňovce and Horná Krupá. In the case of the both municipalities, the water supply pipeline is currently under construction and its connection to the Trstín - Horná Krupá - Bíňovce group water supply is being considered.
Generally, it can be stated that the connection of municipalities of the concerned districts to public water mains was from 92.59% (Trnava district) to 95.83% (Hlohovec district), as of 31 December 2015.

THERMAL AND MINERAL SPRINGS
Neither mineral or thermal water sources, nor their protection zones are registered or recorded in or around the affected area. The nearest mineral and thermal waters are in Piešťany.

TERRITORIES PROTECTED DUE TO WATER-MANAGEMENT

There is no water-management protected area interfering with the evaluated territory, according to § 31 - 34 of Act No. 364/2004 Coll. on Waters and on the amendment of Act No. 372/1990 Coll. on Offenses as amended (Water Act).
Decree of the MoE of the Slovak Republic No. 211/2005 Coll., establishing a list of important water-management watercourses and water supply streams, classified Dolný and Horný Dudváh under hydrological numbers 4-21-10-009 and 4-21-16-045 as significant watercourses from water-management aspect.

II.7. FAUNA AND FLORA

FAUNA
Taking into account the character of the territory with agricultural landscape dominating, there are no preconditions for quality and variety of biota in the territory. Animals live in islands of bushy and tall vegetation represented by gardens of detached family houses, ruderal vegetation and remains of growth of original floodplain forests and growths on the banks of water courses. Greater species variety is also bound to water bodies, flowing and standing, as well as intermittent. The other water bodies are utilised occasionally, mainly for food acquisition.
The affected area, but mainly the wider neighbourhood of the area, provides habitat for protected and important species of invertebrates, such as saga pedo (Saga pedo pedo), praying mantis (Mantis religiosa), locust (Tibicina haemabodes) and stag beetle (Lucanus cervus). The aquatic invertebrates are represented by the lowland mayflies (Ephoron virgo). Several species of molluscs, amphibians and reptiles are bound to the flood-plain forests environment. The zoogeographically and faunistically important are e.g. the green lizard (Lacerta viridis), the dice snake (Natrix tesselata) and the Carpathian

newt (Triturus montandoni), which are also the endangered species. The most abundant representatives of vertebrates are birds, with more than 250 species detected so far in the territory, of which about 110 species are nesting. No nesting of protected and significant bird species was recorded in the affected territory. However, given the proximity of the SPA, there is a presumption that birds will fly to the affected area for food. Mammals are represented poorer in comparison to birds, with small species occurring in particular. There are no protected and significant species, as there are no endemic or relict mammalian species. Hunting game is represented by all important species - roe deer, deer, wild boar, hare, pheasant, fox.

FLORA

The territory under assessment belongs to the cultural country with the prevailing agricultural production. The degree of biodiversity in the agricultural country is very low.

Potential natural vegetation of the Trnava loess slab would be grassy steppe with xerophilous vegetation or Peripanonnian oak-hornbeam forests (Cl - oak, common hornbeam, with Solomon's seal in the undergrowth - according to Š. Maglocký, Atlas krajiny SR, 2002). On the slopes of the hills there would be oak and Austrian oak forests (Qc - Austrian oak, winter oak, yellow oak (Q. acuminata), gray-green oak (Q. pedunculiflora) in the undergrowth with mountain sedge (Carex montana), black broom (Cytisus nigricans), Vicia cassubica, pulmonaria sp.(Pulmonaria mollis) and narrow-leaved meadow-grass (Poa angustifolia).

In bottom land of the low-laying streams the so called hard alluvial forests would grow - i.e. ash-elm-oak forests (U - field elm (Ulmus minor), European white elm (Ulmus laevis), common oak (Quercus robur), in the shrub layer with elderberry (Sambucus nigra) and in the undergrowth with wild garlic (Allium ursinum) and yellow anemone (Anemone ranunculoides). The original vegetation of the affected territory has been largely transformed into intensively used agricultural areas, which also surround the nuclear facilities. The plant communities of the agricultural landscape currently represent secondary plant communities (ruderal communities and agricultural monocultures). The original plant communities have only been preserved on islets and safe sites, especially along the streams.

PROTECTED, PRECIOUS AND ENDANGERED SPECIES AND BIOTOPES

In the place of siting of the technologies of interest, there is no evidence of occurrence of protected, precious or endangered flora or fauna species, however, an isolated occurrence of such individual cannot be excluded.

SIGNIFICANT MIGRATION CORRIDORS OF ANIMALS

In general, significant migration corridors of animals are ecologically important segments of the landscape, often the line vegetation communities. Their function consists in the interconnection of bio centres of various levels. The water course Váh was defined as a biocorridor of transregional significance. Biocorridors of regional significance include Dudváh, Trnávka, Gidra, Parná, Blava and Krupiansky Brook.

II.8. LANDSCAPE

LANDSCAPE STRUCTURE, LANDSCAPE SCENERY AND IMAGE

The landscape image is a set of factors affecting man through optical, aural and ethmoid perceptions. In this context, the aesthetic and scenic qualities of the landscape image must be particularly emphasized, providing the basis for creation of the first impression, the spontaneous initiating relationship of man and the landscape.
The affected territory covers the premises of the Jaslovské Bohunice Nuclear Power Plant situated about 2 km from the closest residential built-up territory of the municipalities Jaslovské Bohunice, Veľké Kostoľany, Pečeňady and Radošovce.
The premises are situated in flat terrain and characterised by the nuclear power plant's structures, access roads and hard surfaces.
The affected territory and its wider surroundings represents an agricultural landscape with the dominating function - arable land.
The SE EBO nuclear power plant area, with its dominant cooling towers, is a landscape structure element that is clearly identifiable with elements of uniqueness.

II.9. PROTECTED AREAS PURSUANT TO SPECIAL REGULATIONS AND THEIR PROTECTION ZONES

The affected territory and its surroundings are situated in the territory with the first degree of landscape and nature protection in accordance with Act No. 543/2002 Coll. on landscape and nature protection (as amended). There are no large-size protected areas (national parks, protected landscape areas) in the affected territory. In accordance with Act of the National Council of the Slovak Republic No. 543/2002 Coll. on nature and landscape protection as amended, the wider surroundings contain one protected landscape area, three protected areas and one nature reserve. The closest large-area protected site is the Small Carpathians Protected Landscape Area, whose territory stretches to the west from the site of Jaslovské Bohunice. It is the only large-area protected vineyard territory with the prevalence of broadleaved forests with the occurrence of beech, ash, maple, and linden.

From the ***small-scale protected territories***, the closest to the NF site are the following:

- Protected area “Dedova jama” (about 6 km east of the NF area) - declared to protect the remains of the original floodplain forest, which is important as an animal safe site, an important landscape-forming element and a locality of rare occurrence of the summer snowflake (Leucojum aestivum) population, and other protected plant species.
- Protected area “Malé vážky” (about 7 km south east of the NF area) - declared for the protection of aquatic biocenoses, important from the scientific, educational, cultural point of view.
- CHA Sĺňava is declared for the protection of waterfowl and aquatic biocenoses and for scientific and research purposes. It is one of the areas with the highest concentration of seagulls in Slovakia, an important wintering place and migration corridor for many bird species in spring and autumn. It is located about 11.4 km north east of Jaslovské Bohunice locality. The raw water intake structure for nuclear installations is located at the edge of the water reservoir.
- Protected area “Trnavské rybníky” (about 17 km south west of the NF area) - declared for the protection of waterfowl and aquatic biocenoses for scientific research and educational purposes.

- The Sedliská Nature Reserve is declared for the protection of xerothermic stands of the steppe character with a rich occurrence of pasque flower (Pulsatilla pratensis subsp. Nigricans, P. vulgaris ssp. Grandis), accompanied by other important thermophilic species of animals and plants, and for scientific and research and cultural-educational objectives. It covers an area of 5.85 hectares and is protected in degree IV of protection. It is located about 11.3 km east of Jaslovské Bohunice locality.

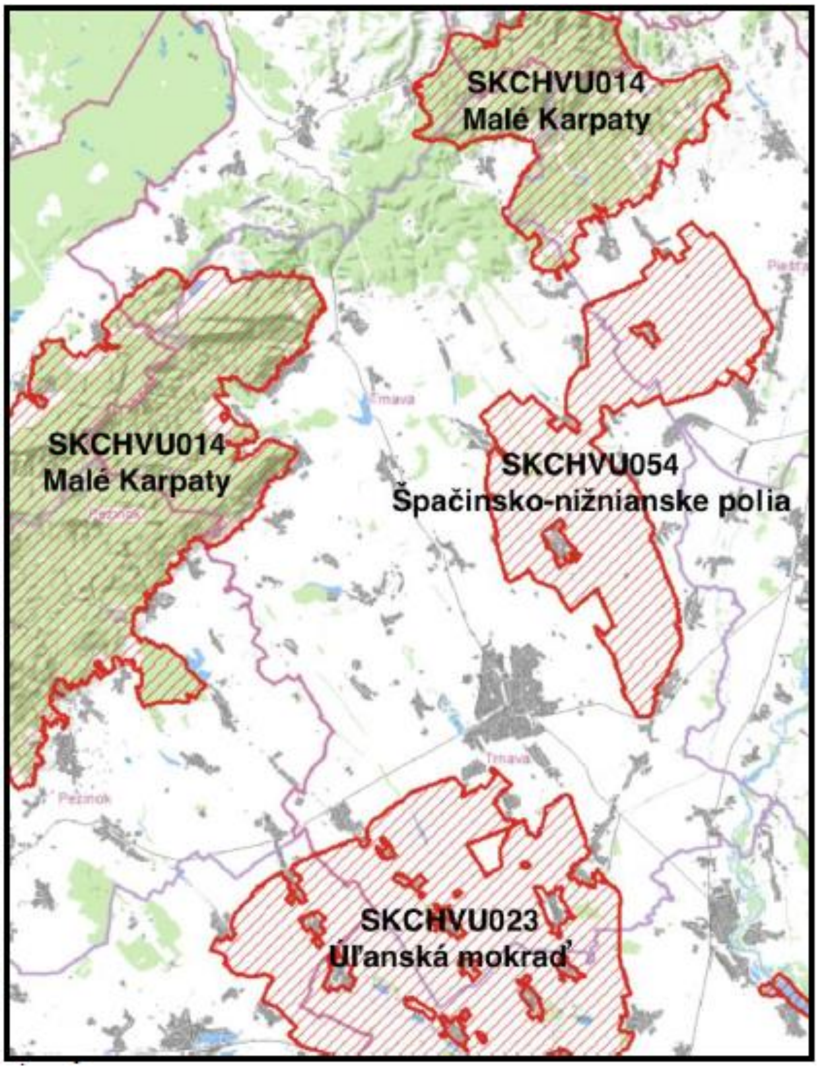
The affected territory does not interfere with special protection areas or territories of European importance (sites ***NATURA 2000***).
The closest special protection area is the Special Protection Area SKCHVU054 Špačince-Nižná Fields, which was designated in order to provide the favourable state of the biotopes of a bird species with a European importance and the migratory saker falcon and to provide for the conditions of its survival and reproduction. This special protection area interferes directly with the cadastral territories of some affected municipalities, such as the cadastral territories Jaslovce, Bohunice, Radošovce or Malženice, and the smallest distance between its boundary and the boundary of Jaslovské Bohunice NI premises is to the north of the NI - about 1 km.

Other nearby bird protection areas are SKCHVU014 Little Carpathians, whose border crosses approximately 11 km north and 19 km west of the NF area. Other bird protection areas situated in the wider surroundings of the affected territory are SKCHVU026 Sĺňava (about 12 km north east of the NF area) and SKCHVU032 Trnavské rybníky (about 17 km south west of the NF area).
The list of areas of European significance, situated in the wider surroundings of the affected territory, contains SKUEV0267 Biele hory (about 21 km west of the NF area), SKUEV0174 Lindava (about 27 km south west of the NF area), SKUEV0277 Nad vinicami (about 18 km west of the NF area), SKUEV0175 Sedliská (about 12 km south east of the NF area), SKUEV0074 Dubník (about 20 km south of the NF area), SKUEV0506 Orlie skaly (about 15 km north of the NF area).

Table C.II.9./01
Protected avian areas in the Trnava district territory

Name of the area	Marking - identification number	Cadastral territory in Trnava district
Little Carpathians	SKCHVU014	Dlhá, Dolné Orešany, Horné Orešany, Smolenická Nová Ves, Lošonec, Smolenice, Buková, Dechtice, Trstín, Dobrá Voda.
Úľany wetland	SKCHVU023	Cífer, Hrnčiarovce, Majcichov, Modranka, Opoj, Pavlice, Pác, Slovenská Nová Ves, Vlčkovce, Voderady, Zeleneč
Špačinče-Nižná fields	SKCHVU023	Bohunice, Bučany, Dolná Krupá, Dolné Dubové, Horné Lovčice, Jaslovce, Kátlovce, Malé Brestovany, Malženice, Paderovce, Radošovce, Špačince, Trnava, Veľké Brestovany

Figure C.II.9.
Protected avian areas in the Trnava district territory



No protected trees have been designated in the territory concerned.

II.10. TERRITORIAL SYSTEM OF ECOLOGICAL STABILITY

The Territorial System of Ecological Stability (TSES) is one of the tools for addressing the spatial aspect of territory ecological stabilization and optimization of land use. The main building elements of such a system are biocentres (Bc) and biocorridors (Bk); in conditions of heavily urbanized areas, other area elements (e.g. categories of inner-city greenery, orchards, vineyards) are a part of the functional TSES. Pursuant to § 2 par. 2, letter a) of Act No. 543/2002 Coll., TSES represents a spatial structure of interconnected ecosystems, their components and elements, which ensures diversity of conditions and forms of life in the country.

In 1993, the Regional Territorial System of Ecological Stability of the Trnava District was worked out (Jančurová, K.,1993). In 2002, a collective of authors prepared a new regional territorial system of ecological stability of the Trnava District, in accordance with which the regional biocorridor Blava was established representing the main skeleton of the local territorial system of ecological stability. The corridor of the water course Blava flows from NW to SE at a distance of approximately 1700 m to the west of the premises of the NI complex.
The site of interest does not interfere with other elements of the territorial system of ecological stability defined at the local level, for example in the framework of the of Jaslovské Bohunice municipal plan (Odnoga et al., 2007) or in Amendments 01/2008 of the of Veľké Kostoľany municipal plan, 2008).

II.11. POPULATION - DEMOGRAPHIC DATA

SETTLEMENTS, HISTORY AND DEMOGRAPHY

The municipalities, whose cadastral territory is directly affected by the premises of the set of nuclear installations, include Jaslovské Bohunice, Veľké Kostoľany, Pečeňady, and Ratkovce. Other affected municipalities, whose built-up areas are situated in the territory specified as affected for the needs of this material (a circle with a radius of 5 km with the centre at the site of the RAW TCT and A1 NPP structures of interest), include Radošovce, Žlkovce, Nižná, Malženice, and Dolné Dubové.
The above municipalities are situated in the Trnava self-governing region in the districts of Trnava, Piešťany, and Hlohovec.

Jaslovské Bohunice
The modern history of Jaslovské Bohunice municipality began on 12 July 1958, when the villages of Jaslovce and Bohunice merged. 18 years later Paderovce joined them.
The historical settlements in Jaslovské Bohunice discovered the burial site of the hunchbacks 3,500 years ago, the remains of the people with fluted ceramics from the Early Stone Age, but also the settlement from the Late Bronze Age.
The first written record mentioning Bohunice dates back to 1113. Paderovce were first found in records from 1333 and Jaslovce are documented since 1438.
The ancient Latin-written documents, as the owners of the village mention, for example, the monastery of St. Hypolith in Zobor; Sebes, the master of the Nitra siege, who received it from King Andrew II, the King Bela IV confirmed in 1258 the purchase of Bohunice to Zochud and Sefereld; for some period, the municipality was owned also by count Pálffy, and by several others.
An important part of the history of Jaslovské Bohunice municipality was the notarial office. Very rare are the first records in the 274-page diary of a notary and mayor, about the municipal economy from the period 1840-1892. This diary is among the most valuable testimonies of the village, the origin and development of the notarial office.
All three parts of Jaslovské Bohunice - Jaslovce, Bohunice and Paderovce - were always very close to each other. Their common patron, St. Michael, the Archangel, who became the dominant of the historical seals, is also proof of this. He is depicted on the Bohunice Seal of 1768 with a cross on his head, with a sword in his right hand and weights in his left hand. Unlike the Jaslovská Seal, which dates back to 1603, it has a six-pointed star under its right hand. The Paderovce seal of 1768 is very similar. The new seal, with which the municipality of Jaslovské Bohunice signs modern history, was

received on 25th May, 1992. It is also dominated by Saint Michael, the Archangel - with a sword and weights, a cross on his head and a six-pointed star.

Veľké Kostoľany

The village Kostoľany (or Velké Kostoľany) merged in 1945 with the village Zákostoľany, creating a single large municipality. Zákostoľany was the second village that originated as an extramural settlement. It was lying behind the church and that was the reason for the name Zákostoľany. It was mentioned in 1457 and it belonged to the castle of Nitra, later to the Andrássy family.
The first written mention of the village is from the year 1209, in the list of Hungarian KingAndrew II. The church of St. Vitus is first mentioned in 1229. In the years 1461 - 1467, there was the last camp of so called Czech Bratríci' movement in Slovakia. The village has a Roman Catholic Church of St. Vitus from 1464 and the Chapel of the lady of the Seven Sorrows from 1768 and the Chapel of the Birth of the Virgin Mary from 1832.

Pečeňady

The oldest written documents of the village mention the villa Bissenorum (Byssenorum) -1208-1209, 1216, and the villa Beseneu (1254). It means the village of Pečeneh tribe. The village of Peťová was merged in 1898 with the village of Pečeňady. Since 1920 there were two forms of the name - Pečeňady and Pečeňany. Since 1927, the name of the village stabilized in its current form as Pečeňady.
The oldest settlement in the village is found from the Early and Late Stone Age. Finds from the Bronze Age and Middle Ages come from the village, as well.
Sights in the village include the Church of the Sacred Heart of Jesus, monastery of the Congregation of Merciful Sisters of the Holy Cross (from 1899), crosses and statues in the village bounds and a classicist mansion in the village part Peťová (1825). The inhabitants of the village were engaged in agriculture.

Ratkovce

For the first time, the village of Ratkovce is mentioned in written documents from 1388 as Ratkolch, where it is mentioned as an accessory of the Čachtice castle. First, it belongs to the property of the castle, later the village became the church property of Trnava parish, then the chapter house.
At the time of the Ottoman invasions, the surroundings of the village Ratkovce was located in the middle of the triangle Leopoldov - Veľké Kostoľany - Malženice, which is known to have served as a base of Ottoman troops. The presence of the Ottomans is evidenced by accidentally excavated remains - skeletons of people and horses, which were found next to Crucifixion in Ratkovce.
In addition to the invasions of enemy hordes, the peaceful live of the inhabitants of the village was disturbed by epidemics, floods and fires. In 1581 and 1585 the village was devastated by plague, in 1678 by raging typhus and in 1710 again by plague. Famine destroyed the village in 1514 and 1610. Cholera affected the village in 1831 and 1866. In 1860 was the largest fire, recurring three times in a year, recorded in the village, leaving almost no single residential building untouched. Cholera raged in Ratkovce also in 1862, when the largest number of casualties was recorded. The flood of Váh in 1813 flooded the whole area, reaching as far as Ratkovce, where it caused a great damage in the lower part of the land area. From a more recent history, the greatest disaster was the fire on 15 August 1904.
In 1948 the schools, and in 1960 the sport unions of villages Ratkovce and Žlkovce were merged. On 1 January 1974, the villages of Ratkovce and Žlkovce were merged into one political municipality, called Žlkovce. Later, in 1991, the villages were separated again, so the village Ratkovce is an

independent municipality. Agriculture was the main occupation of the vast majority of the population. The soil of land area was and is one of the best on the Trnava plain.

Radošovce

In the past, the village belonged to the estate Dobrá Voda, where there were several feudal landlords, such as Štibor, Országh and Erdödy. The first written mention of the village is found in a document from 1208/1209, by which the Hungarian King Andrew II donated to his master Šebeš the land of Great Kostoľany and where the delimitation of the boundaries mentioned also the village Radichov - Radošovce. The second document is from 1229, which determines the boundaries of the village Bohunice (Baguna) land area. In this document, the village Radošovce is named Wradichov.

Radošovce was first looted by the Ottomans in autumn 1530, the second time in 1566, and the third time in 1663.

Citizens of the village built the church from their own resources, without the contribution of the landlord and church nobility, which gives evidence to their high religious and cultural level. The construction of the church began in 1754. The church is consecrated to St. Anna, the mother of the Blessed Virgin Mary, and is made of stone with one altar. The population has been engaged in agriculture and viticulture since ancient times. Until the end of the 18th century, the land area was surrounded by arable land and groves, meadows, pastures and vineyards, as well. All these cultures were gradually converted to arable land.

The village had two mills in operation in past - Upper (stony) and Lower (originally wooden). Reconstruction of the former Upper mill established the operation of the recreational center Mlyn in Radošovce (1990).

Žlkovce

The present cadastre of the village was already inhabited in the Neolithic, in the 5th millennium BC.

The first written mention of the village comes from a dispute between Cosma and Peter, the sons of Hemyruch from the settlement Slažany and the Jobagyns (residents of the Solgadyos - Solgadien castle) regarding the village Bohunice. In 1229 the settlement was settled by German guests and in this period it belonged to the castle of Nitra. According to a inspection of the land area in 1258, the settlement Žuk belonged to the Order of Johanites of Malženice. In the history, in addition to the castle of Nitra, the village belonged in the possessions of yeoman families of Horecký, Užovič, Zay, Majtán, Oczkay and others.

At the time of the Ottoman invasions, the surroundings of the Žlkovce and Ratkovce was located in the middle of the triangle Leopoldov - Veľké Kostoľany - Malženice, which is known to have served as a base of Ottoman troops.

In 1974, the village of Žlkovce merged with the village Ratkovce into one administrative unit called Žlkovce. Ratkovce became a local part of the village. Municipalities thus followed individual municipal organizations, which had already previously merged. In 1990-91, the coexistence of the villages of Žlkovce and Ratkovce in one administrative unit ended. On August 30, 1990, the Ratkovce part of the village became independent again.

Nižná

The land area of the village was intensely settled already in the Early and Late Stone Age. The larger settlement from this period is located in the part Za kostolom I. This settlement belongs to the period of Linear Pottery Culture and Lengyel Culture. Other finds document settlement in the Early Stone Age and Middle Bronze Age. The skeletal burial site of today's agricultural cooperative comes from

this period. Since the 16th century this area was a residence - mansion and farmstead of the landowner family Onory. Contiguous medieval settlements right in the middle of today's urban area is evidenced by the findings of shards from the mid-13th century.
Nižná is mentioned relatively late in the preserved written sources, however a written monument from Nižná itself dates pretty soon. It is a letter from Adam Onory of 5th March 1549, addressed to Trnava mayor Wolfgang Mair, in which he asks the town Trnava to send the executioner to Nižná, because he wants to punish some crime. In this period since the beginning of the 16th century Nižná was owned by the Onory family. The manor-house from the 16th century, which is still preserved, was built by Ladislav Onory. After frequent and devastating anti-Ottoman wars, Nižná was almost completely destroyed in the early 17th century. Around 1688 the Onory family died out and Nižná fell to the royal chamber. In 1688 it was bought by Christopher Erdödy for 10,000 gold ducats. Thus, the village became part of the Dobrovodské estate for almost 250 years.

Malženice
The first indications of the settlement in this area fall in the so-called Palaeolithic - Late Stone Age. Although the first written mention of Malženice dates from 1113, it is undisputed that the village originated earlier. Compared to the surrounding villages mentioned in the Zobor Deed, where the Benedictines mentioned their estates at the beginning of the 12th century, Malženice has the peculiarity of having a monastery and the seat of one of the organizational articles in the hierarchy of the Order - Priorate. The Benedictine and Johanite monastery was probably destroyed by the Tatars and has not been restored ever since. In 1268 the Hungarian king Bela IV donated the village of Malženice to the sons of Conch-Kunz, the mayor of Trnava. In the donation list, the municipality is called Maniga. At the beginning of the 14th century, Malženice was already the seat of the parish. Apart of the undoubtedly oldest church in the area, there is the existence of the rectory documented in written form from 1332. The function and authority of the village in 14th - 16th century increased by the granting of privileges, which were not typical even for the municipalities with larger population at that time. It was the right to set up and collect tolls, the right to organize regular markets and, in particular, the right to use the name of the village as oppidum - a little town. At that time a subjective town. A copy of this document can be found at the parish in Malženice.

Dolné Dubové
The oldest written name of the village is from 1113, in the Latin language *Dumba*. Later there were other names like *Domb*, *Dombóc*. The word *domb*, of Slavic origin, has been preserved to the present day in the bungled-up phrases of the Hungarian language in the meaning of "a hill overgrown with oaks". The name Dubové remained in Hungarian name *Dombó* or *Domboc*. In the last centuries of Hungarian Kingdom, the village was also called Also *Dombó*. Since the establishment of the first Czechoslovakia, the village bears the name Dolné Dubové.

Table C.II.11
Number of inhabitants in the affected territory of individual municipalities in 2018

Municipality	**Numbers of inhabitants in 2018**
J. Bohunice	2339
Malženice	1514

Radošovce	407
Dolné Dubové	711
Žlkovce	663
Ratkovce	339
Pečeňady	562
Veľké Kostoľany	2772
Nižná	548
total	***9855***

All the other data concerning the demographic structure in the affected municipalities are listed in the annex "Health impact assessment (HIA)".

INDUSTRIAL PRODUCTION, FORESTRY AND AGRICULTURE

INDUSTRY

The industrial production in the affected territory is manly focused on the production of electric energy from nuclear fuel. The other industrial and building production in the affected municipalities has only a supplementary character, larger industrial production operations in the territory include the bituminous mixture plant at Veľké Kostoľany, concrete plant at Malženice (AGS Trnava, s.r.o.), etc.

AGRICULTURE

The production capability of the agricultural lands in the affected territory is very good. Thus, after the production of electric energy, the agricultural production is the second dominant production branch in the affected territory. It is focused in particular on the vegetable production (densely-sown cereals, maize, sugar beet, oil plants, technical agricultural plants, to a smaller extent root crops and vegetables). In particular the concentrated cattle and pigs breeding is characteristic for the animal production.

FOREST MANAGEMENT

Hardwood species are dominant in the territory (in particular oaks, beeches, and poplars). However, forest coverage is small in the affected territory.

TRANSPORT

In the affected districts Trnava, Hlohovec, and Piešťany, in which the affected territory is situated, there are three main types of transport: road, railway and air transports (Piešťany military airport).

The road network of the districts consists of Class I, II and III roads and the highway D1 Bratislava – Trnava – Piešťany – Trenčín, however, there are only Class I, II and III roads in the affected territory. The road connection of the premises of the NI Jaslovské Bohunice is provided by road No. III/504015 from two directions – a connection road through Jaslovské Bohunice to Trnava and the road to the municipality Žlkovce to the Class I road Bratislava – Trenčín (about 5.5 km).

The railway tracks in the affected district include in particular the tracks Bratislava – Trnava – Žilina, Leopoldov – Hlohovec – Nitra, Trnava – Sereď, Trnava – Jablonica – Kúty, and Leopoldov – Sereď. However, the above railway tracks do not run through the affected territory. The connection with the railway track is solved as an independent siding, which was originally built for the needs of the A1 NPP and today, it serves for the whole premises. The siding 8.1 km long is connected to the railway track in the direction Piešťany – Trnava – Bratislava and is terminated in the railway station Veľké Kostoľany with a holding track for its operation.

TECHNICAL INFRASTRUCTURE

DRINKING WATER SUPPLY

Supply of the affected area by the drinking water is ensured through the public water mains supply network that use groundwater resources in the area of Dobrá Voda, Dechtice and Trnava, about 550 $l.s^{-1}$ (Trnava), water resources Veľké Orvište and Rakovice - about 300 $l.s^{-1}$ (district Piešťany) and water source in the area of Leopoldov 100 $l.s^{-1}$ (district Hlohovec). In addition, other smaller water sources are used, as well.

The NF complex of Jaslovské Bohunice is supplied with drinking water from the group water supply system of the Trnava Water Company, which uses the water resources - Veľké Orvište or Dobrá Voda.

ELECTRICITY SUPPLY

As a result of its use, the affected area is congested by overhead and cable power lines. The most important high voltage line is the southern branch of the electric artery in the direction of the NF complex of Jaslovské Bohunice - the western border of the Malženice village. The second important branch is formed by the eastern branch of high voltage line in the direction of NF - the northern border of the village of Pečeňady - Madunice. Power distribution networks of individual municipalities are connected to the very high voltage and high voltage distribution networks of regional importance.

GAS SUPPLY

The gas pipeline network in the wider area consists of transit, interstate and national gas pipelines, which ensure the supply of natural gas to the local municipalities.

The following gas pipelines are located within 10 km of the NF complex of Jaslovské Bohunice:

- transit pipeline (3x DN 1 200, 1x DN 1 400) from the Russian Federation to Western European countries,
- VVTL pipeline (1x DN 500) from the Špačince distribution node to Nové Mesto nad Váhom,
- international pipeline Brotherhood (1x DN 700) - Ukraine - Slovak Republic - Czech Republic,
- gas pipeline Považie (1x DN 300) - Bratislava - Trnava - Trenčín,

WASTEWATER COLLECTION AND TREATMENT

The development of public sewer systems in the municipalities of the affected area, as well as in the whole Slovakia, lags significantly behind the development of public water supply systems. Sewerage with WWTPs have e.g. Municipalities of Jaslovské Bohunice, Pečeňady, Ratkovce and Žlkovce.

SERVICES

Facilities in the affected municipalities depend on the population of the municipality. In the affected communities with a lower population, services and civic amenities are driven by demand, the number of their users and economic efficiency. For this reason, only a limited range of services is provided (in particular, a grocery store and a hospitality outlet). From sports facilities, it is mostly a football field, from cultural ones, a library.

Municipalities with more than 500 inhabitants provide already more comprehensive and wider services, and have more facilities, but their development and type also depend on the above mentioned indicators. The basic spectrum is complemented here by e.g. non-food small retail outlets, fuel stations, ATMs, post offices, general practitioners' ambulance or medicine dispensers, etc.

RECREATION AND TOURISM

Due to the character of settlements in the affected area, the conditions for a short-term and day-long recreation of the inhabitants, are provided by their own family development or local sports facilities (school gymnasium, football field, ..). In general, however, the affected area does not have suitable conditions for weekend and holiday recreation. The closest recreation areas for weekend and holiday recreation are the recreation area Sĺňava near Piešťany or the PLA Little Carpathians.

II.12. CULTURAL AND HISTORICAL MONUMENTS AND SIGHTS

Municipality of Jaslovské Bohunice

In the village of Jaslovské Bohunice there is a late-baroque mansion from the end of the 18th century with a bell tower and a historic English-style park with an area of approx. 4.5 hectares, declared by the Decree of the District National Committee in Trnava, No. 79/3/85 as the protected natural monument. It provides visitors with accommodation options, restaurant services, premises for corporate and social events, as well as relaxation options (sauna, swimming pool, massage). The park at the mansion has the character of an English park with paved paths and its own parking lot. Outside the mansion area, there is a municipal pond with fishing opportunities, a new natural amphitheatre, indoor air-conditioned halls with tennis courts, an equestrian area and a shotgun shooting range.

In the village, there is also he following:

- the Roman Catholic Church of St. Michael, the Archangel, built in 1832-1836 in the Classicist style, later extended by a side chapel,
- an old rectory from the beginning of the 16th century, which was rebuilt in the 18th century and in 1993-1995 a new rectory was added to it,
- tomb of the Dezasse family at the cemetery in Bohunice (1825),
- polychrome stone statue of Virgin Mary of the Seven Sorrows (1st half of the 19th century),
- polychrome stone statue of St. Florian (1841),
- sculpture of the Holy Trinity (1945).

Local part of Paderovce

There are the following monuments in the local part of Paderovce:

- filial Church of St. Martin, the Bishop (1848),
- sculptural group of St. Anna and Virgin Mary with Child (1791),
- polychrome stone statue of the Virgin Mary with a child (1794),
- memorial to victims of World War I (1914-1918).

Local part of Jaslovce

The following objects are located in the local part of Jaslovce:

- polychrome stone statue of Pieta (1773),
- polychrome stone statue of St. Vendelin (1798),
- Crucifixion with the statue of the Christ Crucified (1806),
- statue of St. John of Nepomuk (1808),
- polychrome stone sculptures of St. Family (1860),
- stone cross with a sculpture of the Christ Crucified (1863).

Village of Dolné Dubové

In this municipality there is:

- church of the translation of the Virgin Mary from the 1st half of the 14th century,
- commemorative tablet of Jozef Ignác Bajza.

Village of Pečeňady

In this municipality there is:

- church of the Sacred Heart of Jesus,
- monastery of the Congregation of the Sisters of Mercy of the Holy Cross (1899),
- Crucifixions and statues in the village land area,
- a classicist mansion in the part Peťová (1825).

Village of Radošovce

There is a Roman Catholic late Baroque church from 1762 located within the municipality.

Village of Nižná

In Nižná there are the following cultural monuments:

- church of Stephen the King (1682),
- belfry (1788),
- cross at the chapel on the way from Nižná to Velké Kostolany (1891),
- cross with Our Lady - stone cross (1808),
- cross from the year 1863,
- chapel - Crucifixion,
- statue of the Virgin Mary (1897),
- monument to the fallen (1965).

Village of Žlkovce

This village has the following historical objects:

- statue of the Virgin Mary (1656),
- the classicist church of Virgin Mary of the Seven Sorrows, patroness of Slovakia (1811),
- statue of St. Florian (1862),
- a monument to the fallen in a small park on Hollý St.,
- stone cross-statue of Virgin Mary (1858),
- stone cross on a pillar (1730),

- crucifixion (Ecce homo-1927),
- statue of St. Joseph,
- statue of the Holy Trinity at the entrance to the cemetery,
- the classicist 19th-century creation towering on a pillar in front of the cemetery entrance,
- statue of Christ in Záhradná St. - former parish garden,
- statue of Virgin Mary on Kanizska St.,
- parish chapel and old rectory (1768),
- missionary chapel (dated 1834 - 1848) at the cemetery,
- cholera chapel (dated 1832) in "Field Grove",
- Stations of the Cross - 14 Calvaries at the Cemetery (1924)
- "old" cemetery, tombstone remains and a wall,
- "new" cemetery, tombstones, graves, underground spaces, Lourdes Cave - located at the entrance to the cemetery (1954),
- granary - the last preserved object of the former "Englovec" farmstead in the centre,
- upper mill with race-way, unused and devastated at this time,
- objects of the former property of Count Čáky "Na Kaniži",
- private chapel of landlords (1777).

Village of Ratkovce

In the village there is a Roman Catholic church from 1756.

Village of Malženice

In this municipality there is:

- memorial to the fallen soldiers of Malženice in World War I,
- cross (1805),
- statue of the Holy Trinity (1894)
- statue of St. Vendelin (1889),
- statue of St. John of Nepomuk,
- sculpture "Ecce homo"
- stone cross,
- memorable statue of the "Crucifixion" (1711).

Village of Veľké Kostoľany

In this municipality there is:

- Roman Catholic Church of St. Vitus from 1464,
- missionary chapel in the cemetery,
- chapels Farská and Hájska,
- Lourdes Cave at the entrance to the cemetery,
- Stations of the Cross on both sides of the road leading through the cemetery to the church,
- Statue of the Holy Trinity in front of the entrance to the cemetery.

However, there are no cultural or historical monuments located directly on the allotments affected by the activity under consideration and in their immediate vicinity.

II.13. ARCHEOLOGICAL DISCOVERY SITES

There are no known archaeological sites located directly on the allotments affected by the activity under consideration and in their immediate vicinity, however there were several archaeological finds in the cadastres of the affected municipalities.

In Jaslovské Bohunice, there was a discovery of a housing estate with fluted ceramics, or a skeletal burial ground of the Unetice culture from the Early Bronze Age. This area was inhabited already in the Eneolithic period.

In Malženice, there are finds of settlement of voluted culture and fluted ceramics from the Late Bronze Age and La Tène period. Clay statuettes of women and animals were found in the wider surroundings of the affected area, the most precious statuette was named Venus of Bučany. The Celtic burial ground dates back to the 5th to 3rd centuries BC.

II.14. PALEONTOLOGICAL DISCOVERY SITES AND SIGNIFICANT GEOLOGICAL SITES

There is no paleontological site or significant geological locality in or around the affected area.

II.15. CHARACTERISTICS OF THE EXISTING SOURCES OF ENVIRONMENTAL POLLUTION AND THEIR ENVIRONMENTAL IMPACTS

AIR POLLUTION

The table contains the list of the most significant operators of air pollution in the districts Trnava, Hlohovec, and Piešťany for 2016. The values of air pollutant emissions in tons (PM, SO_2, NOx, and CO) and their share in total emissions of the Trnava region in percent are provided. The source table of the SHMU shows the first ten biggest polluters for each indicator, therefore, values of all released pollutants are not provided for each operator.

Table C.II.15/01
The most significant operators of APS in the districts Trnava, Hlohovec and Piešťany in 2016

Operator	**Emissions (t) / share in total emissions of the region (%)**							
Trnava District	**PM**		**SO_2**		**NOx**		**CO**	
John Manville Slovakia, a.s.	29.94t	14.66%	108.63t	25.7%	116.37t	13.27%	11.55t	2.21%
Tate &Lyle Boleráz, s.r.o.	23.46t	11.48%	-		50.61t	5.77%	17.36t	3.33%
Agro Boleráz, s.r.o	5.75t	2.81%	-		-		-	
PCA Slovakia, s.r.o.	5.64t	2.76%						
Zlievareň Trnava, s.r.o.	-		18.39t	4.35%	-		12.39t	2.38%
RUPOS, s.r.o.	-		9.05t	2.14%	-		-	

ZF Slovakia, a.s.	4.99t	1.18%						
IKEA Industry Slovakia s.r.o.	-		-		26.68t	3.04%	27.34t	5.24%
Wienerberger slovenské tehelne,s.r.o.	-		-		-		9.7t	1.86%
Hlohovec District	**PM**		**SO_2**		**NOx**		**CO**	
ENVIRAL, a.s.	4.09t	2%	-		62.01t	7.07%	20.99t	4.02%
Bekaert Hlohovec, a.s.	-		-		20.92t	2.39%		
Piešťany District	**PM**		**SO_2**		**NOx**		**CO**	
STAKOTRA Manufacturing, s.r.o.	-		-		15.97t	1.82%	-	

(Source: Report on Air Quality for 2016 – SHMU)

The following table contains the values of emissions of air pollutants in tons (PM, SO_2, NOx and CO) discharged from air pollution sources of JAVYS, a.s. including the RAW incineration plant in 2016, 2017 and 2018. To show the contribution of JAVYS, a.s. to air pollution in the Trnava region, the share of pollutants in total emissions in the region in percentage is also provided.

Table C.II.15/02
Emissions of pollutants from air pollution sources of JAVYS, a.s. (2016 – 2018)

Operator	**Emissions (t) / share in total emissions of the region (%)**							
JAVYS, a.s.	**PM**		**SO_2**		**NOx**		**CO**	
2016	0.156t	0.08%	0.1t	0.02%	3.058t	0.35%	0.898t	0.17%
2017	0.041t	0.02%	0.039t	0.01%	0.859t	0.10%	0.135t	0.03%
2018	0.04t	0.02%	0.092t	0.02%	0.71t	0.08%	0.099t	0.12%

There is the Malženice Combined Cycle Power Plant in the vicinity of JAVYS, a.s. premises; its contribution ot air pollution is not available to the Proposer as at the date of report preparation.

Several air pollution sources are in operation directly on the premises of JAVYS, a.s. at Jaslovské Bohunice:

- medium-size sources:
  - **stand-by boiler room (boilers K3 and K4)** – str. 441
  - **Diesel generator Caterpillar Olympian** – str. No. 585d:V1 - emergency power supply system,
  - **Diesel generator Martin Power MP 1700** – str. 32.1 - emergency power supply system,
  - **Diesel generator Martin Power MP 400** (2 pcs) – str. 713:V1 - emergency power supply system,
- small sources:
  - **Diesel generator Caterpillar 3306 -** near str. No. 840:M (ISFS) – emergency power supply system,
  - **production of fibre-concrete mixture**

Radioactive waste incineration plant, which is not categorised as an air pollution source in accordance with the Act on Air (agreed after the meeting of individual government authorities) is a specific establishment.

The summary of emissions of pollutants from air pollution sources and from the RAW incineration plant is provided in Tables C.II.5./01 and B.II.1./04.

Within the Slovak Republic, the Trnava Region is one of the least burdened areas in terms of air pollution. Due to wind conditions, the area is sufficiently ventilated, which leads to a good dispersion of pollutants. At present, air pollution caused by particulate matter (PM10) is the biggest problem of air quality in Slovakia as well as in most European countries. The Trnava district belongs to:
Group 1 for ZL PM10 - zones in which the level of air pollution by one or more pollutants is higher than the limit value or, where the limit value is increased by tolerance limits, if specified. In the case of ozone, to the zones and agglomerations where the ozone concentration is higher than the target value for ozone.
Group 3 for sulphur dioxide, nitrogen dioxide, carbon monoxide, benzene, PM2.5 - zones in which the level of air pollution is below the limit or target values, respectively. In the case of ozone, to the zones and agglomerations, where the ozone concentration is lower than the long-term ozone target. The air pollution situation of common pollutants is not monitored in the affected area.

Contamination of the air by radionuclides
The sources of ***gaseous discharges of isotopes*** in the air in the affected territory include:

- V2 NPP of Slovenské elektrárne (SE a.s., EBO plant (V-2 NPP)),
- Nuclear installations of JAVYS:
  - V1 NPP - Stage 2 of decommissioning,
  - A1 NPP - Stage III of decommissioning,
  - RAW TCT (Radioactive waste treatment and conditioning technologies),
  - IRAWS (Integral radioactive waste storage facility)
  - ISFS (Interim spent fuel storage facility at Jaslovské Bohunice).

Gaseous emissions are monitored and evaluated in all cases in relation to the determined guide values (annual limits). Information for the SE-EBO operation is (along with the evaluation of liquid radioactive discharges) published on a regular basis (once per month) at the web site:
http://www.seas.sk/sk/spolocnost/zivotne-prostredie/vplyv-prevadzok/atomove-elektrarne-bohunice.

Data on discharges from the operation of NF of NPP V2 for 2018 are given in the following table:

Table C.II.15./03

Discharges od radioactive material from NPP V2 in 2018 to the atmoshere with the guide values

		Výpusť od	Smerná	% smer.
Analýza/Parameter	MJ	zač. roka	hodnota	hodnoty
Prietok vzduchu	m3	3,768E+09		
Aerosóly - alfa				
Pu-238	kBq	1,105		
Pu-239+240	kBq	7,127		
Am-241	kBq	1,613		
P_Suma alfa	MBq	0,010	20	0,0482
Aerosóly - gama				
Cr-51	MBq	1,241		
Mn-54	MBq	0,377		
Fe-59	MBq	0,144		
Co-57	MBq	0,045		
Co-58	MBq	0,862		
Co-60	MBq	0,638		
Zn-65	MBq	0,150		
Se-75	MBq	1,495		*
Nb-95	MBq	0,687		
Zr-95	MBq	0,331		
Ru-103	MBq	0,073		
Rh-106	MBq	0,548		
Ag-110m	MBq	1,256		
Sb-124	MBq	0,162		
Cs-134	MBq	0,060		
Cs-137	MBq	0,088		
Ce-141	MBq	0,110		
Ce-144	MBq	0,525		
Hf-181	MBq	0,247		*
I-133	MBq	0,032		*
P_Suma gama	MBq	9,073	80000	0,0113
As-76	MBq	3287,000		**
Aerosóly - stroncium				
Sr-89	kBq	35,757		
Sr-90	kBq	37,902		
P_Suma stroncium	MBq	0,074	140	0,0528
SUMA AEROSÓLY	MBq	9,168E+00	80000	0,0114
Rádioaktívne vzácne plyny				
Vzac.plyny V2	TBq	4,215		
P_Suma vzácne plyny	TBq	4,216	2000	0,2108
Jód I-131				
I-131 aer.	MBq	0,196		
I-131 ply.	MBq	0,321		
P_Suma I-131	MBq	0,617	65000	0,0008

The Proposer's sources are also monitored and evaluated, the outputs are published at the Proposer's website in the form of "Eco-information“.
Data from measurements and evaluations of radioactive discharges from the JAVYS, a.s. sources to the atmosphere for 2018 are provided in Table B.II.1/04.

Within the framework of the control of gaseous discharges impacts, the activity of aerosols is also evaluated within the monitoring programme of the NI Jaslovské Bohunice. Aerosol sampling is carried out in 24 stations situated around the premises of Jaslovské Bohunice by means of large-size sampling devices with the air flow of about 200 m^3/h. The filters are analysed after a 14-day exposure.
The activity of fallouts is also monitored. These are sampled by means of large-size sampling devices at selected stations along with the samples of aerosols on water surface. Fallout samples are processed using the method of large-volume coagulation with the following gamma spectrometry analysis. The results of monitoring of the surroundings of the Bohunice site nuclear installations are summarised in the material “Discharges of radioactive substances from the JAVYS, a.s. NI Jaslovské Bohunice and the impact of the JAVYS, a.s. NI on the surroundings, 2018“ available to the affected municipalities.
The general evaluation along with other monitored indicators prove only a minimum impact of the SE-EBO and JAVYS, a.s. premises on the environment.

WATER POLLUTION

Surface waters

The results of the “Programme of Water Status Monitoring for 2016“, according to which quality indicators of surface waters were monitored at 413 monitored places, can be used to evaluate pollution of surface waters.

Requirements for surface water quality listed in Government Order No. 269/2010 Coll. were met at all monitored places in the following indicators:

- general indicators (Part A): temperature, magnesium, sodium, free ammonia, phenol index, chromium (VI), surface-active substances, cobalt, selenium, vanadium, chlorobenzene, dichlorobenzenes, 2,4,6 trichlorophenol
- **radioactivity indicators (Part D): total volume alpha and beta activity, tritium, strontium, caesium**

As the affected area belongs to the Váh water sub-basin, we present information relating only to this catchment. 130 sites were monitored in the Váh sub-basin, of which 104 did not meet the requirements in one or more indicators.

In Part A they did not meet the requirements in the following indicators: O_2, BSK_5, $CHSK_{Cr}$, TOC, pH, EK (conductivity), $N\text{-}NH_4$, $N\text{-}NO_2$, $N\text{-}NO_3$, P_{total}, N_{total}, $Cl^-SO_4^{2-}Ca$, AOX, Al.
In part B they did not meet the requirements in the following indicators: As (RP), Pb (RP), Hg (RP, NPK).
In part C they did not meet the requirements in the following indicators: CN (RP), Alachlor (RP, NPK), Isoproturon (RP), FLU (RP), B(a) P* (RP), B (b) Fluoroanthene (RP*, NPK), B (k) Fluoroanthene (RP*, NPK), B(ghi)perylene (RP*, NPK), Indenopyrene* (RP), TBT* (RP).
In part E they did not meet the requirements in the following indicators: SI_{bios}, ABU_{fy}, EK, TKB.

Water quality in the Váh basin is affected in particular by point sources of pollution (industrial and municipal waste waters), as the Považie area is among the most industrially developed areas of Slovakia. The influence of considerable regulation of the main flow is also important as it contains a system of hydroelectric power stations and channels.

Contamination of waters by radionuclides

Contamination of released waters as a result of the activity in the nuclear installations of JAVYS, a.s. and SE, a.s. EBO V2 plant is strictly limited and monitored. The limits are derived from potential impacts on the environment and population and they cannot be changed for the approved activity inside the nuclear installation. For every operator, the Public Health Authority of the SR specifies the annual values of liquid discharges, the monitored indicators, the way of monitoring, reporting.

During the operation of nuclear installations, waste waters contaminated by radionuclides are produced, which are according to their character treated as liquid radioactive wastes by means of RAW treatment and conditioning technologies or they are cleaned in special facilities up to the level allowing their release to surface waters.

Multiple inspection mechanisms provide for the observance and check of the limits specified by the decision of the Public Health Authority of the SR (check of the tank before emptying, the approval process for emptying, continual monitoring of the discharged waste waters at two measuring structures).

Waste waters discharged by sewerage system at JAVYS, a.s. include:

A) rainwater

- it is discharged into the water body Dudváh,
- the volume activity of discharged waters for A and B branches is continuously monitored in structure 880 of the V1 NPP.

B) sink water

- it is discharged into the structure of sink water treatment – BIOKLAR (mechanical and biological treatment plant),

C) pipeline collector - SOCOMAN

- it is discharged into the water body Váh.

The river Váh is the water body for all service, sink (after treatment at the WWTP) and low-level waste waters produced on the premises of JAVYS, a.s., which are led through the pipeline collector SOCOMAN through structure 368 (measuring structure for both quantity and quality of waste waters discharged). The waste waters from the premises of JAVYS, a.s. (piping capacity 354 L/s) are mixed in front of structure No. 614 with waste waters of the company SE, a.s. -EBO V2, which are discharged into the pipeline collector through the second branch (piping capacity 143 L/s) from the premises of the V2 power plant and water of both entities are discharged together to the water body Váh. The resulting pipeline collector of dry-weather waters SOCOMAN removes waste waters using gravity through the Drahovce channel (river km 0.4), in the cadastral territory Madunice and then to the river Váh (river km 6.4). The collector is on 10.8 km led on the right bank of the Manivier channel to the edge of the municipality Žlkovce, where it crosses to its left bank. It crosses Dudváh and continues to the right-bank termination with a tide gate at the Madunice site, the capacity of piping from structure 614 is 497 L/s.

Waters from the system from the surface run-off and clean Váh waters from the operation, which are not polluted by the technology process from the premises of JAVYS, a.s. without quantity limitation, are discharged **into the water body Dudváh** through the open Manivier channel. It is possible to also discharge the industrial waste waters in case of a planned outage or failure or unexpected event on the pipeline collector SOCOMAN, on condition that the fact will be notified to the respective state water administration authority, Slovak Environmental Inspectorate and Public Health Authority of the Slovak Republic. The sampling checkpoint is structure No. 900:V1 (physical and chemical indicators) and structure No. 880 (activity monitoring).
The following tables show the data on the quantity of discharged waste waters and on the level of activity contained in the waters.

Table C.II.15/04
Summary of quantities of discharged waste waters to the water body Váh in 2014 – 2018 from JAVYS, a.s.

Quantity of discharged waste water from JAVYS, a.s. in m^3					
Water body	**2014**	**2015**	**2016**	**2017**	**2018**
VÁH	459,343	444,345	116,652	429,392	440,414

Table C.II.15/05
Low level water discharge - water body Váh

2018	Activities of radionuclides in Váh water body waste waters							
	NI V1 NPP premises, ISFS				NI A1 NPP premises, RAW TCT			
Volume of discharged waters (m^3)	4,000				189,840			
	CFP (MBq)	**tritium (GBq)**	**% of using the guide value CFP***	**% of using the guide value 3H***	**CFP (MBq)**	**tritium (GBq)**	**% of using the guide value CFP****	**% of using the guide value 3H****
total	11.281	2.378	0.087	0.119	17.791	460.381	0.148	4.604

* guide value for CFP: 1.3×10^{10} Bq ; guide value for tritium: 2.0×10^{12} Bq
** CFP guide value: 1.2×10^{10} Bq ; tritium guide value: 1.0×10^{13} Bq

No low-level waters were discharged to the water body Dudváh in 2018.

Based on the analysis of discharges of radioactive substances from JAVYS, a.s. it can be stated that the quantities of the radioactive substances released into the hydrosphere in no case exceeded the guide values for the discharges of radioactive substances issued by supervisory authorities.
The second source of active discharges in the locality is the company SE, a.s. - the plant EBO V2 and data for 2018 are shown in the following table.

Table C.II.15./06

Discharges of radioactive material from NPP V2 to the hydrosphere recipient river Váh

Analýza/Parameter	MJ	Výpusť od zač. roka	Smerná hodnota	% smernej hodnoty
Objem wpustenej vody				
objem	m3	18779		
Celková beta aktivita				
Sum.beta	GBq	12,969		
SUMB_K	GBq	12,969		
Trícium H-3				
H-3 nádrže EBO	GBq	10564,554		52,823
H-3 para JAVYS	GBq	1,306		0,007
H-3 cez SO na Váh	GBq	35,342		0,177
H-3 SUMA VAH	GBq	10601,202	20000	53,006
H-3 cez SO na Dudváh	GBq	0,740		
H-3 SUMA DUDVÁH	GBq	0,740	200	0,370
Korózne a štiepne produkty - alfa				
Pu-238	kBq	4,211		
Pu239+240	kBq	19,075		
Am-241	kBq	7,212		
K_Suma alfa	MBq	0,030		
Korózne a štiepne produkty - gama				
Cr-51	MBq	3,230		
Mn-54	MBq	1,642		
Fe-59	MBq	0,818		
Co-57	MBq	0,285		
Co-58	MBq	1,275		
Co-60	MBq	2,937		
Zn-65	MBq	1,014		
Se-75	MBq	0,372		
Zr-95	MBq	0,814		
Nb-95	MBq	0,861		
Ru-103	MBq	0,395		
Rh-106	MBq	3,522		
Ag-110m	MBq	0,914		
Sb-124	MBq	0,874		
I-131	MBq	0,549		
Cs-134	MBq	0,401		
Cs-137	MBq	1,579		
Ce-141	MBq	0,560		
Ce-144	MBq	2,217		
Hf-181	MBq	0,001		
K_Suma gama	MBq	24,258		
Stroncium				
Sr-89	kBq	40,722		
Sr-90	kBq	149,398		
K_Suma stroncium	MBq	0,190		
Korózne a štiepne produkty - suma				
KaŠP	MBq	24,478	13000	0,188

Ground waters

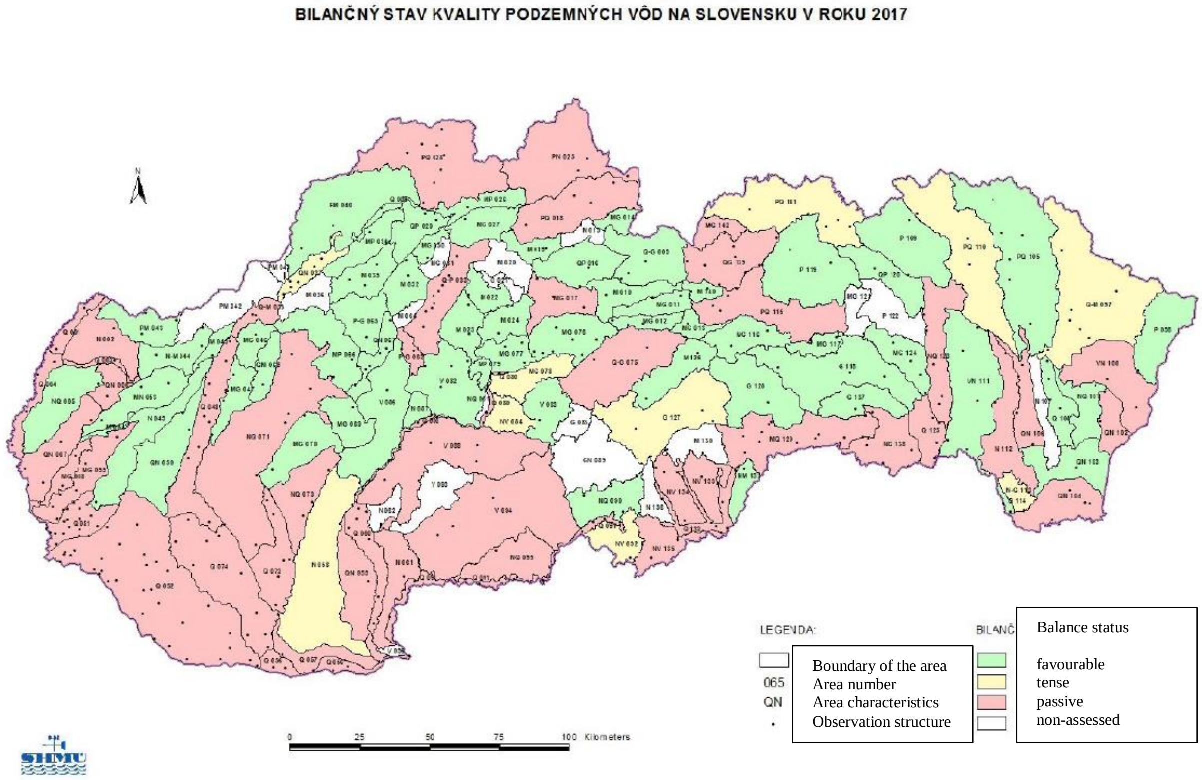
Location of nuclear facilities of Jaslovské Bohunice, together with its surroundings, belongs in terms of hydrogeological zoning (Atlas of the Slovak Republic, 2002) into the groundwater zone Q 050 “Trnava Quaternary Uplands”, which is represented in the locality by hydrogeological complex of aeolian quaternary sediments functioning as regional aquitards (eQp) - loess and loess like loams, aged Pleistocene - Holocene.
In the territory of the area, the collectors of the first aquiferous layer are sandy gravels, gravels and sands, considered as the equivalent of the so-called Kolárovo formation. In the surroundings, it is necessary to include the alluvial sediments of the Dudváh floodplain (wetlands). The aquiferous collectors lie on impermeable plastic Neogene clays, containing sands and gravels, forming the second aquiferous layer. The surface of the sandy gravels of the first aquiferous layer is rugged and is located at 145-159 meters above sea level. Their thickness is variable. The greatest thickness was mapped between Jaslovské Bohunice and the nuclear facility area, as well as directly below it. The thickness of the water-bearing sandy gravels reaches here 15 m, in some places up to 20 m. The thickness of the mentioned gravels is then gradually decreasing in the north-west, north, north-east and south-east directions down to 10 m, and then drops sharply to less than 5 m.
The groundwater in this collector has a free surface. It is of distinct Ca-Mg-HCO_3 type, medium mineralized, hard with slightly alkaline reaction. The dominant cations are calcium and magnesium cations, bicarbonates in anions. The direction of groundwater flow is from NW to SE. Infiltration of water from atmospheric precipitation is minimal, given the thickness and permeability of the loess.

For ground waters, in 2018 ground water quality assessment was used in comparison with the limit or maximum concentrations defined by Decree of the Ministry of Health SR No. 247/2017 Coll. laying down details on drinking water quality, drinking water quality control, programme of monitoring and risk management for drinking water supplies.

In 2017, 147 hydrogeological areas were processed within the qualitative water management balance. Out of it, 122 areas were evaluated and in 19 areas ground water quality has not been monitored yet. In 40 areas there is one structure, in 26 areas there are two structures, and in 56 areas there are three and more structures of the monitoring network of ground water quality.
In the assessed period, out of the total number of 141 hydrogeological areas of Slovakia, the balance processing showed that the balance status was favourable in 63 areas, tense in 10 areas and passive in 49 areas. Balance was not evaluated in 19 areas.

The document “Water management balance of ground water quality of the SR in 2017“ contains the map of balance status of ground water quality in Slovakia in 2017, where colours are used to distinguish the areas with favourable balance status (green), tense (yellow), and passive (red), and the areas without evaluation (white).

Fig. C.II.15./01
Map of balance status of ground water quality in Slovakia in 2017



Waters of the affected territory are loaded with respect to its utilisation also by ***liquid radioactive discharges*** from operations of SE, a. s. EBO Plant and JAVYS, a.s. Quality of discharged waste waters from JAVYS, a.s. to the water body Váh is continuously monitored and the evaluation is published in environmental reports and radiation protection reports.

The following tables contain limits and summary of discharged pollution in 2018.

Table C.II.15/07
Average concentration of chemical pollution released into water body VÁH – 2018

Chemical indicators of pollution	Average concentration of released pollution (for 2018)	Maximum permitted concentration (Decision OU-TT-OSŽP2-2013/00026/Gl)
	mg/l	mg/l
Acidity, alkalinity - pH	8.053	9.00
biochemical oxygen demand -BOD_5	2.442	8.00
chemical oxygen demand – COD_{Cr}	10.097	30.00
insoluble substances - NL	15.000	20.00
soluble substances - RL	382.528	1,000.00
ammonia - $N\text{-}NH_4^+$	1.315	4.00
nitrates - NO_3^-	17.022	50.00
sulphates - SO_4^{2-}	24.272	150.00
chlorides - Cl^-	17.590	100.00
non-polar extractable substances - NES	0.022	0.35
total phosphates – $P_{tot.}$	0.402	2.00
iron - Fe	0.087	2.00
detergents - SAS	0.099	0.50

Table C.II.15/08
Annual guide values of discharges of radioactive substances in waste waters from JAVYS to the water bodies Váh and Dudváh

Structure	V1 NPP and ISFS				A1 NPP and RAW TCT			
Water body	Annual activity Bq/year		Volume activity Bq/m^3		Annual activity Bq/year		Volume activity Bq/m^3	
VÁH	Tritium	CFP	Tritium	CFP	Tritium	CFP	Tritium	CFP
	$2.0x10^{12}$	$1.3x10^{10}$	$1.95x10^8$	$3.7x10^4$	$1.0x10^{13}$	$1.2x10^{10}$	$1.95x10^8$	$3.7x10^4$
DUDVÁH	Tritium	CFP	Tritium	CFP	Tritium	CFP	Tritium	CFP
	$2.0x10^{10}$	$1.3x10^8$	$1.95x10^8$	$3.7x10^4$	$3.7x10^{10}$	$1.2x10^8$	$1.95x10^8$	$3.7x10^4$

Source: Decisions of the PHA SR No. OOZPŽ/3760/2011 and No. OOZPŽ/7119/2011

The summary of liquid discharges of radioactive substances to the water body Váh in 2018 is provided in Table No. B.II.2./03.

Discharged activities in waste waters are controlled by measuring the volume activity of tritium, volume activity of corrosion and fission products, and quantity of waters in collecting tanks for the NI RAW TCT and NI V1 NPP.

The measured results show that the tritium activity limit in discharged waters was not exceeded and the discharges of other corrosion and fission products in waste waters were well below the set authorised limits. No waste waters were discharged to the water body Dudváh in 2018.

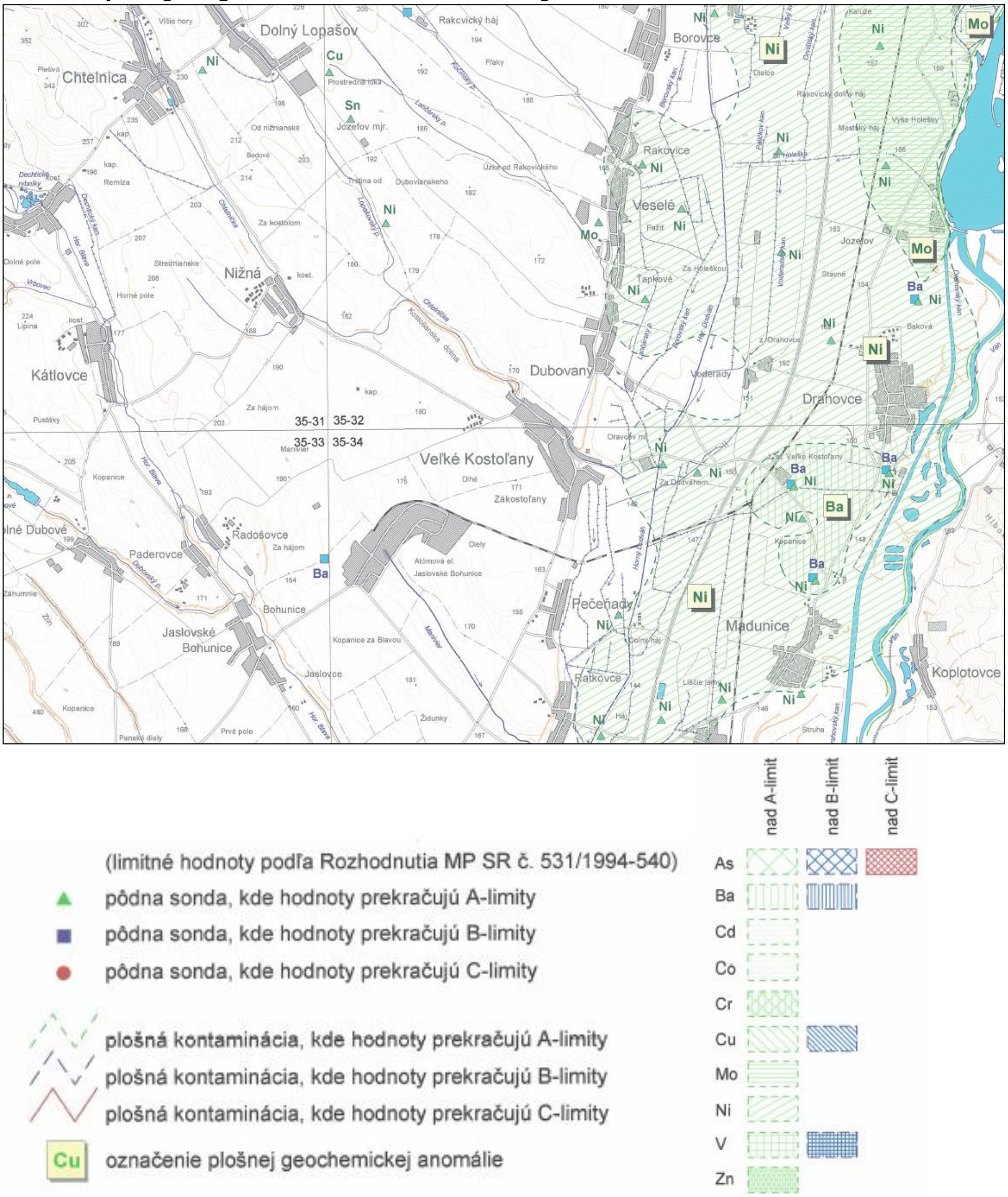
Consequences of radioactive discharges in the form of surface, drinking and groundwater activity are monitored within the radiation control of the surroundings of NF Jaslovské Bohunice: for drinking water once in a quarter in the volume of 10 liters, for surface water once a month, for groundwater in boreholes twice a year (spring and autumn). The results are evaluated in individual reports, the general evaluation along with other monitored indicators prove only a minimum impact of SE, a.s. companies – EBO Plant and JAVYS, a.s. on the surroundings.

Pollution of ground waters in the area of JAVYS, a.s. by tritium is solved by remediation pumping of ground waters, in structure 106 (borehole N-3), whose objective is to limit the spread of ground water contamination out of the source area. The reasons and solution of the radiation situation in connection with ground water contamination are described in detail in the geological task "Monitoring and remediation of ground waters at the A1 NPP Jaslovské Bohunice".

SOIL POLLUTION

The results of the regional geochemical survey of soils (the last data from 2002 – J. Čurlík, P. Ševčík, 2002, a follow-up to the previous sampling for the preparation of the Geochemical Atlas – Part: Soils of authors J. Čurlík, P. Ševčík, 1999), prove that the affected territory does not show anomalous contents of contaminating substances in soil (a sampling density of about one sample per 3 km^2).

Figure C.II.15./02
Section of the pedogeochemical association map



Source: J. Čurlík, P. Šefčík, 2002 in J. Schwarz et al., 2004 (Set of regional maps of geological factors of the environment of Trnava uplands, ENVIGEO, 2004)

The closest delineated anomalies are those of nickel (Ni) in the soils of the alluvial floodplain of Váh, east of the affected area. Ni contents in soils depend on Ni content in soil-forming substrates (e.g. in the mineralized zone of the Little Carpathians between the villages Cajla and Pernek). In addition, the rich alluvial humic soils of the Váh (black earths) are also enriched with nickel. Nickel gets here from

some Mesozoic complexes of the klippen zone. This is indicative of its relatively good migration capacity and the fact that the soil surface horizons are enriched with nickel probably by binding to organic substances and secondary sesquioxides. And to the extent that in many places they exceed the A-limits.
Barium (Ba) contents are also increased in spots - e.g. the soil sample west of the Jaslovské Bohunice NPP site, exceeding the B-limit (1,000 mg/kg). The source of Ba is probably also from the soil-forming substrate, Ba binds to feldspar-rich rocks (granites of the Little Carpathians). It is released only very slowly and does not present a major environmental problem. Along with the solid products of weathering, the feldspars were carried out by streams flowing from the mountain range, and therefore we find its increased contents also in the alluvium of Váh, where the detritic fragments from other crystalline rocks of the Carpathians are brought.
Values exceeding the B-limits (1,000 mg/kg) indicate the presence of barytes ($BaSO_4$), which may originate from the mineralized zones of the Little Carpathians.

Within the framework of Jaslovské Bohunice NI ***radiation monitoring***, the soil activity in the surroundings is monitored, as well.
The soils are sampled once a year. The sampling is divided into two groups, for grass surfaces - carried out in spring and for topsoil - carried out in autumn. The mass activity of natural radionuclides (uranium conversion series - ^{226}Ra, thorium conversion series - ^{232}Th and isotope ^{40}K) and the mass activity of ^{137}Cs or other artificial radionuclides are determined.
The field INSITU gamma spectrometry is performed twice a year, in spring and autumn. Measurements is performed close to the dosimetry stations. The INSITU measurement also includes the measurement of the dose rate at the site and the sampling of the soil.
The monitoring results confirm the fact that the contents of natural and artificial radionuclides in the soil are close to the average contents for the whole region, without distinguishable anomalies caused by the Jaslovské Bohunice NI operation.

NOISE AND VIBRATIONS

In addition to the nuclear installations, there is also a combined cycle power plant near the municipality Malženice with an installed capacity of 436 MW and annual production of 2 billion kWh of electricity. There are no other significant sources of noise and vibrations here.
Noise from nuclear installation operations is in terms of broader surroundings negligible. Moreover, the closest dwelling is at a distance of about 3 km, where the level of noise from SW is virtually zero.
However, the road and railway transport represents a significant source of noise and vibrations in the affected area.

SOURCES OF RADIATION AND PHYSICAL FIELDS

Dose rates in the surroundings of the Jaslovské Bohunice NI premises are measured continuously on 24 stations of the teledosimetric system.
The rates of spatial dose equivalent are evaluated on a regular basis and the evaluation is published at the website: http://www.seas.sk/sk/spolocnost/zivotne-prostredie/vplyv-prevadzok/atomove-elektrarne-bohunice. The dose rates measured at other "non-nuclear" sites are also published at the site for comparison.

Table C.II.15/09
Spatial dose equivalent

Equivalent dose rates
Measured average values

nanoSievert/hour

Site	RS-03	TLD	Ø r. 1993	Ø RS-03 za r. 2014 – 2018
Bohunice	82 ± 3	72 ± 5	75 ± 5	81 ± 2
Jaslovce	92 ± 4	88 ± 2	87 ± 6	90 ± 4
Kátlovce 1, 2	93 ± 4	90 ± 2	78 ± 7	92 ± 2
Krakovany	86 ± 3	76 ± 4	84 ± 5	85 ± 2
Malženice/Trakovice	80 ± 3	79 ± 4	77 ± 6	79 ± 2
Nižná 1, 2	86 ± 3	91 ± 2	92 ± 6	89 ± 6
Pečeňady 1, 2	84 ± 3	81 ± 2	77 ± 4	82 ± 3
Piešťany	87 ± 3	79 ± 6	69 ± 4	86 ± 1
Radošovce	86 ± 3	78 ± 3	71 ± 4	86 ± 2
Šulekovo	77 ± 3	78 ± 6	81 ± 6	77 ± 1
Trnava	92 ± 3	93 ± 2	86 ± 6	91 ± 3
Veľké Kostoľany 1 - 3	85 ± 3	83 ± 2	86 ± 6	84 ± 2
Žlkovce	105 ± 4	110 ± 2	112 ± 3	103 ± 1

Average values of dose rate in other places of the SR

Bratislava	94,7 ± 5,4
Štrbské Pleso	107,3 ± 9,3
Dudince	160,2 ± 28,0
Hurbanovo	71,3 ± 1,2

Differences between individual sites are caused by variations of natural background. Measured values do not differ statistically from the values measured before the start of operation.
Contribution of NPP to total doses is negligible.

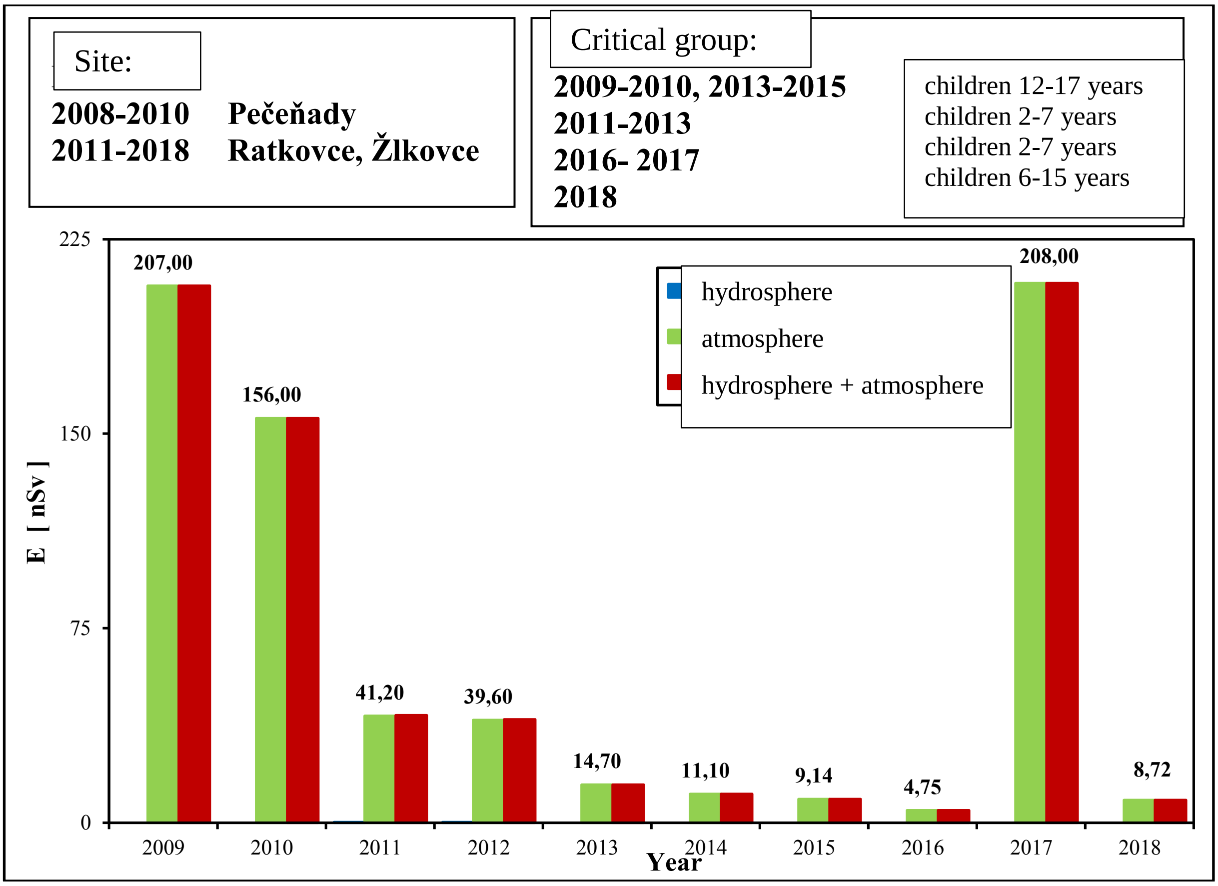
Pozn.: RS-03 – detektor dávkového príkonu, TLD – termoluminiscenčný dozimeter

Note: RS-03 – dose rate detector, TLD – thermoluminescent dosimeter

For a summarising image of previous information about the exposure of individual environmental components to radioisotopes (including the food chain) generated in the environment due to the presence of the Jaslovské Bohunice NI premises, we present the radiation load on the population in the surroundings of SE-EBO and JAVYS, a.s. operations for the last 10 years (Source: the report "Discharges of radioactive substances from the NI JAVYS, a.s. Jaslovské Bohunice and the impact of the NI JAVYS, a.s. on the surroundings, 2018“). Dose load is calculated by means of the ESTE AI computation programme, which uses for the calculation of dose load in the surroundings the conservative factors of inhalation, water consumption, and respiration speed in individual groups, based on the application of requirements of Act No. 87/2018 Coll. on radiation protection and on the amendment to certain acts.

The highest annual effective doses E of a representative person from the population calculated from liquid and gaseous discharges of radioactive substances from the area of SE EBO and JAVYS (since 2011 only from JAVYS) are displayed in the following graph.

Fig. C.II.15./03
Radiation load on the population in the surroundings of JAVYS a.s. for the previous 10 years



<u>*HEALTH CONDITION OF THE POPULATION*</u>

Public health represents the level of health of a certain defined society. It is determined by means of statistical data – demographic (number of inhabitants, age structure, proportion of genders, increase or decrease in the number of inhabitants, migration, ethnicity, education, religion, ...) and health (general morbidity, morbidity by individual diseases, general mortality, mortality by age, mortality by individual diseases, untimely mortality, life expectancy...).
The determination of the share of influence of quality of the environment on public health is a complex process as the quality of public health is affected by several factors. Environmental factors considerably affect the development and health condition - both in positive and negative ways. Thanks to congenital as well as obtained defensive and adaptation mechanisms people successfully cope with even relatively extreme life conditions without considerable impacts on health.

Despite that, external impacts of the environment on health represent only a relatively low share of all factors, so-called determinants of health. The current professional literature divides the determinants of health as follows:

Table C.II.15/10
Determinants of health

Determinants	Examples	Probable % of impact on health
Environment	Air, water, food quality, ionising radiation, noise, climatic conditions...	20 - 30
Working environment	the same in the working environment	
Socio-economic impacts	employment, poverty, education, social contacts, security, culture...	?
Healthcare	Quality, availability, prevention, financing...	15 - 20
Genetic factors	inheritance, hereditary predisposition...	10 - 15
Lifestyle	Nutrition, physical activity, smoking, alcohol, drugs, religion, habits, stresses...	50 - 60

Consequently, environmental factors probably represent only the fourth part of all impacts affecting health quality in inhabitants and determining the resulting health condition. The influence of lifestyle is dominating – diet, physical activity, hygienic habits, coping with stress, impact of self-destructive habits (smoking, alcohol, drugs, etc.).

Environmental factors with possible impacts on public health

The factors, which can affect public health, include:

1. quality of the environment
1.1. physical factors - ionising radiation, noise and vibrations, electromagnetic radiation, UV radiation, optical radiation, climatic conditions
1.2. chemical factors – chemical pollution impact on the quality of air, waters, soil and food chain
1.3. biological factors – biologically active substances, micro organisms in the air, water, soil and food chain
2. working environment factors - work risk factors - physical, chemical, biological, psychological
3. psychological factors – risk perception, stress
4. social factors – employment, transport, financial situation, community integration.

The actual statistically expressed characteristics of population's health condition for the affected districts Trnava, Piešťany and Hlohovec (data for smaller territorial units are not processed statistically) are provided in the Annex "Health Impact Assessment (HIA)".

II.16. COMPREHENSIVE EVALUATION OF CURRENT ENVIRONMENTAL ISSUES

On the basis of the data and information provided in the preceding chapters, the environmental issues of the affected area and its wider surroundings can be summarized in general as follows:

- contamination of surface water flows due to discharges of industrial and sewage waste water,
- groundwater pollution due to application of fertilizers from agricultural activities, infiltration of polluted surface waters, directly in the site also due to leakage of barriers in decommissioned NF, etc.,
- air pollution from mobile sources (road transport) and stationary sources (mainly energy sources and sources related to agricultural production) and increased dustiness caused by agricultural activity,
- increased noise pollution especially around major transport corridors (roads, railways),
- placement of unauthorized landfills,
- reduced ecological stability and insufficiently built territorial system of ecological stability.

II.17. OVERALL QUALITY OF THE ENVIRONMENT - SYNTHESIS OF POSITIVE AND NEGATIVE FACTORS

The quality of individual components of the environment and consequently the overall quality of the environment in the area of interest can be evaluated as a synthetic property based on the following characteristics:

- ✓ vulnerability of the environment to the disturbances,
- ✓ ecological importance of the territory,
- ✓ current environmental load.

For classification of vulnerability (load-bearing capacity) we used three grades of relative evaluation:

low vulnerability - the component is able by its self-regulation processes to eliminate the negative impact of the expected effect of anthropogenic activity, the negative effect has no major impact on these self-regulation processes

moderate vulnerability - the component is able by its self-regulation processes to partially eliminate the negative impact of the expected effect of anthropogenic activity, the negative effect has a significant impact on these self-regulation processes

high vulnerability - the component is not able to eliminate the negative impact of the expected effect of anthropogenic activity by its self-regulation processes, the negative effect will paralyse these self-regulation processes

In assessing the vulnerability of the territory ***in terms of biodiversity, gene pool and ecological stability,*** we have considered, taking generally into account the identified impact of the activity in

question, the nature of the communities in the territory concerned, their level of quality and diversity of representation, the proportion of natural, or semi-natural elements, etc.
Due to the fact that the affected area is located directly in the location of the activity under consideration, consisting of a large complex of nuclear facilities situated in a country formed by agricultural land, interwoven with transport and technical infrastructure network, connecting smaller municipalities characterized by rural settlements, with a limited representation of TSES elements mainly of a linear nature around the streams (i.e. the area can be considered as a territory with significantly impaired self-regulatory capabilities), we assess the vulnerability of biodiversity, gene pool and ecological stability of the affected area as a moderate.

The assessment of the sensitivity and vulnerability of the ***rock environment*** was carried out in accordance with the principles given in STN 44 3705 standard (Evaluation of rock sensitivity and vulnerability of the rock environment). The vulnerability factors include geological activities (processes), including anthropogenic ones, which cause a decrease in the quality of individual elements of the geological environment (e.g. change of groundwater level, change of rock moisture, change of rock temperature, uncovering of the rock environment, etc.).
During the founding of the proposed objects, excavation of the foundation pits and construction of engineering networks, the Quaternary loess sediment complex was the most affected object by the construction work. The complex is dominated by clays and silts.
Based on the sensitivity evaluation, we classify loess clays (silts) and loams as very sensitive rocks. According to Table 2 in STN 44 3705 standard, such rocks are sensitive to vulnerability factors related to the uncovering of the rock environment, changes of humidity and temperature, and changes in groundwater level, or changes in the hydrogeological regime, changes in the morphology of the terrain surface and seismic shocks, respectively.
In this case, the character, intensity of activities and currently available technologies classify the vulnerability of the assessed rock environment in terms of the STN in the 2nd degree of vulnerability - very vulnerable environment. In such an environment, rocks are predominantly sensitive to vulnerability factors, but the available technical measures can mitigate the negative environmental impact. For the purposes of this material, we consider them as moderately vulnerable.

In assessing the vulnerability of ***soils***, in view of the identified impacts of the activity in question, we considered in general, e.g. the soil chemistry and the resulting ability to inactivate pollutants, soil contamination, the ability to transport pollutants, etc. Soils of directly affected area and its immediate surroundings, generally assessed as uncontaminated or relatively clean, predominantly resistant or only slightly susceptible to acidification, in relation to the risk of contamination of plant production by metals as moderately hazardous, predominantly with high and to a lesser extent with moderate intoxication with acid group of hazardous metals and weak to moderate resistance to intoxication with alkaline group of hazardous metals, mostly with high retention ability and moderate permeability, etc., are evaluated as moderately to little vulnerable.

In assessing the vulnerability of the ***relief,*** considered the impact of the activity in question, e.g., we have generally considered the surface shape, its horizontal ruggedness, acting relief processes, etc. Relief of the affected area and its surroundings, with regard to its minimal ruggedness and inclination, as well as given the intensity of exogenous processes (predominantly low potential of water and wind erosion), is assessed as little vulnerable.

In assessing the ***air*** vulnerability**,** we considered:

- ✓ the current state of air pollution, represented by the long-term air pollution index,
- ✓ existing sources of air pollution, represented by annual emissions of pollutants,
- ✓ meteorological conditions.

The atmosphere of the affected area, taking into account the abundance and intensity of winds occurring, ensuring a good dispersion of pollutants emitted, combining emissions mainly from agricultural production, local energy sources, transport and specific emissions from the operation of the nuclear facility complex, metal surface treatment operations and the like, could be evaluated as moderately vulnerable.

In assessing the vulnerability of ***groundwater,*** considering the identified impacts of the activity in question, we generally considered e.g. the permeability coefficient of the hydrogeological unit concerned, the depth of the groundwater level, pollution and the like.
Considering the hydrogeological characteristics of the territory, which shows the ability to isolate pre-Quaternary groundwater from possible seepage, which has already been taken into account in the selection of the site for the location of nuclear facilities, but given less favourable results of local monitoring of pollution of Quaternary groundwater bodies in the affected area due to locally unsatisfactory condition of protective barriers (e.g. in the locality of object No. 41, originally intended for underground storage of LRAW during operation of the currently decommissioned A1 NPP), intensive agriculture, etc., we evaluate the vulnerability of groundwater as moerate.

In assessing the vulnerability of ***surface waters***, considering the identified impacts of the activity in question, we considered their susceptibility to pollution dependent on the qualitative and quantitative indicators of the affected surface streams, the pollution transport routes, as well as the types of contaminants and the possibilities of their escape. Their vulnerability with regard to the above mentioned, as well as in relation to the identified impacts of the activity in question, is assessed as moderate.

In assessing the vulnerability of ***animals and herbage***, considering the identified impacts of the activity in question, we generally considered e.g. the degree of degradation and disruption of their natural habitats, and other factors. Given the characteristics of the affected area (see above in assessing the vulnerability of biodiversity), we assess it in this context as moderately vulnerable.
In assessing the vulnerability ***of human life quality and well-being factors,*** we considered the quality of the individual components of the environment, affecting the health status of the population, data characterizing the health status of the population, factors affecting the well-being of a person's life, such as availability of a health care, education, services, job opportunities, traffic load, etc., but also the presence of NF. With regard to the identified impacts of the activity in question, we consider these factors as moderately vulnerable.

Table C.II.17.
Vulnerability of individual components of the environment in the affected area

Environmental component	***Level of vulnerability***
Rock environment	Moderately vulnerable
Relief	Little vulnerable

Groundwater	Moderately vulnerable
Surface water	Moderately vulnerable
Soils	Moderate to low vulnerability
Atmosphere	Moderately vulnerable
Ecological stability	Moderately vulnerable
Animals and herbage	Moderately vulnerable
Well-being and quality of life	Moderately vulnerable

In terms of overall environmental quality as a synthetic property, we can conclude with respect to partial characteristics that the individual components of the environment of the affected area were summarily assessed as being mostly moderately vulnerable, that the affected area consists mostly of sites of low ecological significance, and in terms of environmental burden (2010) as the output of the process of spatial division of the landscape on the basis of set criteria and selected sets of environmental characteristics according to the quality of the status and the trends of changes of the affected environment, it can be stated that the affected area has been classified in 3rd to 4th quality grade from a 5-grade rating scale, which means a slightly disturbed to disturbed quality of the environment.

II.18. ASSESSMENT OF EXPECTED DEVELOPMENT OF THE TERRITORY IF THE PROPOSED ACTION IS NOT IMPLEMENTED

In the event that the proposed activity was not carried out in the territory, the issue of RAW management through existing facilities for the processing and treatment of RAW by burning, compressing, anatexis and cementing to National Radioactive Waste Repository,would remain in solution process. If the processing capacity of NF TTC RAW is not increased and complemented and the organization of operation of existing RAW management facilities is not changed, it will not be possible to meet the processing requirements for RAW management, especially in terms of RAW production from V1 NPP decommissioning, A1 NPP decommissioning and RAW originated from NF operation in expected scope. It will also not be possible to meet the requirements of RAW processing of individual RAW producers from Slovakia (operation of nuclear power plants in the SR, institutional RAW from various areas of human activities, such as research, medicine, etc., arising outside of nuclear power plant operations, RMUO), in order to achieve the most efficient utilization of processing and personnel capacities of the NF TRWTC.
Due to the binding deadline for termination of Phase II of V1 NPP decommissioning in 2025, it is expected to significantly reduce the radiation load in the locality of Jaslovské Bohunice after 2025. If the proposed activity is not implemented within the scope of Variant No.1, it is not possible to ensure fulfilment of the set objectives, especially in the area of RAW management, and this fact may have a negative impact on the affected area.

II.19. COMPLIANCE OF THE PROPOSED ACTION WITH THE APPLICABLE LAND-USE PLANNING DOCUMENTATION

Implementation of the proposed activity is located in the cadastral area of Jaslovské Bohunice, which is part of the Trnava self-governing region. Pursuant to the land-use planning of the Trnava self-governing region, the binding part of which was declared by the Government Decree of the Slovak Republic No. 183/1998 Coll. of 7 April 1998 (as amended) is required, for example:

- ✓ *10.1.2 to ensure the gradual decommissioning and subsequent disposal of the existing nuclear power plants A1 and V1 in accordance with the agreed schedule.*

Thus, the activity in question is in accordance with the above-mentioned land-use planning documentation.

CONSISTENCY WITH OTHER STRATEGIC DOCUMENTS

The management and disposal of RAW is not subject to solution of the WMP SR or WMP of lower administrative units, due to the fact that the Act of the National Council of the Slovak Republic No. 79/2015 Coll. on Waste, as amended, does not apply to the management of radioactive waste.

The current technologies for the treatment and conditioning of RAW, decommissioning of A1, V1 NPP, are discussed and considered in the Strategy for the Final Part of the Peaceful Use of Nuclear Energy, approved by Government Resolution No. 26 of January 15, 2014. The final part of nuclear energy means a set of actions at the end of activities related to the peaceful use of nuclear energy.

III. ASSESSMENT OF EXPECTED ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTIVITY INCLUDING THE IMPACTS ON HEALTH AND THEIR ESTIMATED SIGNIFICANCE

III.1. IMPACTS ON THE POPULATION

Variant 0:

The directly affected population is the population of the municipality Jaslovské Bohunice, in whose cadastral territory the premises of JAVYS, a.s. including the RAW treatment and conditioning technologies are situated.

The population of municipalities situated in a circle with a radius of about 5 km, with the centre at the site of the affected part of the Proposer's premises (the first (A zone) with a radius of 5 km in accordance with Decree of the Ministry of Interior of the SR No. 533/2006 Coll. on details of population protection against effects of hazardous substances) can also be considered affected population for the needs of this material.

The justness of the above approach is also confirmed by the results of calculation of the real effective dose for the population, according to which, for example, in 2018, the highest total effective dose was calculated for all the facilities of the Proposer at this site (8.72E-09 Sv) for the inhabited sector 76 (Ratkovce), where the age category of 6-15 years would be the potential critical group.

Thus, inhabitants of nine municipalities become affected based on this approach:

- ✓ Jaslovské Bohunice, Malženice, Radošovce, and Dolné Dubové situated in the Trnava District,
- ✓ Žlkovce and Ratkovce situated in the Hlohovec District,
- ✓ Veľké Kostoľany, Nižná, and Pečeňady situated in the Piešťany District.

The nearest residential built-up area in relation to the respective premises of the Proposer is the built-up area of the municipalities Jaslovské Bohunice and Radošovce, at a distance of about 2 km.
During ***operation*** of the RAW TCT, both positive and negative, direct and indirect impacts on the population are created.
Positive, however, indirect impacts on the population include the possibility of systematic and comprehensive approach to management of radioactive wastes from A1 NPP decommissioning, V1 NPP decommissioning, operation of other nuclear installations of the SR, management of IRAW and RMUO, and existence of stable jobs in the territory.

Potentially negative impacts of the activity on the affected population include the contribution to radiation load on the territory, related transport loading, including the generated noise and emissions of common pollutants from the operations of incineration plants and RAW remelting.
Emissions of common pollutants in Variant 0 result in particular from the operation of the RAW incineration plant and to a smaller extent from the operation of other technologies/RAW treatment activities, e.g. milling operations, grinding, handling loose fixation matrices (cement, SIAL, etc.), metallic RAW remelting (under construction), etc., as well as from operation of some equipment creating operation background (e.g. natural gas boilers K3 and K4, stand-by diesel generators, facility producing FCC). If relevant, emissions of common air pollutants are limited or prevented by suitable techniques (e.g. cloth filters, flue gas scrubbers, DeNOx system, etc.), as well as by fuel options (except for the stand-by diesel generators, natural gas is used as fuel for energy equipment and as stabilisation and supporting fuel for the RAW incineration plant as it is a fuel with the most favourable specific emissions of air pollutants). For the activity (with respect to its character), no relevant non-point pollution sources are present. The traffic generated represents a related source of air pollutants.

It results from the above discharges from the operation of the NI RAW TCT that the operation observes the set limits with a reserve and the generated effective dose for an inhabitant is considerably lower than the limit set by the PHA SR.

As regards the generated freight transport load on the site, with conservative approach (i.e. evaluation of the maximum transport frequency) it can be stated that the contribution of the activity in the affected territory is unimportant.

As regards common pollutant emissions from waste incineration, even if we take into account the worst permitted emission situation, the dispersion study proves the observance of all set and recommended limits of immission concentrations for health protection even in the most exposed area.

Limited quantities of produced common operating wastes (RAW produced during the activity are treated directly at the RAW TCT at Jaslovské Bohunice), production of common sink and rain waters, controlled removal of gaseous discharges, etc. do not represent a source of any significant impact on the affected population in consideration of their significance and solution (i.e. waste management in accordance with the valid legislation, with an emphasis on preferred recovery, operation of APS in compliance with the respective legislation, treatment and discharge of waste waters into water bodies in compliance with the set conditions).

Taking into account the distance from the closest non-industrial built-up area, it is not relevant to consider in relation to the population any significant impacts of noise emissions produced by the installed technological equipment.
A feeling of mental discomfort in some individuals resulting from anxiety about the presence of facilities of such character near their dwelling place can also be assigned to indirect, however, non-quantifiable negative impacts on the population.

In Variant 0, taking into account the absence of a standard ***execution stage,*** no relevant impacts on the population would occur in connection with the activity concerned.

Variant 1:

In Variant 1, the impacts occurring during the execution stage would have only low intensity, they would be considerably limited as regards time and place, and taking into account the distance of the execution site from residential zones, they would be connected virtually exclusively with the supporting transport (adequate emissions of noise and pollutants from combustion engines of the supporting transport and adequately increased traffic intensity on the affected roads).

During ***operation*** of the RAW treatment technologies, both positive and negative, direct and indirect impacts on the population are created.
Positive, however, indirect impacts on the population include the possibility of systematic and comprehensive approach to management of radioactive wastes from A1 NPP and V1 NPP decommissioning, operation of other nuclear installations of the SR, management of IRAW and RMUO, and existence of stable jobs in the territory.

Direct negative impacts of the activity on the affected population include, with respect to the character of the activity, the contribution to radiation load on the territory. It is generated by the presence of the treated radioactive materials at the site and also by contribution of the assessed activity to radioactive discharges into the air and surface waters.

For ionising radiation, limits of protection of employees as well as inhabitants are solved by Act of the National Council of the SR No. 87/2018 Coll. on radiation protection.

Article 15 (11) discusses the population irradiation limits in the surroundings of the workplace with ionising radiation sources and sets them as follows:
a) effective dose 1 mSv in a calendar year,
b) equivalent dose in the crystalline lens 15 mSv in a calendar year,
c) equivalent dose in skin 50 mSv in a calendar year (it applies to an average dose on an area of any 1 cm^2 regardless of the size of the irradiated skin area).
The above irradiation limits apply to: for the limit of effective dose, the sum of all annual effective doses from external irradiation and committed effective doses from internal irradiation, and for the limits equivalent doses, the sum of all annual equivalent doses. The doses from all paths of irradiation of an individual from the population, from all sources of ionising radiation and all registered and permitted activities with the sources of ionising radiation worth considering, shall be included in the irradiation of an inhabitant.

The value 1 mSv/year is based on the recommendations of the ICRP (International Commission on Radiological Protection) and was implemented in various national and international legal regulations. The limit is adjusted so that the probability of deaths caused by artificial radiation is minimal.

At the same time, in accordance with the respective act (Article 91 (2)), in releasing radioactive substances into waters and into the air (by one operator of nuclear installation) the limit dose of a representative person of 0.25 mSv/year must be observed, with the following structure: an effective dose for discharges into the air of 0.2 mS/year, and of 0.05 mS/year for discharges into surface waters.

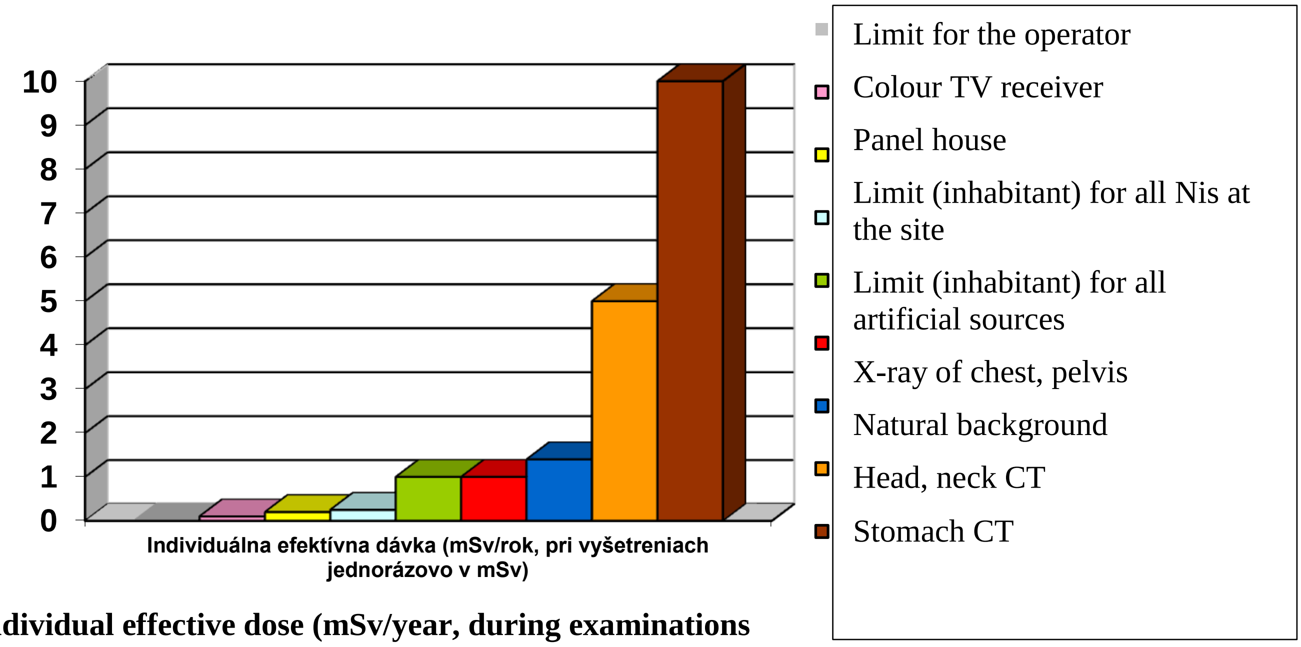
For the operation of the RAW TCT and A1 NPP decommissioning (along with the interim spent fuel storage facility), the PHA SR specified a maximum effective dose of a representative person of the population caused by RAS released into the air and surface waters at a level of 12 µSv/year (i.e. $12x10^{-6}$ Sv/year, Decision No. OOZPŽ/7119/2011 dated 21 October 2011), and for V1 NPP decommissioning at a level of 20 µSv/year (i.e. $20x10^{-6}$ Sv/year, Decision No. OOZPŽ/3760/2011 dated 1 July 2011).
The limit of the effective dose of a representative person of the population caused by RAS released into the air and surface waters for the operation of all nuclear installations of JAVYS, a.s. at Jaslovské Bohunice must not exceed the value 32 µSv/year (i.e. $32x10^{-6}$ Sv/year).

For the documented year 2018, which can also be interpreted as the approximately persisting status in case of recommendation of execution of Variant 0, the maximum total effective dose and committed effective dose from all considered paths for the residential sector 76 (Ratkovce) for a critical group of age category from 6 to 15 years at a level of $8.72x10^{-9}$ Sv/year (i.e. 0.03 % of the annual limit) was calculated based on real meteorological measurements and real discharges for all facilities of the Proposer at this site and in that year, about 57.54 % of treatment potential of treatment technologies was used. As it is obvious from the above, the values generated by real outputs of the respective activity at Jaslovské Bohunice are lower by order than the set limit value.

The total individual effective dose for limit activities of discharges (see Chap. B.II.1 and B.II.2.) set by the Decision of the PHA SR was also calculated for RAW TCT for the Pre-Operational Safety Report . It reached the highest value of $6.47x10^{-6}$ Sv for the age group of adults in zone No. 89 in the south-south-east direction at a distance of about 5 to 7 km in the point of Manivier channel termination in the river Dudváh. This value also represents approximately one half of the set limit value of 12 µSv/year. The total individual effective dose for limit activities of discharges from V1 NPP decommissioning was calculated in the same way, and the value calculated $7.15x10^{-6}$ Sv represents only 22.34 % of the set limit value 20 µSv/year.

To objectify the notion of dose load on the population in the surroundings of the NI at Jaslovské Bohunice, we have to remind that man receives on average 2.5 mSv of total dose annually from the natural radiation background.
For illustration, the following graph shows the comparison of informative individual effective doses (IED) during various human activities, set general limits and specified limit for the solved technologies (along with the ISFS).

Fig. C.III.1.
Individual effective doses of various origin



Individual effective dose (mSv/year, during examinations one-shot in mSv)

In Variant 1, in particular in connection with the optimisation of RAW incineration capacities and metallic RAW remelting, an increase in emitted activity in discharges into the air is expected, as well as an increase in the pertaining total individual effective dose.
The contribution of optimisation of treatment capacities is expected due to creation of gaseous radioactive discharges below 14% of use of limits for the ventilation stack structure 46 and below 5% for the ventilation stack structure 808 with the utilisation of maximum capacity and RAW treatment with maximum permitted input activity. The quantity of activity really released into the air will depend on the character and quantity of treated material.

The increase in the total individual effective dose (for the residential sector 76 - Ratkovce) was calculated as max. 9.70×10^{-10} Sv/year for RAW incineration and 1.01×10^{-8} Sv/year for metallic RAW remelting (of which 2.24×10^{-9} Sv/year appertains to the currently executed remelting with permitted capacity of 1,000 t/year, which was not manifested by the individual effective dose in 2018 yet because of the stage of execution).
This conservative assumption is based on the scenario, during which the entire treatment capacity of both technologies would be used, and for the RAW incineration plant, all the treated waste would show activity at the level of maximum permitted activity for entering RAW of 6×10^{6} Bq/kg.

The other added technologies of RAW treatment (compactor) and proposed storage of RAW do not represent a relevant source of discharges of radionuclides because of their character; nor the change of discharges of radionuclides is expected in connection with the considered relocation of certain fragmentation and decontamination facilities of the V1 NPP, which are a relevant source of discharges into the air, however, the relocation will not affect the pertinence of the discharges to the V1 NPP, i.e. there will be no change of total discharges of the V1 NPP or of the share of the technologies in the dose from the V1 NPP.

Thus, it can be stated that the total individual effective dose from 2018 would increase in connection with the execution of the proposed changes (Variant 1), with conservative estimate, to about $1.98x10^{-8}$ Sv/year, which would represent the use of about 0.06 % of the specified joint limit for all facilities of the Proposer.
It results from the above mentioned that even in case of execution of the proposed changes (Variant 1), the set limits of radiation protection will be observed with a large reserve (the joint generated real individual effective dose for an inhabitant will still remain lower by order than the joint limit of effective dose set for the operator).

Potential risks of environment contamination by radionuclides and subsequent radiation impacts on the population as a consequence of disturbance or destruction of protective barriers (e.g. by natural disasters (flood, earthquake, ..) or by events caused by human activities (plane crash,...)) are discussed in detail in Chapter C.III.19.

The population of the affected territory can also be potentially exposed to ionising radiation in connection with RAW transportation. To limit the risk, the transport is carried out in compliance with the ADR (European Agreement concerning the International Carriage of Dangerous Goods by Road) and Act of the National Council of the Slovak Republic No. 87/2018 Coll. on radiation protection, i.e. RAW is transported in special transportation containers suitably selected according to activity and type of RAW transported, and in accordance with the above Act (Article 103 (6)) it must be ensured that the dose rate:

a) under usual transportation conditions does not exceed the value 2 $mSv.h^{-1}$ at any place of the external surface of the shipment or external packaging,
b) under the conditions of exclusive use does not exceed the value 10 $mSv.h^{-1}$ at any place of the external surface of the shipment or external packaging (under the conditions specified by special regulations),
c) under usual transportation conditions does not exceed the value 2 $mSv.h^{-1}$ at any place of the surface of the transport vehicle and the value 0.1 $mSv.h^{-1}$ at a distance of 2 m from the surface of the transport vehicle.

For the transportation of radioactive material, an increase in the current frequency of related transport from 1-2 trucks/day to 2-3 trucks/day is expected in connection with the proposed changes.
In this connection, it is also necessary to mention that the main part of RAW transportation out of the premises is represented by the transportation of conditioned RAW in FCCs or alternative packaging sets to the NRWR at Mochovce, and also RAW transportation within the provided external nuclear services.

Additional potentially relevant impacts of the activity on the population of the affected territory are related to:

✓ emissions of common pollutants into the air

In case of proposed changes (Variant 1), a contribution to emissions of pollutants into the air is expected in particular in connection with the optimisation of RAW incineration capacities (an increase in capacity from 240 t/year to 480 t/year) and metallic RAW remelting (another RAW remelting line with a capacity of 2 t /batch). For emissions of pollutants into the air from related non-point and line air pollution sources, the situation will not change relevantly in connection with the execution of Variant 1.

In relation to the influence of the expected contribution to emissions of common pollutants on human health, it can be generally stated in accordance with the conclusions of the performed immission-transmission assessment that the activities both in the current and proposed forms have no significant impact on air quality in the monitored area and they will not cause any considerable deterioration of the existing quality of air in the assessed area (the activity's highest contribution to the use of set immission limits for human health protection concerns immisions of nitrogen oxides - before the proposed change at a level of 1.171 % of the limit value 200 $\mu g/m^3$, after the proposed change at a level of 1.248 % of the limit value).

✓ emissions of common pollutants in waste waters

The discharged waste waters come from the hygienic facilities of employees, from the surface run-off of rain waters, from technologies and remediation pumping of groundwaters. Their pollution by common pollutants observes the limits set by issued decisions of the competent government authority for the protection of water quality. In connection with the proposed Variant 1, no relevant change of the existing situation is expected.

✓ related traffic loading, including the generated noise

The expected contribution of proposed changes of 1-2 trucks/day will increase the current frequency of freight transport (transit through the municipality Jaslovské Bohunice, with transit of about 2,500 cars per day) by about 0.08 %.

✓ a feeling of psychological discomfort in some individuals (indirect impact)

It results from the anxiety about the presence of a nuclear facility near their dwelling place and increases in connection with the proposal of changes of character of the set of the existing technologies and increase in treatment capacities (the impact is expressed especially in connection with the proposal of optimisation of RAW incineration capacities). The above impact of NI operation at the site cannot be totally removed, however, it can be prevented by NI operators, for example, by extensive monitoring of impacts of NI operation on individual environmental components and by publishing the results of the radiation load monitoring, by performing the analysis of impacts of NI operation on population's health etc., which the Proposer carries out to the full extent set by permitting decisions.

In relation to other impacts of the respective activity discussed in more detail in respective chapters (e.g. the noise from installed technological equipment, production of common operating wastes), it can be stated that considering the distance and location of the closest non-industrial built-up area, as well as the character and solution of the assessed activity and its outputs, they do not represent a source of relevant impact on the population.

The evaluation of impact of the activity and its proposed changes on health and of health risks is also discussed in detail in the document "Health Impact Assessment" worked out for the proposed activity by a professionally competent person - RNDr. Iveta Drastichová (May 2019) - and attached in full wording in Annex No.5 to the Assessment Report. The assessment was carried out in compliance with Decree of the Ministry of Health of the SR No. 233/2014 Coll. on details of health impact assessment and it was based on the methodology of US EPA: : Risk Assessment Guidance for Superfund. Human Health Evaluation Manual.

The initial screening for the respective activity and its changes in compliance with Decree of the Ministry of Health of the SR No. 233/2014 Coll. resulted in the recommendation to perform maximum HIA (Health Impact Assessment) for the proposed change and based on the screening outputs, the HIA was focused on:

- quantitative assessment of chemical factors,
- quantitative assessment of radioactive radiation,
- qualitative assessment of socio-economic or psychological factors.

Health risk assessment was carried out in the following steps: hazard identification, dose-response assessment, exposure assessment, and risk characterisation.

The assessment/screening included the assessment of basic demographic data, current health condition of the affected population and state of the environment. The assessed *demographic indicators* of the affected population included data on the number and movement of inhabitants, age structure of the population, average age, and ageing index. Data on mortality caused by respiratory diseases, cardiovascular diseases and tumour diseases, as well as gross incidence of malignancies were assessed in adults as *indicators of the current health condition of* the population Based on the assessment, the author stated that the current demographic and health condition of the population at the assessed site could be considered comparable with the average in higher territorial unit (region, SR).

In the assessment of health risk resulting from the **exposure to chemical substances**, the inhalation path of exposure (dermal and oral path of exposure are not expected considering the properties of the evaluated chemical substances and the source of exposure) was taken into account, including various vulnerability of population groups, therefore, health risk was estimated not only for adults but also for children. For health risk assessment concerning the emissions of common pollutants into the air, the maximum identified values of maximum short-term and average annual immission concentrations in reference point calculated in the Dispersion Study of Ing. V. Carach (May 2019) were used, and it was assumed that if those concentrations did not have unacceptable impact on health, the impact of lower concentrations set in other reference points would also be acceptable.

The calculation of health risk for threshold (non-carcinogenic) effects of solved chemical substances (CO, NO_2, PM /assessed as PM_{10} + $PM_{2.5}$/, SO_2, HCl, HF, Cu, Cd/Tl /assessed as Cd/, Hg, Σ of heavy metals /assessed as As/, TOC /assessed as benzene/ and PCDD/DF (assessed as TCDD) was carried out for chronic or subchronic exposure, through the so-called reference concentration (RfC), which is the estimated concentration of the substance in the air, which during the inhalation exposure probably

does not represent any risk of adverse effects even during lifetime exposure[6]. It was further converted to the so-called reference dose (RfD_{inhal}), which indicates "safe" values of daily intake of the substance. Subsequently, the values of the assessed daily intake averaged over the entire period of exposure (ADD – average daily dose) calculated from immission concentrations available in the Dispersion Study were compared with it. The calculated quantitative rate of potential threat to human health resulting from the chemical substances is called hazard quotient (HQ).
The HQ obtained is evaluated as follows:

HQ < 1, no significant risk of non-carcinogenic effects is expected,
HQ 1 – 10, there is a potential risk, corrective measures need to be started,
HQ > 10, emergency situation, remediation needs to be started as soon as possible.

Thresholdless (carcinogenic) effects of emitted pollutants were evaluated for benzene, arsenic, cadmium, nickel, chromium^{VI}, TCDD, again with the use of maximum short-term and average annual immission concentrations calculated for reference points.
The inhalation cancer unit risk factor (IUR) was used for the evaluation of expected exposure; the level of exposure was converted into total life expectancy of an exposed person (70 years), so called LADD (lifetime average daily dose).

Lifetime increase of probability of cancer diseases above the general average for the population (APCR) represents quantitative expression of the risk of carcinogenic effects. As regards the assessment of risk acceptability, probability of cancer disease occurrence of 10^{-6}, i.e. APCR < 10^{-6} is considered "health safe" for the population.

The outputs of the evaluation state the following:

- neither for adult nor for children's population, the risk of health damage by exposure to any of the emitted chemical substances (CO, NO_2, SO_2, PM, HCl, HF, Cu, Cd/Tl, Hg, Σ of heavy metals, TOC, and PCDD/DF) in any of the assessed variants has been proved (hazard quotient HQ < 1),
- of the emitted chemical substances from the solved source (the respective operations of JAVYS, a.s.), heavy metals have the most significant impacts on human health, however, even for them the calculated value of HQ is considerably lower than 1 (for Variant V1, HQ = 0.1172 was calculated for maximum short-term concentrations and HQ = 0.0014 for average annual concentrations),
- In terms of source background, the most significant pollutant at the assessed site in terms of health effects is CO, however, again, the calculated value of HQ is lower than 1 (for Variant V1, HQ = 0.6734 was calculated for maximum short-term concentrations and HQ = 0.5005 for average annual concentrations), and the contribution of the activity assessed to the immissions of this pollutant is minimal,

[6] *The determination of hazardous properties of the assessed chemical substances was carried out based on the results of epidemiological studies carried out in people or the results of laboratory examinations in animals. The results of the studies were obtained from TOXNET, ATSDR databases and from professional publications of WHO, US EPA, IARC and other materials.*

- the evaluation of carcinogenic effects of benzene, cadmium, chromium^{VI}, nickel, arsenic, and TCDD showed that the lifetime risk of cancer disease occurrence will not exceed the admissible risk value for the population (APCR) of 10^{-6} - the highest value of APCR was calculated for chromium^{VI} (for Variant V1, APCR = 1.54×10^{-8} was calculated for maximum short-term concentrations and APCR = 1.78×10^{-10} for average annual concentrations),

The following can also be stated in relation to above outputs:

- the effects of chemical substances were calculated from the modelled immission concentrations with strongly conservative approach (all facilities in operation in parallel, with maximum values of emissions - the level corresponding to emission limits, nominal output of the facility, etc.), therefore, the calculated hazard quotients may be higher than the reality is/will be,
- the hazard quotient for the entire group of heavy metals (Σ of heavy metals) was calculated for one of the most toxic heavy metals (As), which could overestimate the HQ results
- because of the unavailability of the chronic RfC for inhalation path of exposure, threshold effects of Cu were calculated from the acute RfC, i.e. the calculated HQ may also be slightly overestimated,
- to reach a maximum rate of caution, HQ were calculated not only for average annual immission concentrations of pollutants, which represent the chronic population health effects, but also for short-term immission concentrations, which are higher by order, and their constant and long-term occurrence at the site is extremely improbable, i.e. the lifetime exposure of the affected population to these levels taken into account in the calculation is also improbable.

The assessment of health risk **due to exposure to radioactive radiation** was carried out through the calculation of risk posed by irradiation for the inhabitants living all life (70 years) in the residential zone with the highest radiation load (residential sector 76 - Ratkovce). The risk posed by irradiation was calculated by means of the coefficient of risk of death caused by malignancy from irradiation, i.e. 5×10^{-2}/ Sv. The calculation used the real calculated highest value of individual effective dose of a representative person for 2018, and the estimated individual effective dose of a representative person calculated for the solved technologies (an increase in RAW incineration capacities and a new line of metallic RAW remelting), which were calculated by the ESTE AI programme supposing full utilisation of their proposed treatment capacities, and for the RAW incineration plant, also supposing the activity of input RAW in the entire volume at a level of maximum permitted activity.

The conclusions of the assessment state that the resulting risk of death due to cancer diseases caused by irradiation by ionising radiation coming from the current operations of JAVYS, a.s. is 3.1×10^{-8} , i.e. three cases of death in excess of the background per 100 million. The risk of irradiation coming from the proposed activity is 3.9×10^{-8} and represents four deaths in excess of the background per 100 million. At present, 2.5×10^{-3} inhabitants or 250,000 per 100 million inhabitants die of cancer in the SR. Taking into account the above facts, the risk of irradiation calculated for both the current and proposed operations of JAVYS, a.s. is negligible.

Summary of conclusions:

- Exposure of inhabitants of the affected municipalities to emissions of CO, NO_2, SO_2, PM, HCl, HF, Cu, Cd/Tl, Hg, Σ of heavy metals, TOC and PCDD/DF emitted from the operation does not represent ***an increased health risk in any of the assessed variants.***

- Exposure of inhabitants of the affected municipalities to radioactive substances/ionising radiation from the operation does not represent ***an increased health risk in any of the assessed variants.***

During the evaluation, the population’s anxiety about the impairment of their life conditions after the execution of the proposed investment was taken into account. As the anxiety about the impairment of life quality may for some people living in the affected territory represent stress, and stress is among the factors affecting health, to limit this impact in accordance with the conclusions of the assessment, it will be suitable to provide sufficient information to people. The professionally competent person evaluates the increase in the number of jobs and related improvement of living standard as a positive and stabilising aspect in this area.

The above measure in the form of provision of sufficient information to inhabitants and other measures and proposal of monitoring from the Health Impact Assessment were reflected in draft measures for the execution of the proposed activity, its operation and monitoring (Chap. IV.).

Consequently, it can be concluded that as regards the solved relations, the proposed activity is acceptable.

Social and economic consequences and context

According to the EBRD's Environmental and Social Policy, for the assessment and management of the environmental and social aspects of PR1 (Performance Requirements), the social dimension must also be taken into account in the assessment of the proposed activity in order to ensure sustainable development in the following aspects:

- Working standards and working conditions (including health and safety)
- Impacts on society such as public health and population safety
- Gender equality
- Impacts on indigenous peoples and cultural heritage
- Forced resettlement
- Availability of essential services

Table C.III.1./01
Identification of the impacts on social aspects

Social aspects	Identification of impact	Justification
Working standards and working conditions (including health and safety)*	Yes	The proposed activity poses health and safety risks, however the employer must respect existing national legal requirements to protect health of employees and create safe working conditions. Slovakia harmonized legislation in this area with the requirements of European directives. The legal, administrative, management and control actions ensure the labour standards and conditions in the affected NF and have been implemented in the long term in practice.
Impacts on population	Yes	The proposed activity presents a risk to affect the health

Social aspects	Identification of impact	Justification
such as public health and public safety		and safety of the population concerned, however it must be regulated and carried out in such a way as to comply with the permitted limits set primarily for the protection of public health and to minimize non-standard situations. The legal, administrative, management, comprehensive monitoring and control actions in a long term manage, monitor, evaluate and publish the impacts on the population in the affected area, and will be equally applied for the proposed new facility.
Gender equality	No	The proposed activity is in no way linked to gender discrimination.
Impacts on indigenous peoples and cultural heritage	No	This aspect is not relevant for the SR and the territory concerned. The proposed activity will in no way affect the ethnic composition of the population or the cultural heritage in the territory concerned.
Forced resettlement	No	The necessity of population resettlement is in no way connected with the proposed activity, as it is the treatment of RAW in existing objects, and there is neither a land taken, nor the occurrence of emergency situations can result in forced resettlement of the population.
Availability of essential services	No	The proposed activity will in no way affect the current or future availability of basic services; in comparison with other activities in the territory, it is insignificant with respect to basic services and their availability.

** Standards concerning employment and working conditions, which are laid down in a collective agreement or laid down under labour code and labour regulations.*

The impact in social area can be defined as positive with respective to maintenance of employment at the affected site. It is insignificant in terms of cumulative effects in this area.
The positive impact on the population includes socio-economic benefits, in particular increased demands for labour connected with activities of RAW treatment and conditioning, and the long-term impact thanks to created conditions for further industrial use of the site and employment in the future (the activity supporting A1 NPP and V1 NPP decommissioning processes).

<u>Acceptability of the activity for the affected population</u>

The affected municipalities (Jaslovské Bohunice, Pečeňady, Veľké Kostoľany, Ratkovce, Žlkovce, Malženice, Radošovce and Dolné Dubové) delivered a joint opinion on the submitted plan "Optimisation of treatment capacities of the RAW TCT JAVYS, a.s. at Jaslovské Bohunice", which is identical with the opinion of the Association of Towns and Municipalities, region of the Jaslovské Bohunice NPP. The opinions expressed anxiety of the municipalities about the radiation load and emissions of pollutants from waste incineration in the proposed activity. The affected municipalities accept Variant 0, which does not include an increased quantity of treated RAW. The Nižná municipality has no comments on the submitted plan.

As the acceptability for the affected municipalities has been proved, it can be stated that the population of the affected municipalities is not and will not be affected by an increased radiation load and emissions of pollutants. Optimisation of RAW TCT JAVYS, a.s. at Jaslovské Bohunice will not increase the radiation load and emissions of pollutants from waste incineration above the rate set by decisions of competent authorities.

Optimisation of treatment capacities of RAW TCT will ensure faster treatment of RAW into a stable form preventing leakage of radioactive substances into the surroundings. The conditioned RAW will also be gradually transported to the near-surface repository of the NRWR Mochovce. This will considerably reduce the total radiological inventory at Jaslovské Bohunice. After RAW from foreign producers has been treated and conditioned, it will be returned to the country of origin in compliance with valid legislative requirements resulting from Act No. 541/2004 Coll. on peaceful use of nuclear energy (Atomic Act) and on the amendment to certain acts.

Within the acceptability of the affected population, management of JAVYS, a.s. has organised several joint negotiations with mayors and representatives of municipalities in order to explain and justify the change of the proposed activity of optimisation of treatment capacities of RAW TCT.

III.2. IMPACTS ON THE ROCK MASS, MINERAL RESOURCES, GEODYNAMIC PHENOMENA AND GEOMORPHOLOGICAL CONDITIONS

The direct impact on the ***rock mass*** or the indirect impact in the form of contamination is with respect to the character of the respective activity irrelevant for routine operation. Potential risk of contamination as a consequence of non-standard operating states (e.g. leakage of liquid radioactive material as a consequence of leakage of equipment, piping, incidents during the filling of packaging (drum, FCC) etc.) is excluded thanks to emergency securing of all operating premises (sealed joints between the floor and walls, watertight floor and walls up to an adequate height, slope of rooms towards active sewerage, storage of hazardous substances in accordance with Decree of the MoE SR No. 200/2005 Coll., etc.).
The risk of contamination of the rock mass connected with the related traffic is limited by applying the legislative requirements for radiation protection and transport conditions in compliance with the ADR. Thus, the risk of limited and by common remediation operations removable contamination of the rock mass by leaked hazardous substances from a transport vehicle (e.g. oil, petrol) seems to be the most realistic one.

Mineral deposits are not affected by the respective activity.
The area of interest is not situated in a territory with active exogenous geodynamic phenomena (landslides, increased water or wind erosion etc.) nor the respective activity causes them by its character.

The siting and character of the proposed activity does not have any impact on the local ***geomorphological conditions,*** either.

III.3. IMPACTS ON CLIMATIC CONDITIONS AND VULNERABILITY OF THE PROPOSED ACTIVITY TO CLIMATE CHANGE

The activity includes the incineration process and process of metallic RAW remelting (natural gas combustion and RAW incineration), which produce carbon dioxide as a greenhouse gas. Importance of these sources is proportional to the small share of their emissions of CO_2 in relation to total emissions of greenhouse gases in the SR.
The respective activity will be situated in the existing structures of a large NI complex at the Jaslovské Bohunice site, which implies the assumption that it has no impact on the local micro climate in connection, for example, with the change of built-up territory etc.

III.4. IMPACTS ON THE AIR

There will be temporary and adequate emissions of pollutants into the air in connection with the supporting transport and execution work (dust, emissions of pollutants from combustion engines) **during the execution stage** of the proposed variant. However, taking into account the scope and character of the execution stage, as well as applied measures to limit dustiness and intensity of the related transport (e.g. cleaning of transport vehicles used, suitable storage and transportation of loose materials (covering, etc.) or sprinkling), the emissions will not have a potential to essentially affect the immission situation in the surroundings of the premises affected by the change. The execution stage of the proposed change will not have any influence on the emissions of pollutants from the activity of the Proposer.

The proposed changes will affect emissions into the air **during operation** of the RAW treatment technologies as follows:

- an increase in volumes/activity of gaseous fluid released into the air from the controlled area by air-conditioning systems with the respective level of purification (the influence assessed within the radiation load on the population in Chap. C.III.1.),
- an increase in the emitted quantities of common pollutants produced during the performed activities as a consequence of an increase in RAW incineration capacities (from 240 t/year to 480 t/year) and metallic RAW remelting capacities (another line of metallic RAW remelting) /the other supplemented technologies do not have any relevant impact on the emissions of common pollutants into the air or the proposed change character does not have impact on emissions from the technologies concerned (relocation of certain fragmentation and decontamination facilities within the NI V1)/.

The proposed change does not have a relevant impact on the emissions of common pollutants emitted from the background of operation represented by emissions from natural gas/oil combustion in energy facilities and emissions of PM from the fibre-concrete container producing plant.
The impact of the above changes on air quality at the affected site was evaluated within the immission-transmission assessment (Dispersion Study).

Based on the guaranteed mass flows of pollutants for air pollution sources it can be stated that the building height of the existing stacks is sufficient to ensure dispersion of pollutants.

Based on the outputs of the performed immission-transmission assessment, the following can be stated for the immission concentrations of individual pollutants and their groups in selected reference points[7]:

- for **daily** average concentrations **of particulate matters (PM) expressed as PM_{10}**, the execution of the proposed changes will increase the original highest contribution of the source 0.2188 μg/m^3 (0.438 % of the **limit value 50 μg/m^3**) to a value of 0.2874 μg/m^3 (0.575 % of the limit value); even if the background/surroundings of the evaluated source is taken into account, the summary value of immission concentration in the air will not exceed 20.069 μg/m^3,
- for **annual** average concentrations **of particulate matters (PM) expressed as PM_{10}**, the execution of the proposed changes will increase the original highest contribution of the source 0.002554 μg/m^3 (0.006 % of the **limit value 40 μg/m^3**) to a value of 0.003428 μg/m^3 (0.009 % of the limit value); even if the background/surroundings of the evaluated source is taken into account, the summary value of immission concentration in the air will not exceed 18.001 μg/m^3,
- for **daily** average concentrations **of particulate matters (PM) expressed as $PM_{2.5}$**, the execution of the proposed changes will increase the original highest contribution of the source 0.1465 μg/m^3 (no limit value has been determined) to a value of 0.1923 μg/m3; even if the background/surroundings of the evaluated source is taken into account, the summary value of immission concentration in the air will not exceed 18.046 μg/m^3,
- for **annual** average concentrations **of particulate matters (PM) expressed as $PM_{2.5}$**, the execution of the proposed changes will increase the original highest contribution of the source 0.00171 μg/m^3 (0.007 % of the **limit value 25 μg/m^3**/from 1 January 2020 the limit value is set to 20 μg/m^3) to a value of 0.002293 μg/m^3 (0.009 % of the limit value); even if the background/surroundings of the evaluated source is taken into account, the summary value of immission concentration in the air will not exceed 16.001 μg/m^3,
- for **hourly** average concentrations of **sulphur dioxide SO_2**, the execution of the proposed changes will increase the original highest contribution of the source 2.653 μg/m^3 (0.758 % of the **limit value 350 μg/m^3**) to a value of 2.933 μg/m^3 (0.838 % of the limit value); even if the background/surroundings of the evaluated source is taken into account, the summary value of immission concentration in the air will not exceed 14.280 μg/m^3,
- for **annual** average concentrations of **sulphur dioxide SO_2**, the execution of the proposed changes will increase the original highest contribution of the source 0.03004 μg/m^3 (no limit value has been determined) to a value of 0.03349 μg/m^3; even if the background/surroundings of the evaluated source is taken into account, the summary value of immission concentration in the air will not exceed 8.004 μg/m^3,
- for **hourly** average concentrations **of nitrogen oxides expressed as NO_2**, the execution of the proposed changes will increase the original highest contribution of the source 2.341 μg/m^3 (1.171 % of the **limit value 200 μg/m^3**) to a value of 2.495 μg/m^3 (1.248 % of the limit value); even if the background/surroundings of the evaluated source is taken into account, the summary value of immission concentration in the air will not exceed 35.160 μg/m^3,
- for **annual** average concentrations **of nitrogen oxides expressed as NO_2,** the execution of the proposed changes will increase the original highest contribution of the source 0.03363 μg/m^3 (0.084 % of the **limit value 40 μg/m^3**) to a value of 0.03624 μg/m^3 (0.091 % of the limit value);

[7] Detailed evaluation in tabular form is included in the attached Dispersion Study.

even if the background/surroundings of the evaluated source is taken into account, the summary value of immission concentration in the air will not exceed 12.003 μg/m^3,

- for **short-term** (8-hour) average concentrations of **carbon monoxide CO**, the execution of the proposed changes will increase the original highest contribution of the source 2.222 μg/m^3 (0.022 % of the **limit value 10 μg/m^3**) to a value of 2.31 μg/m^3 (0.023 % of the limit value); even if the background/surroundings of the evaluated source is taken into account, the summary value of immission concentration in the air will not exceed 600,088 μg/m^3,
- for **annual** average concentrations of **carbon monoxide CO**, the execution of the proposed changes will increase the original highest contribution of the source 0.04213 μg/m^3 (no limit value has been determined) to a value of 0.04398 μg/m^3; even if the background/surroundings of the evaluated source is taken into account, the summary value of immission concentration in the air will not exceed 450.002 μg/m^3,
- for **hourly** average concentrations of **TOC**, the execution of the proposed changes will increase the original highest contribution of the source 0.1155 μg/m^3 (0.058 % of the **limit value 200 μg/m^3** resulting from the respective "S" value 0.2/ no limit value has been determined by legislation) to a value of 0.1438 μg/m^3 (0.072 % of the limit value); even if the background/surroundings of the evaluated source is taken into account, the summary value of immission concentration in the air will not exceed 5.028 μg/m^3,
- for **annual** average concentrations of **TOC**, the execution of the proposed changes will increase the original highest contribution of the source 0.00133 μg/m^3 (no limit value has been determined) to a value of 0.001678 μg/m^3; even if the background/surroundings of the evaluated source is taken into account, the summary value of immission concentration in the air will not exceed 1.0004 μg/m^3,
- for **hourly** average concentrations of **HCl**, the execution of the proposed changes will increase the original highest contribution of the source 0.1814 μg/m^3 (0.181 % of the **limit value 100 μg/m^3** resulting from the respective "S" value 0.1/ no limit value has been determined by legislation) to a value of 0.2678 μg/m^3 (0.268 % of the limit value); even if the background/surroundings of the evaluated source is taken into account, the summary value of immission concentration in the air will not exceed 0.586 μg/m^3,
- for **annual** average concentrations of **HCl**, the execution of the proposed changes will increase the original highest contribution of the source 0.00210 μg/m^3 (no limit value has been determined) to a value of 0.003128 μg/m^3; even if the background/surroundings of the evaluated source is taken into account, the summary value of immission concentration in the air will not exceed 0.101 μg/m^3,
- for **hourly** average concentrations of **HF**, the execution of the proposed changes will increase the original highest contribution of the source 0.00831 μg/m^3 (0.208 % of the **limit value 4 μg/m^3** resulting from the respective "S" value 0.004/ no limit value has been determined by legislation) to a value of 0.01413 μg/m^3 (0.353 % of the limit value); even if the background/surroundings of the evaluated source is taken into account, the summary value of immission concentration in the air will not exceed 0.506 μg/m^3,
- for **annual** average concentrations of **HF**, the execution of the proposed changes will increase the original highest contribution of the source 0.000100 μg/m^3 (no limit value has been determined) to a value of 0.000165 μg/m^3; even if the background/surroundings of the evaluated source is taken into account, the summary value of immission concentration in the air will not exceed 0.10007 μg/m^3,

- for **hourly** average concentrations of **Hg**, the execution of the proposed changes will increase the original highest contribution of the source 0.00059 μg/m^3 (0.012 % of the **limit value 5 μg/m^3** resulting from the respective "S" value 0.005/ no limit value has been determined by legislation) to a value of 0.000657 μg/m^3 (0.013 % of the limit value); even if the background/surroundings of the evaluated source is taken into account, the summary value of immission concentration in the air will not exceed 0.0101 μg/m^3,
- for **annual** average concentrations of **Hg**, the execution of the proposed changes will increase the original highest contribution of the source 0.000007 μg/m^3 (no limit value has been determined) to a value of 0.000008 μg/m^3; even if the background/surroundings of the evaluated source is taken into account, the summary value of immission concentration in the air will not exceed 0.005001 μg/m^3,
- for **hourly** average concentrations of **Cu**, the execution of the proposed changes will increase the highest contribution of the source to a level of 0.015050 μg/m^3 (0.012 % of the **limit value 125 μg/m^3** resulting from the respective "S" value 0.125/ no limit value has been determined by legislation); even if the background/surroundings of the evaluated source is taken into account, the summary value of immission concentration in the air will not exceed 0.025 μg/m^3,
- for **annual** average concentrations of **Cu**, the execution of the proposed changes will increase the highest contribution of the source to a level of 0.000180 μg/m^3 (no limit value has been determined); even if the background/surroundings of the evaluated source is taken into account, the summary value of immission concentration in the air will not exceed 0.0052 μg/m^3,
- for **hourly** average concentrations of **Cd + Tl**, the execution of the proposed changes will increase the original highest contribution of the source 0.00059 μg/m^3 (0.012 % of the **limit value 5 μg/m^3** resulting from the respective "S" value 0.005/ no limit value has been determined by legislation) to a value of 0.000657 μg/m^3 (0.013 % of the limit value); even if the background/surroundings of the evaluated source is taken into account, the summary value of immission concentration in the air will not exceed 0.0101 μg/m^3,
- for **annual** average concentrations of **Cd + Tl**, the execution of the proposed changes will increase the original highest contribution of the source 0.000007 μg/m^3 (no limit value has been determined) to a value of 0.000008 μg/m^3; even if the background/surroundings of the evaluated source is taken into account, the summary value of immission concentration in the air will not exceed 0.005001 μg/m^3,
- for **hourly** average concentrations of **∑ of heavy metals**, the execution of the proposed changes will increase the original highest contribution of the source 0.02138 μg/m^3 (0.428 % of the **limit value 5 μg/m^3** resulting from the respective "S" value 0.005/ no limit value has been determined by legislation) to a value of 0.02208 μg/m^3 (0.442 % of the limit value); even if the background/surroundings of the evaluated source is taken into account, the summary value of immission concentration in the air will not exceed 0.101 μg/m^3,
- for **annual** average concentrations of **∑ of heavy metals**, the execution of the proposed changes will increase the original highest contribution of the source 0.000247 μg/m^3 (no limit value has been determined) to a value of 0.000255 μg/m^3; even if the background/surroundings of the evaluated source is taken into account, the summary value of immission concentration in the air will not exceed 0.05001 μg/m^3,
- for **hourly** average concentrations of **PCDD/DF**-type substances, the execution of the proposed changes will increase the original highest contribution of the source 3.56E-07 ng/m^3 (0.036 % of the **limit value 1.0E-03 ng/m^3** resulting from the respective "S" value 0.000000001/ no limit value has been determined by legislation) to a value of 5.07E-07 ng/m^3 (0.051 % of the limit

value); even if the background/surroundings of the evaluated source is taken into account, the summary value of immission concentration in the air will not exceed 1.001E-04 ng/m^3,

- for **annual** average concentrations of **PCDD/DF-**type substances, the execution of the proposed changes will increase the original highest contribution of the source 4.12E-09 ng/m^3 (no limit value has been determined) to a value of 5.92E-09 ng/m^3; even if the background/surroundings of the evaluated source is taken into account, the summary value of immission concentration in the air will not exceed 5.0002E-05 ng/m^3.

In general, based on the above mentioned it can be concluded that the proposed optimisation of RAW treatment capacities in the assessed form contributes in the highest rate to the use of set limits for human health protection in the case of emissions of nitrogen oxides (prior to the proposed change at a level of 1.171 % of the limit value 200 μg/m^3, after the proposed change at a level of 1.248 % of the limit value), i.e. the activity (Variant 0) has no significant impact on air quality in the assessed area, nor its proposed changes (Variant 1) will cause significant impairment of the existing quality of air in the assessed area.

The operation of RAW TCT technologies has also a proportional contribution to emissions into the air produced in the affected territory by transport. However, this contribution of the Proposer does not have (e.g. for freight transport out of the premises representing max. 1 % share of the total transport or transport on the premises of about 2-3 transportations per day) any significant impact on air quality in the affected territory.

III.5. IMPACTS ON WATER CONDITIONS

At the time of modification of the existing structures and construction of new structures, the risk of contamination of surface and ground waters will only be connected with the cases of failures or accidents of construction mechanisms, when, for example, oil substances may leak. The rate of this risk can be considerably reduced by good technical condition of the mechanisms used, by observing the safety regulations and operating measures for the time of construction.
Ground waters cannot be affected by construction as the level of ground waters is about -20 m.
The waste waters produced will only include sink water produced by activities of employees of the construction company, and waters from the surface run-off removed from the site by connecting to the existing rainwater sewerage. The increase in drinking water consumption will not be significant, drinking water is only used for social and drinking purposes.

The ***operation*** of the respective activity is connected with the production of common sink and rain waste waters, in the volumes adequate to the area of the affected civil structures and to the number of employees. Before waste waters are discharged into the water body (rainwater to the river Dudváh, sink waters to the river Váh), they are treated at the MB WWTP of V1 NPP or at the OWS. They are discharged to the water body based on the decision issued by the District Office Trnava. During the operation of all technological devices, all the limits set for chemical pollution of discharged waters and release of radioactive substances by discharging them to surface waters (water body Váh) are fulfilled.

The river Váh is the water body receiving the produced technological waste waters. Waters are discharged into the river Váh after they have been treated to the required level of activity in the structure of the cleaning station of waste (active) waters (str. 41, 809), and after they have been monitored.
The levels of activity are set for waters discharged from the NI RAW TCT and A1 NPP by the decision of the PHA SR. Based on the performed monitoring it can be stated that the set limits are observed with a large reserve.
The additionally built technological equipment will produce waste waters of character comparable with the technologies currently in operation (e.g. the incineration plant), no production of waste waters is expected for RAW remelting, compaction, storage. Waters necessary for remelting equipment cooling will be closed in the circulation system of cooling.

Any potential risk of water contamination as a consequence of non-standard operating conditions is prevented by the design of the operating rooms (sealed joints between the floor and the walls, watertight floor and walls up to an adequate height, slope of rooms towards active sewerage), as well as by procedures applied, which are part of the approved emergency plans.

In connection with the flow conditions of water bodies it can be stated that the operator observes all the issued consents and decisions for waste water discharging into the surface water bodies Dudváh and Váh.

As regards outflow conditions of the site, in the long term they have been affected by the presence of civil structures on the premises of JAVYS, a.s. containing also RAW TCT technologies, no significant change is expected.

III.6. IMPACTS ON SOIL

In Variant No.1, with respect to the proposed siting of the required capacities of treatment facilities in the existing structures, there will be no impacts on soil, no requirements for new soil occupation. Occupation of non-built-up areas up to 1000 m^2 is expected during the construction of annex buildings to the existing structures within the premises.

In relation to common pollutants in terms of potential impacts caused by contamination it can be expected that under normal operating conditions, the operation of RAW TCT technologies does not represent a source of quantities representing a risk of soil contamination, change of their chemical condition (acidity increase) etc.
The impact of the emitted radioactive substances on soils, for example through fallout, washing out by rain etc., is monitored within the framework of an extensive system of monitoring of the environmental impacts of the Jaslovské Bohunice nuclear installations, and based on the monitoring it is evaluated as minimal in the long term.

The potential risk of contamination as a consequence of non-standard operating conditions was evaluated, for example, within the Pre-Operational Safety Report for RAW TCT, where only the territory delimited by the boundary of the neighbouring premises of the V1 NPP nuclear installation was considered as a joint emergency planning zone for the complex of facilities consisting of the NI A1 NPP, RAW TCT, interim spent fuel storage facility (ISFS), and integral radioactive waste storage facility (IRAWS).

In no case, exceeding of intervention levels and guide values of intervention levels for immediate and subsequent measures resulted from the calculation for various postulated emergency scenarios.
Any non-standard situations of common character, for example, during transport (e.g. oil, diesel oil, petrol leakage from a transport vehicle) on soil can be solved by usual remediation procedures.

III.7. IMPACTS ON FAUNA, FLORA AND THEIR BIOTOPES

Neither the execution stage nor the operation of optimised facilities for RAW treatment and conditioning or change of use of structure 760-II.3,4,5:V1 will have impacts on fauna, flora and their biotopes.

The structures, in which the proposed technologies of RAW treatment and conditioning will be situated, have been part of the NI Jaslovské Bohunice for decades. It is surrounded by rural landscape with the characteristic, mostly agricultural way of utilisation. The closest areas (to the north) from the respective structures of the Proposer represent agricultural arable land. Thus, the expected occurrence of fauna and flora representatives (synanthropic species of communities populating the edges of human settlements) and poor species diversity correspond to it.

The closest habitats less modified by anthropogenic activities, with a higher expected species diversity include the habitats of the territories that are part of small protected areas, e.g. Protected Area Dedova jama at a distance of about 6 km to the east from the NI premises, etc.

The contribution of the activity to the radiation load on the territory is virtually negligible, thus, it can be expected for the activity that it does not represent a source of significant impact on fauna, flora and its habitats (the Slovak legislation does not determine any standards for the exposure of non-anthropoid habitats).

III.8. IMPACTS ON LANDSCAPE – LANDSCAPE STRUCTURE AND USE, LANDSCAPE IMAGE

With respect to the location of the technologies inside the bounded premises of JAVYS, a.s., no impacts on the landscape will occur in relation to them.
The technologies of RAW treatment and conditioning will be situated in the existing civil structures or annex buildings will be constructed on the premises of the NI at Jaslovské Bohunice; as regards their design and architecture, they will represent standard industrial buildings. The impact of the activity concerned on the landscape scenery, its image or structure is virtually irrelevant.

III.9. IMPACTS ON BIODIVERSITY, PROTECTED AREAS AND THEIR PROTECTION ZONES

The proposed activity is situated in the territory with the first lowest degree of territorial protection in accordance with Act No. 543/2002 Coll. on nature and landscape protection as amended. Thus, its execution will not directly affect any of the small-area or large-area protected territories or their protection zones.

The nearest protected areas include:

- large-size protected area

- ✓ Protected Landscape Area Small Carpathians (about 10 km to the west of the NI premises)
- ➢ small-size protected area
  - ✓ Protected Area Dedova jama (about 6 km to the east of the NI premises)
    - – it is declared to protect the rest of the original flood-plain forest important as a refugium of animals, an important landscape forming element and the site of rare occurrence of a population of summer snowflake and other protected plant species
  - ✓ Protected Area Malé vážky (about 7 km to the south-east of the NI premises)
    - – declared to protect the water biocoenose important in terms of science research, education and culture.
- ➢ sites of NATURA 2000
  - ✓ Special Protection Area SKCHVU054 Špačince-Nižná Fields (the closest boundary about 1 km to the north of the NI premises)
  - ✓ Special Protection Area SKCHVU014 Small Carpathians (about 11 km to the north of the NI premises)
  - ✓ territory of European importance SKUEV0267 Biele hory (about 21 km to the west of the NI premises)

Based on the above distances and character of the activity concerned the direct impact on the mentioned objects of protection is excluded.

In relation to the indirect impacts of the activity concerned, which are relevant with the mentioned position and distances of the protected areas from the site of RAW treatment and conditioning facilities potentially only in case of the respective activity's contribution to radiation load, it can be stated on the basis of regular evaluation of the impacts of presence of these nuclear installations in the affected territory that this (cumulative) impact is minimal.

III.10. IMPACTS ON THE TERRITORIAL SYSTEM OF ECOLOGICAL STABILITY

The territorial system of ecological stability can be understood as the structural skeleton of the landscape in the representation of important elements of the landscape structure - i.e. biocentres, biocorridors, interaction elements, gene pool important sites - such as e.g. large forests, woods, groves, non-forest tree and shrub vegetation, permanent grass-herb stands of various nature and species composition, wetlands and other so-called positive elements of a landscape structure.
Impacts on the territorial system of ecological stability can be understood, for example, as a direct intervention in the areas of TSES elements, connected with the engagement of part of their areas or destruction of the whole structure concerned, or their interruption, such as disruption of the biological corridor integrity, triggering subsequently loss of its functionality (which could also be a violation of functional links, which act between individual elements), or as an indirect influence through e.g. air pollution, resulting in a deterioration of its health and consequently a reduction or loss of the stabilizing function thereof.

The activity under assessment is located out of the areas of individual USES elements, which excludes a direct intervention into any of the elements of the skeleton of the territorial system of ecological stability and subsequent impacts on its function. With respect to its character and rate of impacts caused by its operation, there is no anticipation of links' function violation or influencing of the actual health condition of individual USES elements.

With respect to the location of the technologies inside the bounded premises of JAVYS, a.s., no impacts on the landscape and its ecological stability will occur in relation to them.

III.11. IMPACTS ON LANDS AND LAND USE

The construction and operation of the RAW treatment and conditioning technologies under assessment will not affect the structure of the affected settlements.

The technical infrastructure of the site and transport infrastructure of the affected territory will be affected, loaded by activities under assessment to a sustainable extent.

Taking into account the location of RAW TCT technologies, the agricultural and forestry utilisation of the territory is affected potentially indirectly, through the contribution to radiation load on the territory, which is, however, minimal, this is also confirmed by the regular systematic monitoring including the monitoring of activity of certain selected agricultural commodities (milk, grass, meat, ..).

The industrial use of the territory at the site of interest is affected significantly by the operation of the technologies being solved because it represents for the nuclear installations at the site the possibility to manage RAW from their operation safely and comprehensively.

Common waste management of the affected territory is affected only to a minimum extent by the production of non-active wastes represented by common operating wastes, such as packaging material, wastes from equipment maintenance and maintenance of buildings, municipal waste etc.

No other impacts on the urbanised area and land use are known.

III.12. IMPACTS ON CULTURAL AND HISTORICAL MONUMENTS

In the immediate surroundings of the siting of RAW TCT technologies, there are no monuments of cultural or historical value, which would be the target of interest of the inhabitants from the close surroundings or visitors of the affected region.

In the broader affected territory there are several structures of cultural and historical value, however, they will not be affected by the operation of the activity concerned considering its character a proposed siting.

III.13. IMPACTS ON ARCHAEOLOGICAL SITES

There are no archaeological sites in the close surroundings of the site of the technologies concerned (part of the NI Jaslovské Bohunice).

III.14. IMPACTS ON PALAEONTOLOGICAL AND SIGNIFICANT GEOLOGICAL SITES

In the close surroundings of the site of the activity concerned, there are no significant geological sites or known palaeontological sites, which could be affected by its operation.

III.15. IMPACTS ON IMMATERIAL CULTURAL VALUES

As it has already been mentioned, in the territory of interest immediately affected by the presence of the activity concerned, there are no cultural values of material or immaterial nature. The character of the activity concerned also excludes the impact on the local customs and traditions.

III.16. OTHER IMPACTS

During the operation of the activity concerned in the affected territory, no other, different from the above-mentioned, impacts were identified, which could affect well-being and quality of life of the inhabitants of the affected municipalities or inhabitants of more distant surroundings, natural environment or the affected landscape.

III.17. SPATIAL SYNTHESIS OF ACTIVITIES' IMPACTS IN THE TERRITORY

In terms of the spatial synthesis of impacts of the activities in the territory it can be stated that that at present the affected territory is loaded by ionising radiation and immissions of radioactive substances from the nuclear installations SE-EBO (V2 NPP), V1 NPP and A1 NPP under decommissioning, operation of the RAW TCT, integral storage facility and interim spent fuel storage facility. Currently, the Metallic RAW Remelting Facility, Incineration Plant in str. 809 of the BIDSF D4.1 Project (str. 724) is under construction at the site.

Radiation load from the mentioned nuclear installations at the site Jaslovské Bohunice and in its surroundings is monitored together in compliance with the monitoring plan of SE-EBO. The monitoring outputs for the documented year 2018 are mentioned for individual environmental components in the respective chapters of this document.

The level of "admissible" radiation load at the site such as the surroundings of the nuclear installations at Jaslovské Bohunice is based on the limit value of the individual effective dose for an inhabitant of the critical group 250 μSv/year (set by Act No. 87/2018 Coll. on radiation protection and on the amendment to certain acts), which is specified together for all the ways of irradiation from all the nuclear installations at the site. This value represents the fourth part of the general limit for the effective dose for the population from the artificial sources of radioactivity set by the Order to 1 mSv/year.

At present, the limits of the individual effective dose for an inhabitant of the critical group are distributed among individual nuclear installations by the respective decisions of the Public Health Authority of the Slovak Republic as follows:

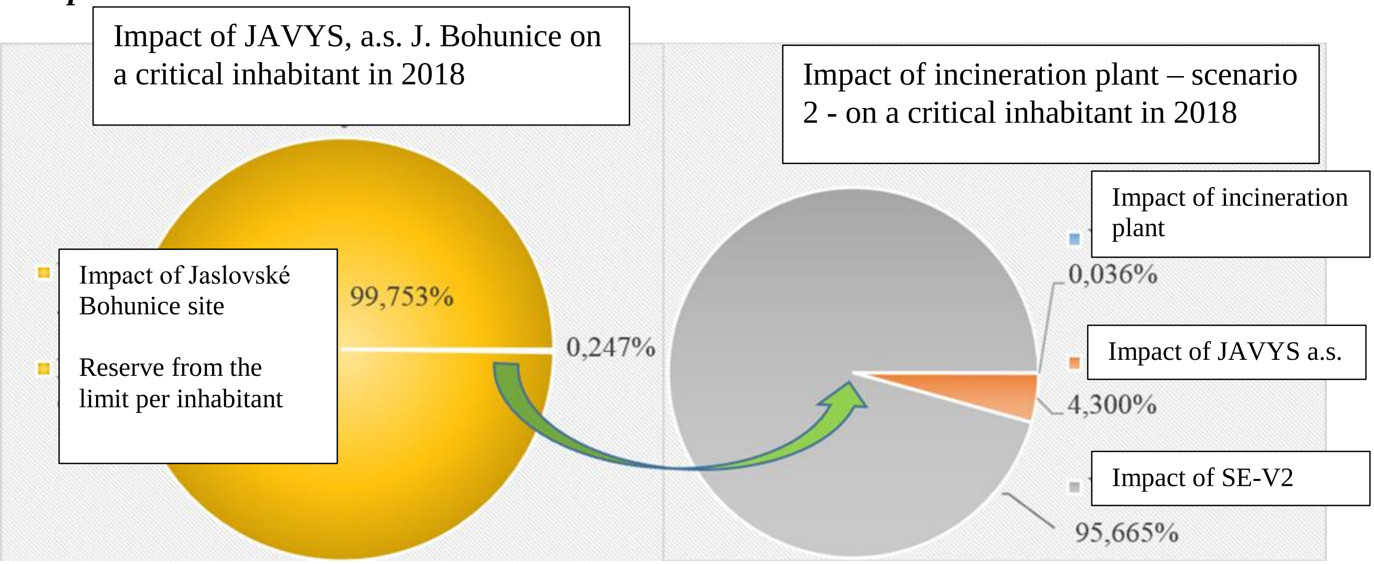
Table C.III.17
Individual effective dose (IED) limits for a citizen from the critical group

Nuclear installation	*Operator*	*IED limit*	*Share in the IED limit value*
SE-EBO (V2 NPP)	SE, a.s.	50 μSv/year	20%
V1 NPP	JAVYS, a.s.	20 μSv/year	8%
A1 NPP+ RAW TCT + ISFS	JAVYS, a.s.	12 μSv/year	4.8%
Total		**82 μSv/year**	**32.8%**

Note: No separate IED limit is determined for the IRAWS.

As it is obvious from the above mentioned, the Public Health Authority of the SR permitted to all the nuclear installations at the site to use only about one third of the limit value of the individual effective dose for an inhabitant of the critical group specified by Act No. **87/2018 Coll. on radiation protection and on the amendment to certain acts** (250 μSv/year).
The real discharges of the nuclear installations are a source of IED of a lower order than the permitted limits.

Fig. C.III.17.
Maximum annual individual effective doses of a representative person from the population calculated from liquid and gaseous discharges of radioactive substances from SE-EBO and JAVYS, a.s. operations



Based on the above data it is unambiguous that in the area of interest (even as a consequence of cumulation of impacts from several nuclear installations), the complete use of limit value of individual effective dose for an inhabitant of the critical group set by Act No. **87/2018 Coll. on radiation protection** will not occur, i.e. in this connection there is no reasonable assumption of a significant negative impact of the assessed activity, nor in connection with other existing loads of similar character.
In this connection it is also necessary to emphasise that the assessed activity does not represent an independent contribution to the radiation load on the territory of interest; it is an activity immediately connected with operation and decommissioning of certain nuclear installations at the site concerned.
To a certain extent, there will be a synthesis of impacts of the activity under assessment with the impacts in the affected territory also in connection with the emissions of noise, common waste waters and air pollutants, and traffic load, however, in all cases, the contribution of the respective activity to the other existing environmental load is acceptable (i.e. it does not represent a risk of exceeding the degree recommended or set for the protection of environmental components or population's health. See details in the previous chapters.).

Anthropogenic load and spatial distribution of expected overloaded sites

The anthropogenic load connected with the activity under assessment will be represented in particular by the contribution to radiation load on the air of the affected site.

Overloaded site shall mean a site with significant concentration of anthropogenic activities with adverse effects on population's health or environmental components.

The affected site, in which the optimisation of activities is planned, is with respect to the character of the activities performed there (operation of nuclear installations), situated at a distance of several kilometres from the built-up areas of the surrounding municipalities (i.e. from the territories with a naturally higher cumulation of various anthropogenic activities), as well as out of the main transport routes in the affected territory. Exactly because of the character of current usage, no other anthropogenic activities are accumulated at the site concerned, which means activities with more or less significant adverse impacts on individual environmental components or population's health. However, directly in connection with the operation of the nuclear installations on site, there are several environmental pollution sources, such as mostly energy sources of air pollution, and the performed activities represent a source of common sink and industrial waste waters, noise etc. So the site can be considered a common industrial zone with standard administrative background.

Based on the results of the current environmental condition monitoring we suppose that the site of interest cannot be considered an overloaded site.

In the specified affected territory there are, in terms of anthropogenic load, in addition to line air pollution sources, also several mostly medium stationary sources of air pollution related in particular to energy and agricultural activities, and the domestic hearths in the surrounding rural settlements also represent a non-negligible air pollution source. Water pollution sources in the affected municipalities are connected in particular with the level of connection of the population to the public sewerage system, with the performance of agricultural activities etc. so in general, it is a common rural country in the Western Slovakia region with developed agriculture, small industry proportional to the settlement importance (e.g. concrete paving production, metal surface treatment, ..), and services.

Thus, the cumulated anthropogenic load of the affected territory caused that during the environmental regionalization of the Slovak Republic, the affected territory received a quality degree of 3 to 4 out of a 5-degree evaluation scale, which means a moderately deteriorated to deteriorated environmental quality, however, no other site within it can be considered an overloaded site.

Synthesis of positive impacts

The most important positive impact of the activity under assessment is undoubtedly the functionality and safety of management of the RAW produced during operation and decommissioning of nuclear installations in the core site of their production. The positive benefit of optimisation of treatment capacities of RAW treatment and conditioning technologies as a follow up to requirements of individual RAW producers from the SR and requirements resulting from contractual obligations with foreign producers of RAW is the achievement of as efficient way of utilisation of treatment and personnel capacities of the NI RAW TCT as possible.

The advantage of the siting of the proposed technology is the mutual interconnection with RAW management procedures (transport, decontamination, storage, etc.), the use of the existing infrastructure and the existence of an extensive and complex monitoring system for individual impacts caused by radioactive materials management, including the outputs of the monitoring from the time before starting the activity of this character at the affected site.

III.18. COMPREHENSIVE ASSESSMENT OF THE EXPECTED IMPACTS IN TERMS OF THEIR SIGNIFICANCE AND THEIR COMPARISON WITH THE VALID LEGAL REGULATIONS

Based on the evaluation of all the necessary inputs and outputs of the activity and taking into account the condition of the environment, to which the outputs are released, it can be stated that they are in compliance with the valid legal regulations of the Slovak Republic and all of them respect the limits in the respective area set by the legal regulations.

During operation of the technologies under assessment, no adverse impacts on biotopes, landscape scenery, soil, rock mass, territorial system of ecological stability elements, protected areas, cultural monuments and discovery sites are expected because the proposed operation of these elements does not affect the elements and is not situated in their territory or in the close vicinity of them.

As regards long-term direct and indirect impacts on environmental components, it is a long-term positive influence on waste management. After the optimisation, RAW TCT operation will positively affect the possibilities of re-use of wastes as secondary raw materials (remelting) and minimise the quantities of RAW, which would have to be otherwise treated by placing in FCCs, cementing and disposal at the NRWR at Mochovce. The contribution of the facility to the adverse impacts on the population (gaseous discharges into the air) and impacts on the personnel (radiation) will be eliminated by observing the technological measures and using the latest technological systems.

Impacts in terms of significance for individual environmental aspects

Air

The impact of the activity under assessment on the municipal air quality is assessed as of low importance with the following substantiation:

- the activity does not represent a significant source of emissions of basic pollutants
- air vulnerability is relatively low – the limits specified for air protection are not exceeded, the affected territory does not fall under the territory with special air protection
- gaseous discharges will be released into the environment only up to the level of the set limits
- optimisation of incineration and remelting will not represent a dominant source of air pollution in the affected territory and even in case of a cumulative effect, it will not affect the current condition considerably
- the actual air quality will not change significantly in any of the parameters

Soil and rock mass

The impact on soil and rock mass is assessed as insignificant for the following reasons:

- there will be no land occupation
- the hygienic condition of soil cannot be deteriorated by the planned activity
- taking into account all the technical and technological measures, the outputs from the proposed activity will not affect the actual condition of soil and rock mass
- the activity does not produce emissions, which would contribute to acidification or intoxication of soil

Fauna and flora
We anticipate insignificant impacts taking into account:

- the negligible outputs from the proposed activity, which will practically not change the actual environmental condition
- there will be no land occupation, felling of trees, destruction of biotopes
- the planned activity will not result in emissions of conventional pollutants significant to flora (in particular SO_2)

Surface and ground water
Neither surface waters nor ground waters will be affected with respect to the fact that no significant quantity of waste waters is produced during the proposed activity. Consumption of service cooling water will not affect the source of surface water. The influence on waters is assessed as insignificant.

Wastes
The environmental impact of wastes is assessed as medium-significant with the following substantiation:

- reduction of the volume of original RAW, production of small quantities of secondary RAW and significant quantities of conventional wastes with a high potential of use and recovery,
- all secondary RAW can be treated on the existing treatment lines into the form meeting the conditions for disposal at the NRWR,
- the method of conditioning, storage and disposal is provided for the RAW produced with sufficient capacity,
- RAW from foreign producers will be returned to the foreign producers in compliance with legislative requirements resulting from Act No. 541/2004 Coll. on peaceful use of nuclear energy (Atomic Act) and on the amendment to certain acts, at a level aliquot to imported activity.

Landscape
The impacts on landscape are assessed as insignificant because the landscape structure and use, scenery or the territorial system of ecological stability will not change; the activity under assessment will not affect the cultural and historical monuments, the structure of settlements, architecture, local traditions or the existing economic activities.
Landscape protection will be affected neither in the national or in the European context of interest.

Population
The adverse impacts on the population are assessed as low-significant with the following substantiation:

- in comparison with the actual condition, a slight increase in the radiation outputs to the atmosphere is expected, however, it is within the framework of fulfilment of the set limits and there is no assumption of a threat to health of the affected population as a consequence of exposure to radiation, even during non-standard states of performance of the proposed activity,
- the proposed activity cannot considerably affect the total radiation load on the population because the operation of the NI RAW TCT is not a dominating source of radioactive pollution of the environment in the affected territory, its conservatively estimated share is lower than 0.06 % of total radiation load coming from the NI Bohunice,

- max. values of the effective dose of a representative person caused by radioactive substances released into the air and surface waters in discharges from the proposed activity are considerably lower than 32 μSv/year (the actual limit) – annual limit of irradiation for a representative person from the population from discharges of nuclear installations situated on the premises of JAVYS, a.s. Jaslovské Bohunice, determined by the decisions of the state supervision of the PHA SR for a representative person from the population.

Positive impacts

The assessed activity is focused on minimising the volume of RAW, which was produced or is produced during the NI operation and decommissioning in the territory of the SR. The importance of the positive impact is related to the methods of RAW treatment minimising the RAW volumes (compaction, incineration), the remelting technology will separate radionuclides from usable metallic material, which can be released as a secondary raw material for further use, wastes are conditioned in the form ensuring separation from the environment. These methods of RAW treatment will considerably reduce the quantity of RAW deposited at the repository at Mochovce, i.e. it saves the storage capacity of the NRWR. Optimisation will ensure the observance of V1 NPP and A1 NPP decommissioning schedule, continuous operation of the V2 NPP, EMO (RAW treatment). The positive impact on the population is considered an impact with medium importance at least for the following reasons:

- in the time horizon of 2019-2025, employment in JAVYS, a.s. will be maintained,
- conditions will be created for new industrial activity in the affected territory (after the completion of 1 NPP and A1 NPP decommissioning).

Time path of impacts of the proposed activity

At the site Jaslovské Bohunice, JAVYS, a.s. operates five nuclear installations (A1 NPP, V1 NPP, ISFS, RAW TCT, and IRAWS). The operation of optimised capacities will be part of the NI RAW TCT and their activity is expected in parallel with the existing technologies for RAW treatment and conditioning already in operation and V1 NPP and A1 NPP decommissioning. The activity of the NI ISFS and IRAWS will not be affected by the optimisation of capacities of the NI RAW TCT.

The time of execution of optimisation of treatment capacities of the NI RAW TCT is expected in the following periods:

- Optimisation of RAW incineration capacities – supplementation of the rotary kiln incineration plant in str. 809 with a technological capacity of 240t will be completed in 2020. Optimisation of incineration capacities within the scope of permit for parallel operation of both facilities PS06 and PS45 is considered after the completion of the process of assessment of the proposed change and issuance of final approving opinion of the MoE SR on the execution of Variant No.1.
- Optimisation of RAW supercompaction capacities – 2020-2021
- Optimisation of RAW remelting capacities – 2020-2021
- Relocation of the existing fragmentation and decontamination facilities from V1 NPP – 2022-2023
- Relocation of the workplace of electric cables management from V1 NPP – 2022-2023
- Relocation of the workplace for releasing materials from institutional control – 2023
- Supplementation of RAW storage capacities – 2020-2021

Table C.III.18.
Comparison of the effects of the activity under assessment with some relevant legislation in force

Area	Comparison
Atmosphere	the evaluated activity respects the listed legislation
Act No. 137/2010 Coll. on Air, as amended	
Decree of the Ministry of the Environment of the Slovak Republic No. 244/2016 Coll. on Air quality, as amended	
Decree of the Ministry of the Environment of the Slovak Republic No. 410/2012 Coll. on Implementing some provisions of the Air act, as amended	
Noise and vibrations	the evaluated activity respects the listed legislation
Decree of the Ministry of Health No. 549/2007 laying down details on permissible values of noise, infrasound and vibrations and requirements for objectification of noise, infrasound and vibrations in the environment, as amended	
Government Regulation No. 115/2006 Coll. on Minimum health and safety requirements for the protection of employees from the risks related to exposure to noise, as amended	
Government Regulation No. 416/2005, Coll. on Minimum Health and Safety Requirements for the protection of employees from risks related to vibration exposure, as amended	
Waters	the evaluated activity respects the listed legislation
Act of the National Council of the Slovak Republic No. 364/2004 Coll. on Waters and on the amendment of the Act of the Slovak National Council No. 372/1990 Coll. on Offenses, as amended (Water Act), as amended	
Decree of the Ministry of the Environment of the Slovak Republic No. 200/2018 Coll. on Details of the treatment of polluting substances, the details of the emergency plan and the procedure for dealing with the extraordinary contamination of water., as amended	
Government Regulation No. 269/2010 Coll. laying down the requirements for achieving good water status, as amended	

Soils	
Act of the National Council of the Slovak Republic No.220/2004 on Protection and use of agricultural land and on amendment to Act No. 39/2013 Coll. on Integrated prevention and control of environmental pollution and on Amendments to certain Acts, as amended	the evaluated activity respects the listed legislation
Nature protection	the evaluated activity respects the listed legislation
Act of the National Council of the Slovak Republic No. 543/2002 Coll. on Nature and landscape protection, as amended	
Decree of the Ministry of the Environment of the Slovak Republic No. 24/2003 Coll., Implementing the Act on Nature and landscape protection, as amended	
Waste	the evaluated activity respects the listed legislation
Act of the National Council of the Slovak Republic No. 79/2015 Coll. on Waste and on Amendments to certain Acts, as amended	
Decree of the Ministry of the Environment of the Slovak Republic No. 371/2015 Coll. implementing some provisions of the Waste Act, as amended	
Preservation of monuments	the evaluated activity respects the listed legislation
Act no. 49/2002 Coll. on the Protection of the monuments fund, as amended	
Nuclear safety	
Act of the National Council of the Slovak Republic No. 541/2004 Coll. on Peaceful use of nuclear energy (Atomic Act) and on amendments to certain acts, as amended	the evaluated activity respects the listed legislation
Decree of NRA SR No. 30/2012 Coll. laying down details on requirements for the management of nuclear materials, radioactive waste and spent nuclear fuel	
Decree of NRA SR No. 430/2011 Coll. on Nuclear safety requirements, as amended	
Radiation protection	the evaluated activity respects the listed legislation
Act No. 87/2018 Coll., on Radiation protection and on amendments to certain acts	
Decree of the Ministry of Health No. 96/2018 Coll. laying down details on the activities of the Radiation Monitoring Network as amended	
Decree of the Ministry of Health No. 99/2018 Coll. on Ensuring radiation protection, as amended	

Safety at Work	
Act No. 124/2006 Coll. on Occupational health and safety and on amendments to certain acts, as amended	the evaluated activity respects the listed legislation
Government Regulation No. 391/2006 Coll. on Minimum safety and health requirements for the workplace, as amended	

III.19. OPERATING RISKS AND THEIR POSSIBLE IMPACT ON THE TERRITORY

Scenarios for safety assessment are postulated or expected sets of conditions and a defined sequence of events, which can cause exposure of people or contamination of the environment.

The set of assessment scenarios took into account all the relevant existing and expected hazards resulting from the activities and operation of facilities and development of scenarios throughout the life cycle and in the context of assessment.

In accordance with the valid nuclear safety legislation, the expected events at the NI RAW TCT were divided into the following events:

- due to internal causes - events connected usually only with the impact on the operating staff,
- due to external causes - events/accidents connected with the influence on the operating staff and surrounding environment.

Operating events due to internal causes

Failures of equipment or operators' mistakes can represent initiating sources of these operating events. Taking into account the structure of buildings and equipment or staff qualification and training, the operating events will be limited to the respective elementary system.

The ways of solving of abnormal states of individual elementary systems and activity of operators are described in respective operating regulations for individual technologies/activities and in the operating regulation for solving failure states. This regulation can be used in determining the failure and recovery of normal operation. The objective of the regulation is to perform necessary operations to avert further failures of equipment, determine the causes, eliminate the failure and recover normal operation.

Conclusion of assessment of the operating events caused by internal factors

Taking into account the structure of the buildings and facilities or qualification and training of the staff, the risk of occurrence of operating accidents is very low. The analysis of possible operating events at the NI RAW TCT caused by internal factors shows that no event caused by an internal factor will cause disturbance of integrity of the building, and liquidation of consequences of events is possible by means of the technical means in individual structures of the NI RAW TCT in such a way that it will not affect the environment, i.e. their scope will have a limited impact mostly on the immediate area, where the technology is situated.

Thus, it results from the prepared analyses of operating events that no event will cause a significant negative environmental impact and the above events will not affect the population living in the surroundings. As regards the permitted annual doses for the population - the calculated values of effective annual doses for adults from external and internal irradiation caused by possible leakage of radioactive substances will not exceed the value of the annual dose limit for an individual from the population (1 mSv) because the facility will be situated in statically resistant structures with an independent air-conditioning system containing its own filtration unit.

As regards the dose load (from internal and external irradiation) on the staff or population, none of the possible events has a character of great event with serious consequences for the staff and surroundings.

Maximum conservative assumptions were taken into account as initial and boundary conditions of safety analyses. The volume of stored RAW is given by storage capacities. The initial state of structures of the NI RAW TCT with the conservative approach to the assessment of consequences of individual initiating events was the same for all cases. It means that maximum amount of activity will be present in the structure of the NI RAW TCT at the moment of beginning of the event, i.e. all liquid RAW tanks are full and all the places for temporary storage of solid and solidified RAW are full.

Operating events due to external causes

The following events were considered basic initiating events, which can cause uncontrolled process of events in the structures of the NI RAW TCT during RAW treatment and conditioning:

- treatment of wastes that do not correspond to the specification,
- fire,
- explosion,
- leakage,
- mechanical damage,
- earthquake,
- plane crash,
- flood,
- lightnings and fragments of objects transmitted by wind.

The above external initiating events could lead to emergency conditions as well as small events that are considered rather common operating events. Thus, they are events included in the technical solution of structures of the NI RAW TCT.

Conclusion of assessment of the operating events caused by external factors

The performed analyses of operating events show that integrity of buildings can be disturbed in case of an earthquake over 8° EMS-98, plane crash and/or explosion. The consequences of the other considered events can be liquidated by the technical means in individual structures of the NI RAW TCT in such a way that the environment will not be affected.

Assessed representative accidents

The events at the NI RAW TCT, which could lead to the release of radioactivity, are the so-called representative accident events, and they were examined in order to find out whether significant release of activity can occur during them. The analysis of operating events also performed within the fulfilment of requirements of the EURATOM Treaty, Article 37 shows that none of the events caused by an internal factor will disturb integrity of buildings and liquidation of consequences of events is possible by means of the technical means in individual structures of the NI RAW TCT in such a way that it will not affect the environment.

All the types of emergency situations considered in the safety documentation of respective nuclear installations were taken into account in selecting reference accidents during NI RAW TCT operation. (Preliminary and Pre-Operational Safety Report for the NI RAW TCT). The way of defining of emergency conditions, analysis of their consequences, specification of measures minimising the risk of their occurrence, and the solution for elimination of consequences respected valid legislation such as IAEA "Safety Assessment Methodologies for Decommissioning of Facilities Using Radioactive Material", Act No. 87/2018 Coll., Decree of the Ministry of Interior SR No. 533/2006 Coll. etc. Consequences were analysed for these representative scenarios; the criterion for selection of representative accidents was the value of dose load calculated for the critical group of the population in the critical area. The calculation of the dose load on the population was preceded by the definition of the source term, i.e. the size of leakage of radioactive substances into the environment. The maximum capacity of facility or structure in terms of the RAW stored or treated and their radionuclide composition were taken as a basis for the determination of the source term.

The performed analyses show that as an overlapping event for leakage into the atmosphere, RAW fire can be selected with a total leak of $6.6x10^{10}$ Bq, and for leakage into the hydrosphere, leaks of radioactivity during emergency conditions, such as earthquake over 8º EMS-98, plane crash, explosion, with a total estimated leak of $3.0x10^{12}$ Bq.

Conclusions of calculations of radiological consequences of reference accidents at the NI RAW TCT

According to the criterion in accordance with Article 15 of Act No. 87/2018 Coll., limits for population irradiation for expected events, i.e. **1 mSv/year**, must not be exceeded in the most endangered individuals from the population in the surroundings of the nuclear source, i.a. at the boundary of the zone of protection (area without permanent settlement - 3 km for EBO).

Based on the analyses of results of RTARC programme calculations for a reference accident "fire" at the BRWTC it can be stated that the maximum values of RTARC predicted effective doses were calculated for all age groups. The following facts result from the analysis of results of RDEBO programme calculations for a reference accident "earthquake over 8° EMS-98 (plane crash, explosion)" at the NI RAW TCT:

The highest value of **individual effective dose per day**, with leakage into the hydrosphere - the river Váh, was calculated for suckling babies, from ingestion of drinking water in zone No. 92 = **$4.67x10^{-10}$ Sv**, with leakage into the hydrosphere - the river Dudváh it was calculated = **$7.00x10^{-8}$ Sv** in zone No. 89.

The highest value of annual individual effective dose with RAS leakage into the hydrosphere - the river Váh during a reference accident - earthquake over 8° EMS-98 (plane crash, explosion) at the NI RAW TCT was calculated for the age group of children of age of up to one year = **$1.99x10^{-06}$ Sv**, in zone No. 92, i.e. in the south-south-east direction at a distance of 15-20 km - at the point of flowing of waters from the pipe collector SOCOMAN into the river Váh.

The highest value of annual individual effective dose with RAS leakage into the hydrosphere - the river Dudváh during a reference accident - earthquake over 8° EMS-98 (plane crash, explosion) at the

NI RAW TCT was calculated for the age group of children of age of up to one year = $\mathbf{2.98x10^{-04}}$ **Sv**, in zone No. 89, i.e. in the south-south-east direction at a distance of 5 - 7 km - at the point of flowing of waters from the Manivier channel into the river Dudváh.

The highest contribution to the ID for single-day individual effective dose is represented by the radionuclides ^{3}H, ^{90}Sr and ^{60}Co, and for annual effective individual dose by the radionuclide ^{60}Co. The decisive path of irradiation for a single-day dose is drinking water ingestion, for annual dose it is the stay on sediments. The contribution of the other irradiation paths is negligible. Ingestion of fish and food contaminated by irrigation is not taken into account for this emergency event.

In case of expected concurrent occurrence of both accidents, i.e. earthquake over 8° EMS-98 (plane crash, explosion) at the NI RAW TCT and fire at the BRWTC, the consequences of RAS leakage into hydrosphere are decisive.

The calculated values of annual individual doses at the boundary of the zone of protection by the RTARC programme for a reference accident "fire at the BRWTC" are by about 3 orders lower than the set criteria of acceptability in accordance with the valid legislation, i.e. 1 mSv per year. The calculated values of annual individual doses at the point of liquid wastes flowing into surface water courses by the RDEBO programme are in case of leakage into the river Váh by about 3 orders lower than the set criteria of acceptability in accordance with the valid legislation, in case of leakage into the river Dudváh, they are approaching the limit value 1 mSv/year.

Thus, the above results show that the legislative requirements have been met for the analysed emergency events.

Expected impacts in a transboundary context

As the above analyses show, the contribution of RAW TCT technologies to radiation load under normal operating conditions as well as under emergency or otherwise non-standard operating states is minimal (for the facility, it was not necessary to design an emergency planning zone for emergency events connected with leakage of hazardous pollutants, which would exceed the premises of the Proposer.
Consequently, it can be stated that there is no reason to expect any impacts in a transboundary context for the activity concerned.

FURTHER POSSIBLE RISKS CONNECTED WITH THE EXECUTION OF THE PROPOSED ACTIVITY

The current operations and their emergency scenarios were assessed within the safety analyses and submitted to supervisory authorities within the application for execution of a change of nuclear installation at the time of commissioning. The outputs of the safety analyses are incorporated in the operating documentation of NI RAW TCT technological equipment.
The assessment of risks connected with the execution of optimisation of NI RAW TCT treatment capacities will be part of the safety documentation, which will be assessed and approved by supervisory authorities in compliance with the legislation of the SR.

IV. MEASURES PROPOSED FOR THE PREVENTION, ELIMINATION, MINIMISING AND COMPENSATION OF THE PROPOSED ACTIVITY'S IMPACTS ON THE ENVIRONMENT AND HEALTH

IV.1. LAND-USE PLANNING MEASURES

- respecting all the existing protection zones at the site of interest
- elaboration of a plan of fire protection by a professionally competent person and submission for approval
- elaborate and submit for approval a safety analysis and calculation of radiation load
- taking into account requirements for the provision of occupational health and safety during construction and during operation pursuant to Article 4 (1) and (2) of Act No. 124/2006 Coll. within the project documentation for building proceedings.

IV.2. TECHNICAL MEASURES

As the activity is already present in the affected territory, conditions of operation are known so any adverse impacts can be minimised to a maximum possible extent. During the execution of the optimised treatment capacities, the requirements for best available technologies will be met, the conditions of legal requirements related to the proposed technologies will be applied, and all the technical measures for minimising will be designed and executed in compliance with the processed safety analyses, Plans of Work and OHS, etc.

IV.3. TECHNOLOGICAL MEASURES

➢ **In the sector of soil and water**
  - at the time of execution, to take all the available measures to prevent leakage of oil substances from the building and transport mechanisms used and to equip the building site with a sufficient quantity of absorbents of oil substances,
  - at the time of operation, to execute all the available measures to prevent uncontrollable leakage of hazardous substances, i.e. to execute the emergency protection of operation and to perform inspection and maintenance activities of the equipment used on a regular basis, and to equip individual workplaces with sufficient quantity of absorbents,
  - in case of leakage of hazardous substances during transportation of wastes or raw materials necessary for operation, to proceed in compliance with the respective emergency plan and to dispose any contaminated soil in compliance with the principles of hazardous waste management.

➢ **In the sector of radiation protection and health protection**
  - they will be designed and executed based on prepared safety analyses
  - structures of the NI RAW TCT are constantly monitored by dosimetry control.

➢ **Other technological measures**
  - Workplaces will be situated in the closed area or controlled area at the site

- The working area inside the structures will use air-conditioning system with double filtration,
- operators will control technological equipment from control workplaces,
- All the workplaces will be constantly monitored by dosimetry control.

IV.4. ORGANISATIONAL AND OPERATING MEASURES

The organisational measures during construction will consist in:

➢ **Work organisation**
- Performance of assembly work according to the approved Work Programmes,
- Observance of the valid directives of JAVYS, a.s. (Process documentation) for occupational health and safety,
- Observance of the valid directives of JAVYS, a.s. (Process documentation) for work performance in the controlled area.

➢ **Preparation of material for assembly**
- Material for construction will be gradually supplies according to schedules prepared and approved in advance

➢ **Other organisational measures**
- Work performance according to the PP (Operating Regulation),
- Observance of internal directives (Process documentation) for occupational health and safety,
- Observance of internal directives (Process documentation) for work performance in the controlled area.

➢ **Equipment care programme**

- Classified equipment – CE will be included in the lists and plans of CE quality, inspections will be carried out pursuant to the approved quality assurance individual plans (QAIP).
- Selected technical equipment will be included in the lists and plans of selected technical equipment, inspections will be carried out pursuant to Regulation No. 508/2009 Coll.
- Equipment inspections and maintenance will be carried out according to the technological documentation of the equipment manufacturer.
- Equipment diagnostics will be carried out according to the annual schedule of periodicity of vibro-acoustic measurements.

IV.5. OTHER MEASURES

To ensure better awareness of inhabitants of the planned execution of the proposed activity and current operation of the NI RAW TCT, during the organised joint negotiations with mayors and representatives of the affected municipalities, management of JAVYS, a.s. agreed upon the establishment of a website for mayors of the affected municipalities from 1 August 2019. Based on agreement with mayors, at the website, the Proposer will provide information on the outputs of radioactive substances into the atmosphere and hydrosphere on a monthly basis and data on incineration of RAW from individual producers. Based on mutual agreement, the content of the website can be supplemented with additional information depending on the requirements from the affected municipalities.

IV.6. STATEMENT ON THE TECHNICAL AND ECONOMIC FEASIBILITY OF THE MEASURES

All the proposed measures are organisationally, technically and economically feasible, and their feasibility was verified in the previous period during changes performed on the NI RAW TCT.

V. COMPARISON OF SUITABLE VARIANTS OF THE PROPOSED ACTIVITY AND PROPOSAL OF OPTIMAL VARIANT TAKING INTO ACCOUNT ENVIRONMENTAL IMPACTS

V.1. CREATION OF A SET OF CRITERIA WITH RESPECT TO THE CHARACTER, SIZE AND SCOPE OF THE PROPOSED ACTIVITY, TECHNOLOGY AND LOCATION AND DETERMINATION OF THEIR IMPORTANCE FOR THE SELECTION OF AN OPTIMUM VARIANT

The assessment criteria were set on the basis of the prediction that every activity in the territory can affect the state of any component of the environment as well as on the landscape-ecological and social-economic characteristics of the affected territory.

Thus, the preliminary assessment of the respective activity was carried out not only within the scope of the sets of the ***environmental criteria*** expressing the impacts on individual components of the environment and within the scope of the set of ***technical and technological criteria,*** where the evaluation of such criteria expressed the degree and level of the technical and technological solution of the activity, but also within the scope of the last group of assessed criteria, i.e. the ***impacts on the affected population*** including the evaluation of the activity's impacts on the population well-being and health condition as well as on their social and economic situation.

Taking into account the character of the respective activity, the most important criteria of its assessment in general include the impacts caused by the presence and handling of radioactive materials, including their transportation, and the impacts caused by operation of the RAW incineration plant as this treatment technology also produces specific non-radiation outputs of the activity. The significance of the activity for RAW management safety and complexity is also an important criterion for the evaluation of the respective activity.

V.2. SELECTION OF AN OPTIMAL VARIANT OR SPECIFICATION OF SUITABILITY ORDER FOR THE VARIANTS UNDER ASSESSMENT

The activity is submitted for assessment in one variant solution. ***Variant 1 is proposed in particular in the form of utilisation of the existing structure of buildings and its necessary expansion.***

The resulting (final) products of RAW treatment and conditioning may include materials with activity that allows releasing them into the environment (ingots from remelting, recoverable material from the treatment of electrical cables) and RAW, which after fixation in fibre-concrete container (FCC) or alternative packaging set fulfils the limits and conditions for its storage, transport and disposal in the NRWR Mochovce. RAW treated for external producers will be managed in accordance with the legal regulations of the SR and EU.

Impact assessment scale:

+ 5 Very significant favourable impact, long-term, mostly with a regional or cross-regional reach
+ 4 Favourable, significant impact, long-term, mostly with local impact or regional importance
+ 3 Medium-significant favourable impact, mostly with local importance
+ 2 Low-significant favourable impact, or with a small-area operation
+ 1 Very low-significant favourable impact, mostly in a very limited territory

0 No impact or irrelevant impact

- 1 Very low-significant adverse impact, mostly in a very limited territory
- 2 Low-significant adverse impact, or with a small-area operation
- 3 Medium-significant adverse impact, mostly with a local importance
- 4 Adverse significant long-term impact, mostly with local reach or regional importance
- 5 Very significant adverse impact, long-term, mostly with a regional or cross-regional reach

Table C.V.2
Comparison of suitability of the zero variant and Variant 1 of the activity

Element	***Impact***	***Evaluation***	
		Variant 0	***Variant 1***
Impacts on the population			
Well-being and health risks	Rush, noisiness and traffic situation changes	0	-1
	Job opportunities in the affected area	2	4
	Stabilisation of job positions	-1	4
	Operation noisiness	0	0
	Emissions of common pollutants into the air	0	-1
	Emissions of common pollutants into waters	0	0
	Radiation load	0	-1
	Vibrations	0	0
	Wastes	0	0
Impact on the natural environment			
Rock mass	Disturbance of deposits of raw materials	0	0
	Disturbance of slope stability	0	0
	Contamination of rock mass	0	0
	Disturbance of geological subgrade	0	0
Air	Emissions of common pollutants into open space	0	-1
	Emissions of RS into open space	0	-1
Surface waters	Surface water pollution (common pollutants)	0	0
	Surface water pollution (RS)	0	0
	Change of flow conditions	0	0
Ground waters	Ground water pollution (common pollutants)	0	0
	Ground water pollution (common soluble substances)	0	0
	Change of outflow conditions	0	0
Soils	Land occupation	0	0
	Contamination of soils (common pollutants)	0	0
	Contamination of soils (RS)	0	0
	Soil erosion	0	0
Vegetation	Felling of trees and bushy vegetation	0	0

	Planting and care of substitute vegetation	0	2
	Changes in vegetation variety	0	1
	Reduction of precious habitats	0	0
	Impact of immissions of common pollutants	0	0
	Impact of immissions of RS	0	0
Fauna	Interruption of migration paths	0	0
	Disturbance of the affected fauna	0	0
	Contamination of habitats by common pollutants	0	0
	Contamination of habitats by RS	0	0
	Impairment of precious habitats	0	0
Impacts on the landscape			
Landscape structure	Dividing effect	0	0
Landscape scenery	Landscape image	0	0
Protected areas	Impact on protected areas of nature	0	0
USES	Changes concerning USES elements	0	0
	Impact on the eco-stabilisation function of USES elements	0	0
Ecological stability	Impact on the ecological stability of the territory	0	0
Urban complex and landscape utilisation			
Settlements	Dividing effect	0	0
	Impact on settlement's architecture	0	0
	Impacts on cultural monuments	0	0
	Impacts on archaeological palaeontological sites	0	0
Agriculture	Occupation of agricultural land under cultivation	0	0
	Contamination of agricultural soils (common pollutants)	0	0
	Contamination of agricultural soils (RS)	0	0
Forest management	Forest land occupation	0	0
Industry and services	Development of industrial and regional activities	1	3
Transport	Connection with local roads	0	0
	Loading of local roads	0	-1
	Limitation of transport due to	0	0

	construction/operation		
Wastes	Quantity of produced common wastes	0	-1
	Quantity of RAW produced	0	1
Recreation and tourism	Impact on the provision of services due to construction/operation	0	0
Total costs	investment costs	0	-2
	operating costs	0	-1
Utilisation of treatment capacities		2	5
Reduction of radiological inventory at the site		2	5
Reduction of volumes of RAW disposed at the NRWR		2	5
Material recovery of material released from NI decommissioning		2	5
Sum		10	25
		Variant 0	Variant 1

The results:

Variant 0.........10 points
Variant 1.........25 points

Sequence of suitability of the respective activity's variants:

Variant 0
Variant 1

The above summarising evaluation of impacts of variants 0 and 1 of the activity shows that ***Variant No.1 is more optimal.***

V.3. SUBSTANTIATION OF OPTIMAL VARIANT PROPOSAL

The activity creates room for comprehensive and safe management of low and very low level RAW produced during NI operation and decommissioning, IRAW and RMUO management, and creates room for optimum utilisation of treatment and personnel capacities also within the provision of nuclear services to external RAW producers.

The proposed optimisation of treatment capacities, modification of str. 760-II.3,4,5 with the simultaneous use of the existing operations will ensure the observance of the deadline for A1 NPP and V1 NPP decommissioning according to the approved strategic documents and obligations of the SR to the EU.

The above outputs of evaluation of discharges of radioactive substances from the operation of RAW TCT technologies imply that the current operation observes the set limits with a great reserve and the effective dose for an inhabitant generated by all operations of the Proposer at the site is considerably lower than the limit of the effective dose set by the PHA SR. Based on the preliminary evaluation, the outputs of contribution of optimised treatment capacities of the NI RAW TCT will not load significantly the surroundings and represent a negligible load on the environment and population's health.
The execution of optimisation of treatment capacities within Variant No. 1 will not change the boundaries of the emergency planning zone (the boundary of the premises of JAVYS, a.s.) or guide values of radioactive substances released into the environment set by supervisory authorities.

In general it can be stated that the proposed activity within Variant No. 1 is an optimal solution for treatment of low and very low level RAW from NI operation, A1 NPP and V1 NPP decommissioning and from external RAW producers in terms of all assessed aspects, i.e. environmental, technical and technological, as well as socio-economic, with the observance of the set limits and conditions of operation.

VI. PROPOSAL OF MONITORING AND POST-DESIGN ANALYSIS

VI.1. PROPOSAL OF MONITORING FROM THE BEGINNING OF CONSTRUCTION, DURING THE CONSTRUCTION, DURING OPERATION AND AFTER THE END OF OPERATION OF THE PROPOSED ACTIVITY

As the optimisation concerns the technological equipment already in operation or under construction, where monitoring already takes place or is designed, no significant changes of the way of monitoring will be carried out and proposed.

Monitoring during execution – installations of equipment and small building modifications of structures
At the stage of execution, waste production and management will be monitored according to the safety and technical conditions for suppliers and according to the rules provided in the directive describing waste management.

The project documentation of individual technologies or the project documentation describing the change of use of structure No. 760-II. 3,4,5 will also contain the design of monitoring of technologies and working environment.

Monitoring during operation

Monitoring of the working environment

Monitoring of activities important in terms of radiation protection is performed according to requirements of Act No. 87/2018 Coll. on radiation protection and on the amendment to certain acts and its implementing regulations. All the facilities are or will be situated in the controlled area and the radiation situation will be monitored by the existing monitoring systems, or the monitoring systems will be supplemented and adapted to individual technologies.

In the process approach of the integrated management system of JAVYS, a.s., "Radiation protection" is assigned to the process "Safety". The concept of radiation control is based on the requirements and international recommendations of the IAEA, ICRP, IEC and ISO standards, as well as criteria and national regulations of radiation protection of workers at work with radiation sources in the conditions defined by technological processes. The legal requirements of the SR concerning radiation protection, system of radiation control of the working environment, protection of persons against ionising radiation effects, specification of zones subject to radiation control, and the way of work organisation in these premises is described in JAVYS, a.s. in the directives of the "Radiation protection" subprocess and in the operating documentation.

Radiation control of the working environment is focused on health protection and control of observance of radiation hygiene in the controlled area.

All the activities performed in the environment with ionising radiation sources are, before their permission, during their execution and after their completion, subject to optimisation of dose load in accordance with valid legal regulations and internal quality assurance system.

Everyone working in the controlled area are subject to irradiation monitoring and control. Radioactive radiation is monitored and controlled at the entrance and at the exit to and from the controlled area in order to prevent the release of radioactive materials out of the controlled area. Control monitoring devices are also at gate houses, where people and vehicles entering and exiting the premises are monitored.

To monitor the dose load on individual employees and suppliers and to determine the received doses at work in the environment with ionising radiation, film dosimeter is used as the basic dosimeter. Every person working with ionising radiation sources is also obliged to wear an operational electronic signal dosimeter, and if prescribed, also a supplementary thermoluminescence dosimeter. Moreover, measurement of internal contamination by radionuclides within periodic examinations and after risky work (e.g. work with an increased risk of inhalation of radioactive aerosols) is provided.

Any new activities in the controlled area must be described in detail in the respective project or programme of work. Every such activity/working procedure must contain the chapter "radiation protection" containing all the safety measures and calculated expected doses in compliance with the directive BZ/RO/SM-02 "Application of the ALARA principle". These working procedures must be approved by the radiation protection department. If these activities are important in terms of radiation protection, they will be negotiated with the supervisory authority (PHA SR) or by the ALARA commission. All the activities in the controlled area must be carried out based on the R order.

The following scope of radiation control results from the character of activities:

- control of dose rate level in the working premises,
- control of volume activities of radioactive aerosols in working premises, upstream and downstream the aerosol filters,
- control of level of surface contamination of working surfaces, equipment (tools), transport roads and means (portable dosimetry systems),
- control of level of staff contamination and dose load,
- control of gaseous discharges,
- control of RAW activity and radionuclide composition,
- control of dose rate of the resulting treated product,
- control of discharged waters.

Monitoring of discharges of RA substances into the air

The system of removal of gaseous fluid from the controlled area ensures the removal of air by the exhaust air-conditioning system operating in vacuum regime into the ventilation stack (str. 46, str. 808, str. 460 (V1 NPP)) after filtration at absolute filters according to the respective operating regulations. The ventilation system ensures air exchange speed for individual types of premises (unattended, semi-attended, attended) and it also ensures suitable climatic conditions (temperature, relative humidity).
RAS discharges through the ventilation stacks are monitored by the monitoring systems situated in the civil structures of stacks. These systems represent backed up continuous measurement of aerosols and proportional sampling of aerosols to the filter for the subsequent laboratory measurement of activity.
For monitoring the discharges of RA substances through the ventilation stack, operating regulations are in place; they govern operation and evaluation of the monitored data. Guide values for the activity released annually, scope of radionuclides, examination and intervention levels of radionuclides are determined for each ventilation stack by PHA SR decisions. Activity of discharged gaseous fluid is monitored for purposes of balancing and evaluation of impact on dose load on inhabitants.
The equipment meets the requirements for "legally controlled measuring instruments“ in accordance with Act on Metrology No. 142/2000 Coll. and implementing Regulation No. 210/2000 Coll.
Execution of the optimisation will not affect the system of monitoring of discharges of RA substances into the air; it will not be necessary to change the currently valid PHA SR decisions issued for the release of radioactive substances from administrative control by discharging in emissions through the ventilation stacks. The change of use of structure No. 760-II.3,4,5 depending on the project solution can be supplemented with an air-conditioning system terminated in some of the existing stacks or a stack can be constructed with a monitoring system installed.

Monitoring of discharges of pollutants into the air

Monitoring of common pollutants with the scope based on air protection legislation is installed specifically for RAW incineration plants. Thus, PM, NOx, SO_2, HCl, HF, TOC, CO, O_2, humidity, pressure, temperature, and volume flow of flue gases are monitored continuously, heavy metals and PCDD/F-type substances are monitored discontinuously.
Metallic RAW remelting facilities can be considered, in terms of air protection with respect to requirements and conditions of operation and emission limits of common pollutants, adequately in accordance with Point 8, Part B, Annex No. 7 of Decree of the MoE of the SR No. 410/2012 Coll., as "Production of ferro alloys by electro-thermal and metallothermic procedures", which in such cases requires to monitor only PM (it does not specify any special conditions and requirements for facility operation). Monitoring of emissions of pollutants can also be governed adequately by Decree of the MoE of the SR No. 411/2012 Coll., which determines frequency/continuance of measurements for technological equipment in Article §8 depending on the expected mass flow.
The other air pollution sources operated on the premises of JAVYS, a.s. (stand-by boiler room, diesel generators, production of fibre-concrete mixture) do not have the duty to monitor pollutants released during their operation.

Monitoring of liquid discharges into surface waters

Liquid discharges from nuclear installations at Jaslovské Bohunice are monitored at several stages, i.e. discharges from the facility (according to the monitoring principle at the source - tank) as well as from the whole site are measured. Continuous monitoring is measured in str. 880 (waste water control station) – waters removed to the water body Dudváh, and in str. 368 (waste water activity measuring station) – waters removed to the water body Váh.
After the measurement in the tank, evaluation of samples and approval of discharge, the waste waters are led to the water collector SOCOMAN, where they are measured using the continual measurement of summary activity by the MR 100 monitor. The measuring volume is represented by a stainless steel vessel with a capacity of 15 L and a measuring scintillation probe. The equipment meets the requirements for "legally controlled measuring instruments" in accordance with Act on Metrology No. 142/2000 Coll. and implementing Regulation No. 210/2000 Coll.
Discharged activities in waste waters are controlled by measuring the volume activity of tritium, volume activity of corrosion and fission products, and quantity of waters in collecting tanks. In addition to activity measurement, waste water pollution indicators are monitored according to Decision of the District Office Trnava No. OU-TT-OSŽP2-2013/00026/Gl, which determines the place, time and frequency of sampling of waste waters discharged into the resulting sewerage collector SOCOMAN, and subsequently to the water body Váh.

Sampling and analyses for monitoring the observance of permitted limit values of pollution indicators in the waste waters discharged into surface waters are performed only by accredited laboratories for the area of waters in compliance with the requirements of water protection legal regulations.

Concentrations of common pollutants in the discharged waters are continuously measured in str. 368 (waters discharged through the pipe collector SOCOMAN into the river Váh). In order to ensure

constant quality of discharged waste waters, pH, conductivity, flow, turbidity, COD, NO_3 and NES are monitored.
The optimisation of treatment capacities does not change the character or procedures of waste water discharging, the waste water monitoring system does not need to be supplemented.

Waste production monitoring

Wastes produced during operation of RAW treatment technologies are monitored according to the requirements of radiation protection and if they meet the limits for release from administrative control pursuant to PHA SR decisions, they are managed in compliance with the Act on Wastes. The requirements of waste management legal regulations are elaborated in Directive BZ/OŽ/SM-03, which governs non-active waste management (sorting, record-keeping, recovery/disposal, etc.).
Secondary RAW produced during operation is registered in the ARSOZ system according to internal regulations describing RAW management in the IMS system, it is treated according to the RAW Type Catalogue at the existing facilities.
Neither the procedures of non-active waste management or RAW management, nor monitoring procedures need to be changed due to the proposed optimisation.

Monitoring of materials released from institutional control into the environment

Materials released from institutional control into the environment are monitored by monitoring equipment in accordance with Decision No. OOZPŽ/7119/2011. Materials can be released only with the use of meters certified by metrology procedures at the facilities:

- CMP - Central monitoring workplace
- VMP - Large-capacity monitoring workplace
- RTM – Monitoring workplace at structure 28

Environmental monitoring in the surroundings of JAVYS, a.s.

Monitoring of radioactivity in the environment and assessment of impacts of operation of the nuclear installations of JAVYS, a.s. and SE, a.s. – EBO V2 Plant on the surroundings is carried out based on the agreed common Programme of Monitoring of the Surroundings – JAVYS, a.s. and SE EBO, based on which individual environmental components are monitored.
Environmental monitoring is carried out by specialised departments of Laboratories of Radiation Control of the Surroundings in Trnava, by independent organisations with the accreditation for the activity and supervisory organisations (PHA SR, MoE SR). Mobile means of the Laboratories of Radiation Control of NI Surroundings in Trnava also serve to take samples from the environment in the surroundings of the NI up to a distance of 25 to 30 km according to the monitoring programme of radiation control of Jaslovské Bohunice NI surroundings.
By sampling, environmental components characterising individual paths of radionuclides from operation to humans (exposure paths) are controlled. The following is monitored by sampling:

- aerosols and fallouts in the ground layer of the atmosphere,
- seepage from the underground tanks of liquid RAW or whole structures (take-off probes finding seepage from the ISFS),

- ground waters in the first water horizon under the premises of the NI and in wider surroundings,
- drinking and surface waters in the water bodies Manivier, Dudváh and Váh (including the water reservoir Kráľová),
- soils and sediments,
- individual links of food chains (fodder plants, agricultural products, vegetables, fruit, meat, milk, etc.).

The results are included in the reports "Analysis of discharges of radioactive substances from the premises of JAVYS, a.s., Jaslovské Bohunice", which are prepared on a quarterly basis.

Based on the evaluation of the activities after the application of the proposed optimisation we recommend to maintain monitoring of individual areas in the current form.

VI.2. PROPOSAL OF CONTROL OF SET CONDITIONS OBSERVANCE

All the authorised authorities must be allowed to carry out control in the operations in accordance with the valid legislation, in particular the NRA SR, PHA SR, government authorities competent in the area of environmental protection. At the same time, consistent operating records, records of any non-standard states, records of produced wastes and waste management, records of monitoring results, etc. must be kept. All the required information must be available to competent administrative and supervisory authorities within the set time-limits.
It is not necessary to propose the control of set conditions observance because at JAVYS, a.s. it is unambiguously set by decisions of the supervisory authorities (e.g. PHA SR, NRA SR, District Offices), which are based on the requirements of the legislation of the Slovak Republic.

VII. METHODS USED IN THE PROCESS OF EVALUATION OF THE PROPOSED ACTIVITY ENVIRONMENTAL IMPACTS AND THE WAY AND SOURCES OF THE CURRENT ENVIRONMENTAL DATA ACQUISITION IN THE TERRITORY FOR IMPLEMENTATION OF THE PROPOSED ACTIVITY

Standard methods used in the EIA process were used for elaboration of this report, e.g. acquiring information about the affected area, about evaluated activity - proposed optimization, analysis and synthesis of acquired information, e.g. outputs from monitoring systems, outputs from expert studies in the following sequence:

- ✓ examination of the proposer's documentation,
- ✓ collection of data on the basic characteristics, contamination and pollution of the various components of the environment in the territory affected,
- ✓ cooperation with independent experts,
- ✓ identification of outputs of processing technologies,
- ✓ permits and decisions of state supervisory authorities,
- ✓ the proposer's operating rules,

- ✓ investment plan,
- ✓ the proposer's technical documentation,
- ✓ comparison of the compliance of the optimization outputs with the valid legislation and issued decisions of the Public Health Authority,
- ✓ ESTE AI computation program,
- ✓ procedures for conducting a dispersion study and public health impact assessment,
- ✓ comparison of zero variant impacts and proposed variant solution
- ✓ project team meetings, brainstorming,
- ✓ publicly available information on the Internet.

VIII. SHORTAGES AND UNCERTAINTIES IN THE KNOWLEDGE OCCURRING IN ELABORATION OF THE EVALUATION REPORT

From the aspect of the results of the environmental evaluation of the complex effects of the activity, we can say that there were no major problems in the process of elaborating the report, for which there was no necessary information and suggestions for their solution.
The technical uncertainty is the change of the use of object No. 760-II.-3,4,5, which will be implemented gradually and depending on the design solution, the system of air exhaustion into one of the existing ventilation chimneys will be designed, or a separate chimney for the object will be built. The result of the HVAC system solution does not affect the evaluation of the impact of discharges from this object. Also, the spatial arrangement of the facility for the metal RAW anatexis and the necessary completion of the extension building for its future placement on site is currently not precisely defined.

IX. ANNEXES TO THE ASSESSMENT REPORT

Annex No. 1 Map of the affected territory
Annex No. 2 Map of location of RAW treatment and conditioning technologies at Jaslovské Bohunice
Annex No. 3 Statements delivered to the plan
Annex No. 4 Dispersion Study
Annex No.5 Health Impact Assessment for the "Optimisation of treatment capacities of radioactive waste treatment and conditioning technologies JAVYS, a.s. at Jaslovské Bohunice"
Annex No. 6 Assessment scope
Annex No. 7 Evaluation of incorporation of specific requirements for the assessment scope

X. GENERALLY COMPREHENSIBLE FINAL SUMMARY

1. Basic data of the proposer

Nuclear and Decommissioning Company, Inc.
Tomášikova 22
821 02 Bratislava
Identification No.: 35,946,024

Contact person:

Mgr. Miriam Žiaková - spokeswoman
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Proposer of the "Optimization of processing capacities of technologies for processing and treatment of radioactive waste JAVYS, a.s. in Jaslovské Bohunice" - Jadrová a vyradená spoločnosť, a.s., based in Bratislava, is an organization established and authorized by the Ministry of Economy of the Slovak Republic pursuant to § 3 Par. 9 of Act no. 541/2004 Coll. on Peaceful use of nuclear energy (the Atomic Act) and on amendments and supplements to certain acts, as amended, which ensures the safe management of RAW and spent nuclear fuel, pursuant to § 10 Par. 3 of that Act.

At the locality of Jaslovské Bohunice, they operate the nuclear facilities "Technologies for treatment and conditioning of RAW", "Interim Spent Nuclear Fuel Storage Facility", "Integral RAW Storage Facility" and implement decommissioning of nuclear facilities "NPP A1" and "NPP V1".

2. Basic data on the proposed activity

2.1 Title

Optimization of processing capacities of technologies for the processing and treatment of radioactive waste JAVYS, a.s. in the locality of Jaslovské Bohunice.

2.2 Purpose of the facility

The purpose of the activity under assessment is optimization - supplementation of existing processing capacities of the operation of a set of technologies for the processing and treatment of radioactive waste of the company JAVYS, a.s., located in the locality of Jaslovské Bohunice.
The proposed technologies will be used for the processing and treatment of low and very low active RAW arising from the decommissioning of NPP A1, which is currently in Phase III and IV of decommissioning, decommissioning of V1 NPP (currently in Phase II of decommissioning), RAW coming from NF operation, NPP operation in Slovakia, institutional RAW from various areas of human activities, such as research, medicine, etc. arising from the operation outside of nuclear power plants, RMUO and RAW management within the scope of provided nuclear services for external foreign RAW producers.
The purpose of the proposed optimization is to increase the currently assessed combustion capacities (from 240 MT/year to 480 MT/year), to complete anatexis capacities (adding a furnace with a melting

charge of 2 MT), to add compressing capacities (high pressure compactor), change of use of the object No. 760-II.3,4,5 (refurbishment of the object to the RAW repository, relocation of existing fragmentation and decontamination equipment from V1 NPP, relocation of the workplace for releasing materials from institutional control, workplace for handling electrical cables).

2.3 Facility location

The location of the facilities subject to optimization is proposed in the Jaslovské Bohunice locality, in the existing objects (in the controlled area), or in extensions to existing objects, as part of the nuclear facility "Technology for radioactive waste processing and treatment". The assumed plots are owned by the proposer, registered as built-up areas and courtyards, outside of the built-up area of the municipality.

2.4 Proposed technological solution

According to the issued scope of evaluation - the decision of the Ministry of the Environment of the Slovak Republic, the report contains only elaboration of the Variant No. 1, which represents the following solution:

Optimization of processing capacities of high-pressure RAW compressing

The change of the proposed activity represents the completing of the existing capacities for the management of solid compressible RAW by a method of reducing its volume using high-pressure compactor. Required is a compactor with a compressing force of min. 20,000 kN, waste form - 200l MEVA barrel with max. weight 400kg, high pressure compactor output - 15 barrels/hour.

The implementation shall encompass building of insulated closed shelter, or an object extension, with building and technological connection to the object No. 808 BSC RAW. Implementation of processing capacity optimization of HP compressing will achieve the total processing capacity of high pressure compressing in the volume of 1000 MT/year.

Optimization of the RAW incineration capacity

The change in the proposed activity represents optimization of the RAW incineration capacity. The subject of optimization is the parallel operation of PS06 combustion technologies in object No. 808 BSC RAW (shaft furnace) and PS45 in object No. 809 (rotary furnace), with an annual processing capacity of 240 MT/year for each combustion plant.

By optimizing the RAW incineration capacities, the total annual processing capacity of the RAW incineration activities within the NF TTC RAW will be achieved in the range of 480 t / year.

Optimization of metallic RAW anatexis processing capacities

The change in the proposed activity represents a complement to the anatexis capacities of metallic RAW within the framework of NF TTC RAW. The technology of this anatexis line for metallic RAW will enable the effective and safe reprocessing of metallic RAW, including non-ferrous metals, thus fully meeting the requirements for the management of various types of metallic RAW by the anatexis method. The equipment shall include a melting furnace, a dosing device, all necessary auxiliary equipment and systems, gas venting and filtration equipment, slag and molten metal collection, handling equipment, etc. A melting furnace with a capacity of 2 metric tons per batch will be placed on a structure that will allow tilting, to ensure that the melt is poured directly into the moulds.

Ingots in moulds, following emptying, will be further placed in existing premises in the locality for the cool down process. Throughout the whole anatexis process, the kiln gases will be cleaned of dust and airborne contamination. Dust and waste gases will pass through a built gas purification system with a cyclone separator installed and an autonomous cooling unit, followed by a filtration and exhaust system with HEPA filters. The gas extraction and purification system will ensure the necessary underpressure throughout the technological system.

Downstream of the filtration stage, the gases will be continuously monitored chemically and radiologically, to report the chemical parameters and alpha and beta activity of the anatexis process.

Optimization of processing capacities of metallic RAW anatexis of means:

- addition of a new technological equipment for anatexis with a capacity of 2 MT per melting charge, while using the equipment in the 3-shift operation
- change of operation of the facility in the object No. 34 with a capacity of 2 MT/melting charge, from 1-shift operation to 3-shift operation.

The above method will enable processing of max. 4500 MT/year, taking into account the necessary time for preparation of metallic RAW for anatexis and compliance with the guide values of radionuclides specified in the decision of PHA SR.

Change in use of object No. 760-II.3,4,5

The subject of the proposed change is the use of building object No. 760-II.3,4,5:V1 for the storage of radioactive materials and radioactive waste prior to further management. At the same time, the proposed change also represents a possible relocation of fragmentation and decontamination facilities (project BIDSF C7-A3), a workplace for the management of electric cables from the V1 NPP and a facility for releasing materials from institutional control to these premises, so that the storage and operation areas of these relocated facilities were structurally separated. Technological connection to the auxiliary systems will be made to the nearest connection point, including the discharge of air from these premises. The building object will be completed with a double-shell collecting tank with a volume of about 10-15 m^3 for LRAW from the operation of decontamination lines; and a hygienic loop with piping to the special sewerage network in the locality will be built.

Change in use of object No. 760-II.3,4,5 will contain:

- completing of storage capacity of max. 3740 m^2 for low radioactive RAW and very low radioactive RAW (in box pallets, 200l MEVA drums, ISO containers, containers 2 EM-01, or other approved packaging means)

- relocation of the electrical cable management workplace

  The recycling line for electrical cables has been designed for recycling copper or aluminium electrical cables without a lead shielding. To remove lead insulation, the cable insulation cutter

"Bobr" is used to remove the lead shielding. The treated aluminium or copper cables can be then separated using a recycling line. Capacity of the line for processing contaminated but also non-contaminated electrical cables is 1050 kg/h. The line includes a crusher, granulation and separation device, conveyor, magnetic separator, granulator, storage silo, separation table, which ensures separation of insulation from Al or Cu metals, belt conveyor with a built-in drum magnet. The entire system is equipped with exhaustion via a fan.

- relocation of fragmentation and decontamination facilities

Technological fragmentation and decontamination facilities were built as part of the BIDSF C7-A3 project in SO800 V:1. They consist of fragmentation and decontamination workplaces.

The RAW decontamination workplace consists of:

- stainless steel decontamination equipment (two electrochemical and two ultrasonic decontamination baths, one rinse bath for high pressure water jet spraying, seven decontamination titanium baskets and auxiliary equipment);
- equipment for mechanical abrasive decontamination of carbon steel (two suspended blasting machines for fragmented parts, one cabin for manual abrasive blasting).

The devices are equipped with a manipulation table, electric hoists and an exhausting system with a filter module.

The workplace for RAW fragmentation consists of:

- segmentation equipment for dismantling of technological assemblies (self-clamping circular saws, circumferential pipe cutters, hydraulic shears, wire saw, portable plasma cutting machine with mobile exhaust system, portable flame cutting machine with mobile exhaust system)
- equipment for fragmentation of dismantled components (hydraulic cross-cutting band saw, longitudinal cutting hydraulic band saw, stationary hydraulic shears, hydraulic band saw, stationary plasma cutting machine with portable exhaust and filtration system, stationary flame cutting machine with portable exhaust system).

The fragmentation and decontamination facilities, following their utilization in the object SO800 V:1 and subsequent need to empty the premises in the said building, in connection with the planned activities of NPP V1 decommissioning, will be moved to the object 760-II.3,4,5 for further use.

- relocation of the facility for release of the materials from decommissioning

The facility for releasing materials from decommissioning, which is currently located in V1 NPP, was delivered within the BIDSF C10 project.

This facility includes:

- instrument for measuring bulk materials FRM-06, which includes scintillation detectors, gamma spectrometric measuring channel, control program and accessories. The system enables measurement of material placed in large-volume containers with dimensions of 3.4m x 1.9m x 0.5m and max. weight 5 MT.

- automated gamma measuring system FRM02c, which includes a metering chamber with orifice plate, automatic feeder for pallet transfer, weighing equipment and evaluation workplace.

After relocation of fragmentation and decontamination equipment from object SO800 V:1, the release workplace, located in the object No. 490, will be moved to object 760-II.3,4,5 V1.

Optimization of processing capacities, related to incineration, compressing and anatexis, will ensure the efficient utilization of existing and proposed facilities, designed to reduce the volume of RAW, and by anatexis it ensures the production of metal ingots, which could be released into the environment for further use of metallic material.

During remelting of the contaminated radioactive metallic waste, the radionuclides are partially redistributed between the melt (ingot), slag (secondary RAW) and kiln gases from the anatexis process, thereby decontaminating the input material. After melting, the slag formed on the surface of the metal phase, is removed and the molten metal is poured into solid moulds. With anatexis, the radionuclides will be separated from radioactive wastes (nuclide distribution into slag), the volume will be reduced, in order to increase safety and economic efficiency of disposal (minimizing the amount of remaining RAW), while recovering the separated substances for further use (generated ingots), all of the above complying with the requirements of the decree for "treatment" of RAW. The 'treatment' of radioactive waste results in a packaged form of radioactive waste, prepared in accordance with the requirements for safe handling, storage, transport and deposition. The produced ingots (in case they are not released into the environment) will represent a suitable form for safe further handling. The anatexis of metallic RAW significantly reduces the amount of RAW by volume that remains as a result of the technological process for treatment, conditioning and final disposal.

3. Brief evaluation of environmental impacts (impacts on the population, impacts on the abiotic and biotic environment, impacts on the landscape, its structure, protected areas and their protection zones, other impacts)

<u>Environmental impact assessment</u>

The following table summarizes the identification and evaluation information of the environmental impact of the proposed activity.

Effects	Identification yes/no	Comment/explanation
Impacts on the population - health risks	yes	For the assessed activity, together with other nuclear facilities in the locality, a mandatory radiation load assessment is regularly performed, which follows that the achieved highest values of the individual effective dose are steadily lower than the specified limits (set by the PHA SR). The contribution of technology optimization (combustion, anatexis) to total discharges is expected to increase the utilization of the current limits in the range of 0.225% - 13.95%, which will not cause significant changes in the dose burden on the population (increase in limit utilization by about 0.0381%). On the

Effects	**Identification yes/no**	**Comment/explanation**
		basis of the above, the impact on the population can generally be evaluated as minimal and acceptable, as confirmed also by results of the dispersion study and the public health impact assessment.
Social and economic consequences and relations - employment	yes	Employment rate will remain, or new jobs will be created within the period of 2019-2025. In the long term, conditions will be created for new industrial use of the territory with the potential to create new jobs.
Population activities	no	From the aspect of development of affected municipalities and activities of their population, there is no presumption of independent impact of the assessed activity, due to its location outside the built-up area of municipalities, within the JAVYS, a.s. area.
Impacts on rock environment, mineral resources, geodynamic phenomena and geomorphological conditions.	no	The impact is irrelevant in view of the nature and location of the activity in question.
Impact on pollution of the rock environment	no	Impact is excluded in view of the nature and location of the activity in question.
Impacts on climatic conditions.	no	The activity is irrelevant from the aspect of major changes in greenhouse gas production.
Impacts on atmosphere (e.g. quantity and concentration of emissions and immissions).	yes	During the operation of the RAW combustion and anatexis technology, the originated waste air will be exhausted both, from the furnace premises and then from the entire controlled zone, which will be contaminated by the presence of radionuclides. The air will be filtered on high performance HEPA aerosol filters. Following implementation of the proposed activity, only the amount of radionuclides that will be released into the atmosphere via ventilation chimneys (objects No. 46 and 808) will change. The contribution of anatexis technology and the increase of combustion capacities to current discharges from the operation of the TTC RAW nuclear facility technologies can be expressed as an increase in the level of current limits utilization, ranging from 0.225% to 13.95%, while ensuring multi-stage air filtration. No requirement to change the current limits of gaseous discharges from JAVYS, a.s. equipment. The proposed optimization of RAW treatment capacities in the assessed form contributes most to utilization of the limits set for nitrogen oxides emissions (before the proposed change at 1.171% of the 200 $\mu g/m^3$ limit value,

Effects	**Identification yes/no**	**Comment/explanation**
		after the proposed change at 1.248% of the limit value). The contribution to pollutant discharges has been assessed in the dispersion study so, that the proposed activity will not have a significant impact on air quality and will not cause a significant deterioration of the existing air quality in the monitored area. On the basis of the above, the impact on the atmosphere can be evaluated as minimal and acceptable for given territory.
Impacts on water conditions (e.g. quality, modes, runoff coefficients, reserves).	yes	Operation of the activities in question will be associated with the production of common sewage and rainwater, in volumes appropriate to the area of the affected building objects (unchanged compared to the current situation) and the number of employees (increased for the Variant 1). The anatexis technology will not produce other types of waste water, only in case of need for decontamination of the premises in case of extraordinary events, used decontamination solutions may arise, which would be treated as liquid radioactive waste by the current NF TTC RAW facilities. Increasing the incineration capacity does not assume higher wastewater production due to the operation of a rotary kiln that does not have a wet flue gas cleaning method. The chemicals or mixtures used do not affect the surface or groundwater.
Impacts on soil (e.g. method of use, soil erosion).	no	The assessed activity will be located within the existing objects in the premises of JAVYS, a.s. and, as a result, there will be no new footage of undeveloped areas. The use of surrounding agricultural soils, as well as current soil erosion, will not be affected.
Impact on soil pollution	no	Given the proposed location in existing objects, there will be no impact on soils, the impact of the operation of optimized technologies is irrelevant from the aspect of the new land take. With regard to the nature of the activity under consideration, soil contamination of the affected area can potentially originate only indirectly, by active gaseous discharges or common pollutants. However, given the level of pollution of the discharged waste air (and in relation to common pollutants and characteristics of surrounding soils), this potential is minimal, as evidenced, for example, by the systematic monitoring of the environmental impact of nuclear facilities operation around Jaslovské Bohunice.
Impacts on fauna, flora and their habitats	no	The activity is concentrated in the existing industrial area, inputs and outputs from this activity cannot change the current state of the surrounding fauna, flora and

Effects	**Identification yes/no**	**Comment/explanation**
		biotopes. On the basis of the above, the impact on biota can be generally assessed as minimal and acceptable for given territory.
Impacts on landscape - structure and use of landscape	no	Existing technologies for RAW treatment and conditioning are located in the building objects of the company JAVYS, a.s. in the NF complex of Jaslovské Bohunice, which are designed as a standard industrial development. The direct impact of the proposed technologies on the landscape, its scenery or structure, is practically irrelevant.
Impacts on protected areas and their protection zones [e.g. proposed avian protected areas, areas of European significance, European network of protected areas (Natura 2000), national parks, protected landscape areas, protected water management areas]	no	The NF area does not interfere with any protected areas; the first level of landscape and nature protection applies here Although there is Natura 2000 territory, the SPA of Špačín - Nižná fields near by, the proposed activity will in no way affect the conditions of securing a favourable habitat of a bird species of European significance and a the migratory saker falcon species, who has lived here even during the operation of NF Bohunice.
Impacts on the territorial system of ecological stability.	no	The proposed activity does not represent a major change. The impact on the landscape can be evaluated as insignificant.
Impacts on urban complex and land use.	no	Neither the operation of existing technologies for processing and treatment of RAW, nor the completing or increase of capacity, shall affect the structure of the settlement units concerned.
Impacts on cultural and historical monuments.	no	The proposed activity does not represent a major change.
Impacts on archaeological sites.	no	They are not present in the territory.
Impacts on palaeontological sites and important geological localities.	no	They are not present in the territory.
Impacts on cultural values of an intangible nature (e.g. local traditions).	no	The proposed activity does not represent a major change.

Effects		**Identification yes/no**	**Comment/explanation**
Other impacts	Impacts on transportation	yes	Increasing the capacity of processing technologies will require higher demands on the transport of packaging, input feedstocks, delivery of waste for processing and abtransportation of secondary processed RAW into National Radioactive Waste Repository, which will be transported to NRR Mochovce, or to the country of origin, but an overall increase in traffic intensity of about 1 truck/day will not imply a noticeable increase in traffic frequency.
	Impacts on waste management (WM)	yes	The effect of decontamination by the anatexis process is assumed, resulting in ingots usable as secondary raw material. It is expected approximately 90% of the total amount of metallic RAW to be released to the environment for further use and recovery. The load on WM infrastructure will be minimal. On the basis of the above, the impact on waste management and related effects, can generally be evaluated as minimal and acceptable for the territory in question.

The operation of the proposed optimization will not cause a significant change in outputs, as compared to the current situation. **The proposed changes (increasing the capacity of combustion, compressing, anatexis and change of utilization of the object 760-II.3,4,5 will not require a change of the currently set limits of gaseous and liquid discharges**, set by the decisions of PHA SR. Given the location of the facilities and the outputs of the proposed activity, there is no reason to expect a negative impact going beyond national borders.

The selection of the variants was made on the basis of a multi-criteria evaluation, which **proved the selection of Variant No. 1 as a more optimal variant.**

XI. LIST OF SOLVERS AND ORGANISATIONS THAT TOOK PART IN THE ASSESSMENT REPORT PREPARATION

Jadrová a vyraďovacia spoločnosť, a.s., Bratislava (Environmental Impact Assessment Report)
Ing. Viliam Carach, PhD. (Dispersion Study)
RNDr. Iveta Drastichová (Health Impact Assessment)
EKOS PLUS, s.r.o. (selected chapters from the Environmental Impact Assessment Report)

XII. LIST OF ADDITIONAL ANALYTICAL REPORTS AND STUDIES, WHICH ARE AVAILABLE TO THE PROPOSER AND HAVE PROVIDED A BASE FOR COMPILING OF THE EVALUATION REPORT

Dispersion study for the proposed activity "Optimization of Processing Capacities of Technologies for Radioactive Waste Processing and Treatment in JAVYS, a.s. in the locality of Jaslovské Bohunice" - Ing. Viliam Carach, PhD., May 2019

Public health impact assessment for "Optimization of Processing Capacities of Technologies for Radioactive Waste Processing and Treatment in JAVYS, a.s. in the locality of Jaslovské Bohunice" - RNDr. Iveta Drastichová, May 2019

10-BSP-001 Pre-operational safety report for NF TTC RAW Bohunice, issue No. 1, October 2017

Investment requirements

Project for building permit within the scope of implementation project "Optimization of RAW incineration capacity" - ZTS VVÚ KOŠICE a.s.

Report on the Environment for the year 2018, JAVYS, a.s., Bratislava - March 2019

Discharges of radioactive substances from NF of JAVYS, a.s. Jaslovské Bohunice and the influence of NF JAVYS, a.s. on the surroundings, year 2018 - March 2019

Operating records, operating regulations

Website pages applied

http://www.enviroportal.sk
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http://www.seas.sk

XII. DATE AND CONFIRMATION OF CORRECTNESS AND COMPLETENESS OF DATA BY THE SIGNATURE (STAMP) OF THE ASSESSMENT REPORT AUTHOR'S AUTHORISED REPRESENTATIVE AND PROPOSER

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