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(The numbers of chapters follow the structure of the Assessment Report pursuant to Annex No. 11 to Act of the NC SR No. 24/2006 Coll. on Environmental Impacts Assessment)

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Note:
In order to make this extract comparable to the original text of the Assessment Report in the maximum extent possible, besides the numbers of chapters, the numbers of tables, charts, etc. have also been preserved.

ABBREVIATIONS AND SOME TERMS:

AC	Air-conditioning
ADR	European Agreement Concerning the International Carriage of Dangerous Goods by Road
BL	Bituminisation line
BRAWPC	Bohunice Radioactive Waste Processing Centre
CCTU	Contaminated concrete treatment unit
CSSU	Contaminated soil sorting unit
CZ	Controlled zone
DN	Decontamination node
EBO	Bohunice Power Plant
FCC	Fibre-concrete container
FLR	Forest land reserves
FP LRW	Final Processing of Liquid Radioactive Waste
FTF	Facility for the treatment of spent nuclear fuel aimed for transport
HC	Hot chamber
HS	Hazardous substances
JAVYS, a. s.	Jadrová vyraďovacia spoločnosť, a.s. (Nuclear Decommissioning Company)
LCDL	Large-capacity decontamination line
LRAW	Liquid radioactive waste

MoE SR	Ministry of Economy of the Slovak Republic
MoH SR	Ministry of Healthcare of the Slovak Republic
MSK-64	Macro-seismic 12-degree scale (Medvedev, Sponheuer, Karnik)
NC SR	National Council of the Slovak Republic
NDB	New draining bed
NPP, NPF, NF	Nuclear power plant, nuclear power facility, nuclear facility
NRA SR	Nuclear Regulatory Authority of the Slovak Republic
NRAWR	National Radioactive Waste Repository
PHA SR	Public Health Authority of the Slovak Republic
PMS	Partial monitoring system
RA	Radioactive
RAS	Radioactive substances
RAW	Radioactive waste
RAWPTT	Radioactive waste processing and treatment technology
SE a. s.	Slovenské elektrárne a.s. (Slovak Electricity Company)
SE-EBO	SE a.s., Atómové elektrárne Jaslovské Bohunice, závod (SE a. s., Nuclear Power Plant Jaslovské Bohunice)
SFF	Sludge fixation facility
SRAW	Solid radioactive waste
TCLSF	Treatment of cases from the long-term storage facility
UHG	Underground high-pressure gas-holder
VICHR	Vitrification facility
WWTP	Waste waters treatment plant

IONISING RADIATION – radiation that transmits energy in the form of particles or electromagnetic waves with a wavelength of up to 100nm or a frequency of 3.10^{15}Hz and higher, with the ability to create ions directly or indirectly;

CONTROLLED ZONE – a complex and clearly designated part of a workplace, usually separated by building structures, ensured against the entry of unauthorised persons. The conditions for the determination of a controlled zone, the designation of a controlled zone, the conditions of stay in a controlled zone, etc. are generally laid down in the Government Regulation No. 345/2006 Coll. on basic safety requirements for the protection of health of workers and of the population against ionising radiation;

IRRADIATION – exposure to the effects of ionising radiation;

NATURAL SOURCE OF IONISING RADIATION – source of ionising radiation of natural earth or cosmic origin;

RADIATION PROTECTION – protection of people and the environment against irradiation and its effects, including means to ensure such protection;

RADIOACTIVE CONTAMINATION – contamination of any material, surface, environment or individual with radioactive substances. In the case of a human body, radioactive contamination means external skin contamination and internal contamination irrespective of the route of exposure to radionuclides;

RADIOACTIVE SUBSTANCE – any substance containing one or more radionuclides whose mass activity or volume activity is not negligible from the point of view of radiation protection;

RADIOACTIVE EMITTER – radioactive emitter whose activity and mass activity exceed the values stated in Annex No. 2 to Government Regulation No. 345/2006;

RAW PROCESSING – activity aimed to separate radionuclides from radioactive waste, change its composition and reduce its volume with the aim to enhance the safety and economic efficiency of their treatment;

ARTIFICIAL SOURCE OF IONISING RADIATION – source of ionising radiation other than the natural one;

RAW TREATMENT – activity resulting in packaged radioactive waste prepared in compliance with the requirements for safe handling, storage, transport and storage.

RAWPTT - this abbreviation is generally used for RAW processing and treatment technology; where it refers exclusively to the nuclear facility for RAW processing and treatment technology, the abbreviations RAWPTT NF is used in the text below.

INTRODUCTION

The technology for RAW processing and treatment in Jaslovské Bohunice was designed and completed gradually.

The history thereof started with the accident of the first nuclear power plant in the former Czechoslovak Socialist Republic (CSSR), called A1 NPP, in February 1977. The Federal Government of the CSSR decided not to restore its operation and to prepare its gradual decommissioning on the basis of a complex analysis of the post-accident situation by Resolution No. 135/1979. As part of Slovenské energetické podniky, š. p. (Slovak Energy Companies, state-owned enterprise – predecessor of Slovenské elektrárne, a. s.), the nuclear facility liquidation unit was established for this purpose as the first predecessor of the Proponent.

In the period 1977–1995, works were performed to halt the operation of the A1 NPP after the shutdown of the reactor, and actions were taken directly in relation to its decommissioning in 1979. The works performed primarily focused on the liquidation of the consequences of the accident (removal of damaged spent fuels) and minimisation of the environmental impacts of the critical radiation condition of the power plant (in the meantime, the facility ensured the processing of operational RAW, and the low-contaminated technological equipment also started to be decommissioned). At the same time (as mentioned above), preparations were going on to decommission the power plant, i.e. to develop technology for RAW processing and treatment and a repository for permanent and safe deposition of treated RAW in Mochovce.
During this period, the Slovak Government imposed by Resolution No. 266/1993 of 14 April 1993 the task to "Prepare a complex project of bringing the A-1 NPP Jaslovské Bohunice into a radiation safe condition". The outcome was the project "Bringing the A-1 NPP into a radiation safe condition" of 1994 by which the decommissioning of the A1 NPP was divided into five stages.
The aim of stage I, already completed, was:

- to ensure the treatment and transport of spent nuclear fuel that remained in the A-1 NPP and of radioactive substances originally in non-solid condition to bring them into a solid form suitable for permanent deposition in the RAW repository;
- to create the conditions to improve environment protection and to decommission the A-1 NPP in Stage II.

Stage I of the decommissioning project was scheduled for the period 1995–2007, and was approved by Government Resolution No. 649/95. In spite of the preparatory works, the Slovak Republic did not dispose of all required technology and equipment at the beginning of this stage for the processing and final treatment of the RAW to be deposited at the repository (for example, the Bohunice RAW Processing Centre /the core part of the existing technology/ was in inactive test operation at that time with insufficient technology scope).

As the preparation of this stage and the designing of required technology started before the effective date of Act of the NC SR No. 127/1994 Coll. on Environmental Impacts Assessment (in effect since 01 September 1994), the EIA process for this stage was carried out at a later period.
The evaluation report of 1999 thus assessed activities, technologies and processes which
- started to be implemented before the act came into force;
- were designed before the act came into force;
- were at the stage of an investment plan at the time of preparing the evaluation report.

In spite of the various degrees of implementation, the report aimed to assess the environmental impacts of implemented and designed activities in mutual relations.

The second EIA process was conducted for activities performed after completion of Stage I of the decommissioning under the title "A-1 NPP decommissioning after the completion of Stage I".
The evaluation report was submitted to the Ministry of Environment of the SR on 16 January 2003; the purpose of the assessed activity, as defined in the report, was to come to a state where the criteria are fulfilled for an unlimited use of the area comprising the equipment, auxiliary operation units of the A1 NPP, and technology for RAW processing and treatment, such as BRAWPC, bituminisation lines, waste water treatment plant.
This report also analysed the use of some technology/equipment for the decommissioning of other nuclear power plants within the Jaslovské Bohunice complex, i.e. their transportation to the RAWPTT complex.
Three decommissioning options were analysed in this process, and the Assessment Report logically also assessed the impacts of the RAWPTT nuclear facility, since the treatment of RAW to bring it to a form suitable for deposition is an inevitable and final part of the treatment of RAW produced during the A1 NPP decommissioning.

The final opinion of the MoE SR No. 5936/2002 – 1.12 of 20 October 2003 recommended to continue with the activities related to the "A-1 nuclear power plant decommissioning after the completion of stage I" under option 3, i.e. continuous decommissioning of the A-1 NPP after the completion of Stage I.
The continuous decommissioning of the A-1 NPP is expected to be completed in 2033. In fact, this process represents continuous performance of the different types of decommissioning activities: pre-disassembly decontamination, disassembly, post-disassembly decontamination, decontamination of construction surfaces, and waste processing.

In view of the need of subsequent continuous reconstruction or innovation of some equipment/technology and the need to adapt it for further use, the Proponent, while respecting the requirements under Act of the NC SR No. 24/2006 Coll. on Environmental Impacts Assessment, submitted to the competent authority a request for opinion concerning each relevant change in the technology or documentation.
Although the opinion of the competent authority (MoE SR) states that the proposed changes do not mean increased equipment capacity or change of the purpose of the original equipment

operation requiring a process of assessment of the proposed modifications of the different units, it was recommended to conduct a complex process of assessment of the RAW processing and treatment technologies, as they are interlinked in terms of operation and spaces, and also several partial modifications of the operations have recently been submitted for opinion.

Since the Proponent only plans minor adjustments of the technologies by installing some equipment which will not have any impact on the nature, extent or capacity of the works performed (e.g. equipment for the fragmentation of large-sized metal RAW in the main production block for being further processed by the RAWPTT), no opinion on the change of operations under the recommendation mentioned above and the relevant legislation has been requested, and the Proponent chose to directly fulfil the recommendation of the competent authority and presented a Plan offering a complex solution (considered final under the given circumstances).
This enabled joint assessment of the technologies and workplaces as a single optimised unit which will later be able to fulfil the tasks in Stage II of the V1 NPP decommissioning.

A. BASIC INFORMATION

I. BASIC INFORMATION ABOUT THE PROPONENT

I.1. NAME

Jadrová a vyraďovacia spoločnosť, a.s.

I.2. IDENTIFICATION NUMBER

35 946 024

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II. BASIC INFORMATION ABOUT THE PROPOSED ACTIVITY

II.1. TITLE

RADIOACTIVE WASTE PROCESSING AND TREATMENT TECHNOLOGY BY JAVYS, a.s. AT JASLOVSKÉ BOHUNICE SITE

II.2. PURPOSE

The purpose of the assessed activity is the operation of radioactive waste processing and treatment technology of JAVYS, a. s. at Jaslovské Bohunice site.

These technologies serve for the processing and treatment of low and medium activity RAW produced during the decommissioning of A1 NPP, which is currently at stage II, and during the decommissioning of the V1 NPP (currently at stage I), as well as for RAW produced by the NPP facilities and by various other fields of human activities, such as research, medicine, etc. (institutional radioactive waste).

In this regard, the works executed at present mainly focus on the following activities: liquidation of the original, currently non-operated technological facilities of A1 NPP (including production unit), and of building structures after the vacation of the facilities; handling of contaminated soil and concrete; treatment of cases from the long-term storage facility using chrompik cooling medium for fuel elements and its fixation; gradual purification of the organic cooling medium for fuel elements (dowtherm) and its incineration; processing (concentration, cementing) of historic liquid RAW; sorting, treatment and processing of historic solid RAW; and treatment and processing of solid and liquid RAW produced during decommissioning with the aim to store the processed and treated RAW, fixed in fibre-concrete containers, at the NRAWR in Mochovce.

The Bohunice RAW Treatment Centre (BRAWTC) plays an important role in the process of RAW processing and treatment, and comprises a facility for the thickening of liquid radioactive waste, a facility for the sorting of solid RAW, an incinerator of solid RAW and liquid organic RAW, a facility for high-pressure RAW pressing, and a cementation facility for final covering of processed RAW with a cement mixture in fibre-concrete containers. The processes of RAW fixation are ensured by bituminisation, vitrification, cementing, and sialisation technology, and the concentration of liquid RAW is performed at the active waste waters treatment plant. These technologies for RAW treatment also include parts of technology currently used for executing specific tasks related to RAW treatment under the A1 NPP decommissioning, and spaces for RAW storage.

The RAW processing and treatment technology concern two nuclear facilities:

- ✓ nuclear facility "A1 Nuclear Power Plant (A1 NPP)" ,
- ✓ nuclear facility "RAW Processing and Treatment Technology (RAWPTT)".

Chapter II.8 provides a detailed description of the individual pieces of equipment.

The output of the given RAW processing and treatment processes depending on the type and contamination of processed and treated RAW is a fixed product in the form of a fibre-concrete container (FCC) to be deposited at the NRAWR, and waste materials (waste soil, metals, concrete, etc.), meeting the discharge limits.

In some cases, RAW which fails to meet the conditions for reposition at the NRAWR will be stored in suitable premises of the given technology complex until an underground repository or integral RAW storage site is constructed.

II.4. LOCATION OF THE PROPOSED ACTIVITY

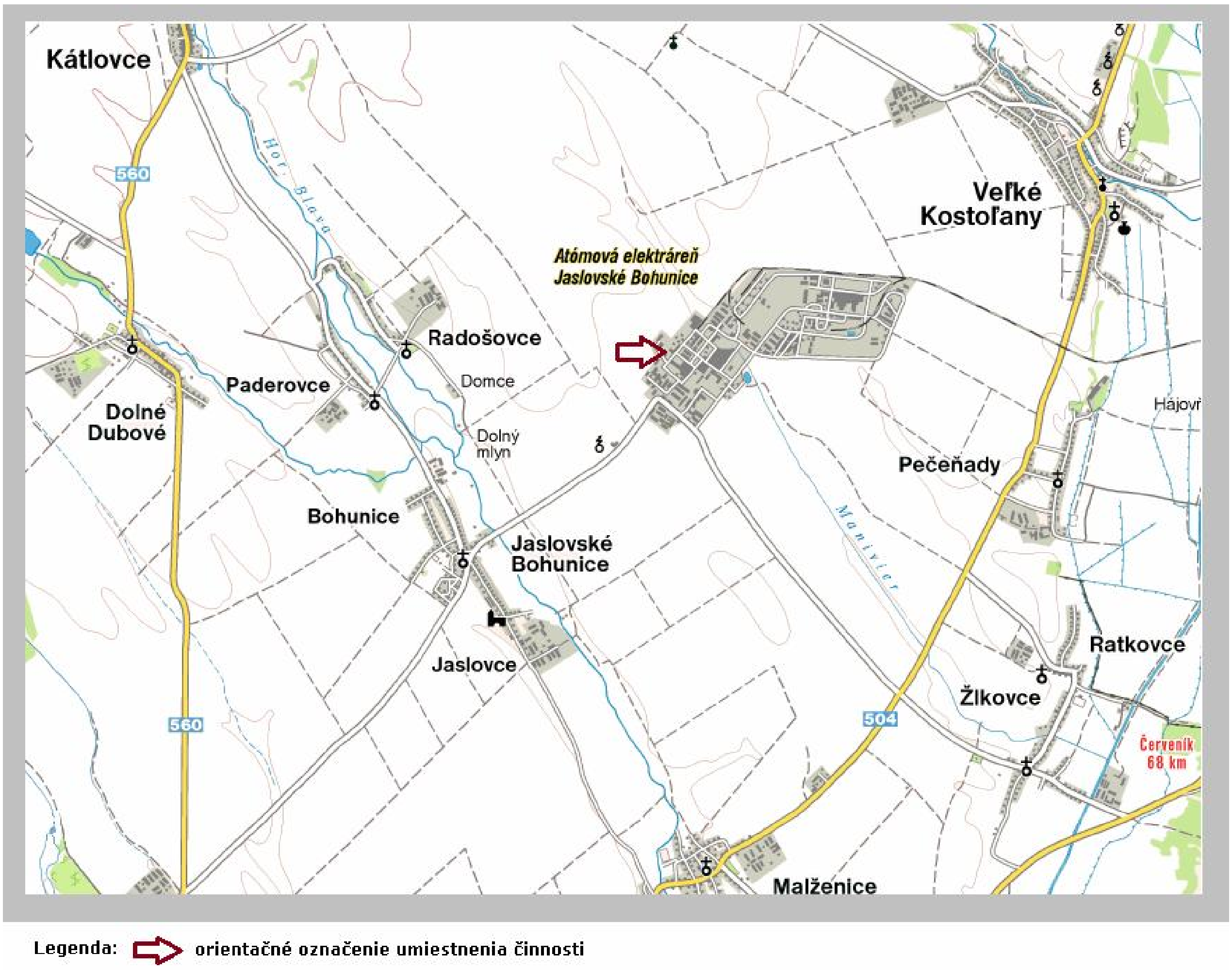
Region:	Trnava
District:	Trnava
Municipality:	Jaslovské Bohunice
Cadastral territory:	Bohunice

Building no.	***Plot no.***
30	704/56
32	704/55
34	704/54
46	704/57
41	704/65, 704/68
44/10	704/62, 704/69, 704/70
44/20	704/96
808	704/99
809	704/67
28	704/66
723	701/37
807	704/73

The buildings in which the RAW processing and treatment facilities are located are situated within the A1 NPP site (currently in the process of decommissioning) north-west from the buildings of the principal production unit which comprises other pieces of technology for RAW processing and treatment that fulfil tasks related to A1 NPP directly on site. (For the individual pieces of technology and their location in the listed buildings see Table A.II.8./01.)

All these plots owned by the Proponent are registered as built-up areas and yards outside of the developed area of municipality.

II.5. OVERVIEW OF THE PROPOSED ACTIVITY LOCATION



Legend: Indication of the activity location

II.6. JUSTIFICATION OF THE LOCATION

The technologies for radioactive waste processing and treatment are situated within the respective area as a logical next level of treatment of radioactive materials produced as waste by nuclear facilities located in Jaslovské Bohunice and as a result of the decommissioning of nuclear facilities the operation of which has already been stopped. The A1 Nuclear Power Plant (Stage II) and V1 Nuclear Power Plant (Stage I) are currently being decommissioned.

II.7. DATE OF START AND END OF CONSTRUCTION AND OPERATION OF THE PROPOSED ACTIVITY

Since the main reason for the gradual implementation of the technologies in Jaslovské Bohunice with the RAWPTT NF as a core was the need to process and treat radioactive waste from the decommissioning of the A1 NPP (the decision not to restore the operation of the A1 NF was taken by Resolution of CSSR Government No. 135 of 1979) and from the operation of the V1 and V2 NPPs and their subsequent decommissioning, the decommissioning will not take place before the second half of this century.

The assumed end date of operation of the individual parts of the decommissioning technology varies and depends either on the technical life-cycle and the time period during which they are in operation, or on their wear-out, which is influenced by the intensity and remaining demands for their use. For example, the expected life-cycle of VICHR is approx. 10 more years, the life-cycle of the parts of technology in building no. 41 is approx. 25 more years, while the life-cycle of DN in the O-P corridor is approx. 15 more years and of FRAGIS II approx. 25 years, etc.

Stage II of the A1 NPP decommissioning after the completion of which only three buildings will remain within the A1 NPP area – the reactor building, electrical building and auxiliary building for storing some of the original equipment of the A1 NPP (e.g. reactor, primary technological circuits, accessories of the primary circuit, steam-generators, turbo-compressors, etc.) is planned to be completed in 2016. The other stages of the A1 NPP decommissioning (stages III to V) are planned to be completed by 2034.

II.8. BRIEF DESCRIPTION OF THE TECHNICAL AND TECHNOLOGICAL DESIGN

The activity complies with the abandonment from an alternative option (letter of the MoE SR No. 7243/2012-3.4/hp of 02 October 2012) issued on the basis of the justified Proponent´s request, and is assessed as a single alternative under the defined Scope of Assessment No. 2671/2013 - 3.4/hp of 11 April 2013.

For the purposes of better orientation, the given technologies for radioactive waste processing and treatment, located in Jaslovské Bohunice, can be divided as follows in terms of arrangement and space:

A. Technologies forming part of the nuclear facility “Radioactive Waste Processing and Treatment Technology (RAWPTT)”;
B. Technologies for RAW treatment which currently serve for the execution of specific tasks related to RAW treatment under the process of the A1 NPP decommissioning, located in the former operation buildings of the A1 NPP;

C. Technologies for RAW treatment which currently serve for the execution of specific tasks related to RAW treatment under the process of the A1 NPP decommissioning, located in the premises of the former main production block of the A1 NPP.

A. The nuclear facility "Radioactive Waste Processing and Treatment Technology (RWPTT)" includes:

1. BOHUNICE RAW TREATMENT CENTRE (building 808)

The Bohunice Treatment Centre processes combustible solid and liquid waste, pressable solid waste, non-combustible and non-pressable waste, concentrates, ion exchanger resins (sludge) and other contaminated liquids and sludge.

Several processing facilities serve for the processing of such waste:

1. ***Liquid radioactive wastes thickening unit – evaporator (PS 03)***
   - thickens inorganic liquid RAW, which, after being condensed, is processed by the cementing line.
2. ***Cementation unit for the treatment of concentrates, saturated ion exchangers and sludge (PS 04)***
   - enables RAW treatment for final storage, i.e. covering of processed RAW with a cement mixture in fibre-concrete containers (FCC);
3. ***Solid RAW sorting unit (PS 05)***
   - serves for waste sorting (in sorting boxes) depending on the type of RAW and other methods of RAW processing and treatment: pressable, combustible, and non-pressable and non-combustible.
4. ***Incinerator of solid RAW and liquid organic waste (PS 06)***
   - serves for the incineration of solid RAW, liquid organic RAW and saturated ion exchangers. Flue gases are treated by a textile self-generation filter, washed in two wet washers and finally cleaned by HEPA filters which capture radioactive particles with 99.9% efficiency. The ash produced in the incinerator is filled in 200dm^3 MEVA barrels after being paraffined, and transported for treatment by pressing. The washing liquid from flue gas washers is treated by cementation.
5. ***High-pressure RAW pressing (PS 08)***
   - serves for the pressing of sorted waste packed in 200dm^3 barrels.

In 2012, some operating units of the BRAWTC or their parts were reconstructed or innovated, and this process was completed by Decision of Approval No. 72/2013 of the NRA SR with effect from 24 January 2013. The purpose of this reconstruction was to improve the functionality, efficiency and reliability of installed technology and technological equipment, reduce the personal doses of the operating staff during maintenance and operation of equipment, further reduce the adverse environmental impacts on the affected area, and reduce the amount of secondary RAW.

2. *BITUMINISATION LINES (building 809)*

This equipment consists of three bituminisation lines: PS 44 – bituminisation line, PS 100 – bituminisation line, PS 44/2 – discontinuous bituminisation line (DBL) and a new RA water treatment facility. The equipment serves for the fixation of liquid RAW ("LRAW"), and the DBL for the fixation of ion exchangers and sludge into a bitumen matrix. The product of the process is filled in 200dm^3 zinc-coated barrels which are subsequently processed on the BRAWPT cementation line. The interim warehouse for fixed radioactive waste serves for temporary storage of the DBL product.
The waste water treatment facility PS 100 serves for the treatment of active waste waters from the BL by evaporation and final purification at sorption columns. The matter thickened by purification is processed, after attaining optimum concentration, by bituminisation at bituminisation lines.

3. *WASTE WATER TREATMENT PLANT (building 41)*

The treatment plant serves for the treatment of LRAW with specific beta and gamma activity under 3.7.10^6 Bq.dm^{-3} (i.e. low activity LRAW) and a pH of 6-8. The treatment is carried out by evaporation and subsequent purification of the breed condensate at the ion exchanger filtering unit. The treated waters are discharged to the environment in a controlled way through the SOCOMAN sewerage system once their volume activity has been determined. Saturated ion exchangers from water treatment are processed by RAWTPT equipment.

4. *METALLIC RAW PROCESSING UNIT (building 34)*

This unit serves for the sorting, fragmentation, subsequent decontamination and release into the environment of metallic RAW, or for its safe storage deposited at the NRAWR Mochovce. It consists of the following sections: Coarse fragmentation (PS001), Fragmentation (PS002), Coarse sorting (PS003), KEMPER suction and filtration (PS006), Dividing and jet-blasting (PS007), and Grinding of used electric cables (PS008). The other auxiliary sections are PS 004 – Air-conditioning and PS 005 – Electrical section.
Last year, an independent process was conducted to assess some modifications resulting in an increase, via modernisation, of the processing capacity of the operation from 200t/year (in 2011) to 250t/year (one-shift operation), while an increase by 50t/year of metallic RAW from the V-1 NPP against the present capacity is planned. The operation is expected to start in 2014. An approving Final Opinion No. 2294/2013-3.4/hp of 28 February 2013 has already been issued for this modification.

5. *AIR-CONDITIONING FILTER PROCESSING UNIT (PS 009)*

This unit is designed to process contaminated filters from the air-conditioning systems of nuclear facilities in Jaslovské Bohunice. It enables sorting and packaging of waste according to types of RAW (metallic material from carbon steel, aluminium, paper and cellulose, wood, polyethylene, and polypropylene). After being packaged and monitored, the sorted types of RAW are further processed. This unit consists of three technological sections: technological section for grinding and separation, technological section for the pressing of separated ground materials, and a sanitary node.

6. LARGE-CAPACITY DECONTAMINATION LINE (LCDL, PS 24)

This decontamination line represents a compound designed for the decontamination of non-fragmented metallic materials. The LCDL consists of a set of bowls the technical devices of which enable various decontamination procedures: steeping bowl, chemical decontamination pool, ultra-sound decontamination pool, flushing ultra-sound decontamination pool, drying pool, and electro-chemical decontamination pool. Besides this basic equipment, the line includes other related technological devices for the preparation and regeneration of decontamination solutions and treatment of sludge phases, as well as heating and air-conditioning systems.
Last year, changes aimed to increase the processing capacity of this unit from 200t/year (year 2011) to 250t/year (one-shift operation) via extension and modernisation were assessed under an independent process, where the increase by 50t/year will be due to metallic RAW from the V-1 NPP. The planned start of the operation in changed form is planned in 2014, and an approving Final Opinion No. 2294/2013-3.4/hp of 28 February 2013 has already been issued for this change.

B. The following facilities situated in the former operation buildings of the A1 NPP serve for execution of specific tasks related to RAW treatment during the A1 NPP decommissioning:

7. SLUDGE FIXATION UNIT (SFU)

SFU is a mobile unit for fixing radioactive sludge in various types of fixation matrices (e.g. cement, aluminium-silicate matrix SIAL, etc.). This facility can be placed next to a sludge tank equipped with a sludge pumping system. The sludge is pumped through the SFU storage tank system into 200dm^3 MEVA barrels in required amounts. Afterwards, the barrel is placed under the mixing unit in which the required amounts of loose reinforcing matrices are dosed, and sludge homogenisation is performed using reinforcement matrices. Once the barrel is closed, the solidified product is transported to the BRAWTC to be inserted in a fibre-concrete container.

Waste fixation "in situ"
Besides the SFU site, RAW can also be fixed into a solid form by means of a mobile device (at present, the devices of contractors are used; in the future, the Proponent may buy its own devices) to be adapted to the given operation and space conditions, and the use of a suitable matrix depends on the nature of treated RAW.

8. CONTAMINATED CONCRETE TREATMENT UNIT (CCTF, building 44/20)

This unit serves for the decontamination of concrete to reach a surface contamination level of 0.3Bq/cm^2 as the limit value for release into the environment. The unit consists of two operation sections: treatment of barrels containing contaminated concrete (PS 01), and treatment of contaminated concrete blocks (PS 02). The former one is used to sort concrete blocks by a vibration sorting equipment to produce dust, which is automatically considered RAW, and larger ground materials which is released to the environment after control measurement, or is sorted manually. The latter section is used to decontaminate concrete blocks to a level allowing their manual release to the environment manually by milling, grinding and cutting.

9. CONTAMINATED SOIL SORTING UNIT (CSSU)

This unit serves for the sorting of natural wet soil clear of stones and larger objects as per mass activity of ^{137}Cs (or other radionuclide) to three adjustable activity classes: up to 300Bq/kg, from 300 to 10,000Bq/kg, and over 10,000Bq/kg.

10. SORTING UNIT IN BUILDING 44/20

This unit is designed for the sorting of earlier solid RAW from the A1 NPP which is stored in certified storage facilities of the main production unit (MPU). The unit consists of a working platform on a rail track on which a sorting table is installed, and the platform can be moved all around the building. The material is sorted into three categories: combustible, non-combustible – pressable, and small solid non-pressable. The operating staff is protected against the effects of RAW by means of a protective shield. The protection of staff against inhalation of RA substances is ensured by an effective suction device located above the sorted material.

11. EQUIPMENT FOR THE DECONTAMINATION OF GAS-HOLDERS DEZAPLYN (building 28)

This equipment serves for the decontamination of underground high-pressure gas-holders (UHG), and consists of the following parts: chemical unit, high-pressure unit, spraying trolley, pumping unit, neutralisation unit, filtration unit, pneumatic unit, rail, and main distributor frame.
The high-pressure unit installed on the spraying trolley moving inside the gas-holder on rails sprays a decontamination solution on the internal walls of the gas-holder. The used solution is pumped to the neutralisation and filtration unit for further use.

12. CONCRETE BLOCKS GRINDING AND SORTING UNIT

This worksite ensures, by means of one piece of equipment (for all planned operations – demolition, fragmentation and grinding), the demolition of building structures of up to 800mm in thickness, heavy demolition works on highly reinforced concrete structures of up to 800mm in thickness; processing of iron-concrete blocks of 900x500mm by grinding, with an optional output size of the ground fragments from 15 to 120mm; separation of iron reinforcements from ground iron-concrete; and the loading of iron-concrete blocks and crushed materials to trucks. The equipment has a wheel chassis protected against tyre damage.

C. The following parts of RAW processing and treatment technology are situated in the buildings of the former main production unit of A1 NPP:

13. VITRIFICATION UNIT (VICHR)

The vitrification unit is used for the fixation of inorganic liquid RAO (chrompik – cooling medium for spent fuel elements) in a glass matrix after thickening the liquid RAW in the concentration evaporator (volume of 50dm^3).

After being purified in sorption columns, the breed condensate generated in the evaporator is pumped to the low-contaminated waste waters treatment plant for final treatment. The thickened concentrate is drained to the vitrification furnace where it is heat-treated with the addition of a glass matrix. The active hot-melt is drained to a metal mold (approx. 8dm^3 volume) and stored in an interim storage facility. The breed condensate from the vitrification furnace returns back to the process.

14. UNIT FOR SPENT NUCLEAR FUEL TREATMENT FOR TRANSPORTATION PURPOSES (UTF)

This unit is currently used for the destruction of cases from the long-term storage facility (CLSF) using fixed sludge of cooling media (chrompik, dowtherm). Within the FTF equipment, the bottom part of CLSF with fixed RAW is separated from the empty upper part and inserted in an air-tight case. The upper part is fragmented in the CLSF treatment equipment. Once the air-tight case is filled and closed, it is temporarily stored in the spent fuel storage facility. It is a large capacity container, originally designed for storing CLSF with dry fuel elements (without chrompik). At present, it is used for storing fixed bottom parts of CLSF and chrompik vitrificates I and III that cannot be deposited at the NRAWR Mochovce.

15. NEW DRAINING BED (NDB)

This equipment was originally used to drain the cooling medium (chrompik III) from CLSF with fuel elements in case the fuel elements could not be removed. After draining the liquid phase of the cooling medium, the fuel element with a part of CLSF was closed into HP. The draining equipment was later used for the draining of chrompik II from CLSF without fuel elements. The CLSF draining can currently be performed by draining a hole at the bottom part of the CLSF wall, which allows the draining of the entire contents of the cases, their washing, and plugging of the holes. The draining equipment will also be used for the draining of sludge phases from the CLSF.

16. Unit for the Treatment of Cases from Long-Term Storage (UTCLS)

This unit is designed for the fragmentation of cases from the long-term storage facility used for the storage of spent nuclear fuel, as a leakage of fissiles from nuclear fuel occurred during storage and the cases show a high level of surface contamination. It is therefore necessary to decontaminate them to a level enabling their recasting or deposition at the National Repository.

17. Decontamination Node (DN) in O-P Corridor (building 30)

The decontamination node in the O-P corridor was created for decontaminating objects or dismantled parts of equipment which, due to a higher level of contamination, cannot be decontaminated by the large-capacity decontamination line (at present mainly CLSF fragments). The equipment consists of the following parts: electro-chemical decontamination pool, ultra-sound decontamination pool, mobile decontamination pool, decontamination table, absorption column, pipelines and suction ducts, cooling aggregate, and filtration unit.

18. Dowtherm treatment unit (building 30, long-term storage premises, room no. 516)

This unit is used to reduce the specific activity of the dowtherm (organic cooling medium for spent fuel elements) by an inorganic sorbent, which subsequently enables its processing by combustion in the BRAWTC incinerator. The entire process runs in a shielded stainless steel tank with added sorbent. The technological process is remote controlled and is monitored by means of a closed-circuit television.

19. SUZA DS – Sludge Processing unit

This unit was used for the selection and fixation of RA sludge from the long-term storage pool. The unit (fixation part) is currently used for the processing of saturated sorbents drained from the stainless steel tank of the facility for the purpose of dowtherm treatment directly to the $60 dm^3$ barrel. The sorbents are fixed in the SIAL matrix.

20. HOT CHAMBER (HC) – renamed to Handling Box

The hot chamber (HC) is designed for remote performance of technological operations with high activity materials. It is a special handling box equipped with a system of devices for handling operations by means of manual manipulators controlled from the operator´s room.

21. FACILITY FOR FRAGMENTATION OF LARGE-SIZED METALLIC RAW

This facility will serve for the fragmentation of large-sized metallic RAW from the dismantling of bearing structures of the fuel charging machines ZS I and ZS II in O-P corridor in order to transport them in containers for further processing in building 34, i.e. to the metallic RAW processing facility.

22. FRAGIS I FRAGMENTATION EQUIPMENT

It is a container used to store devices and tools designed for the liquidation of machines. This equipment includes a storage container, a decontamination table, a decontamination tank, shelves, an air vent and a trash bin. It also has remote controlled manipulators MT 15 and MT 80 and a camera system that can be used for the fragmentation of remote controlled devices aimed for removal.

23. DECONTAMINATION EQUIPMENT FRAGIS II

This equipment serves for the decontamination of metallic RAW from the A1 NPP decommissioning (dismantled parts of non-operated equipment of A1 NPP). This unit is designed as a mobile container (currently located next to building 30 of A1 NPP) connected to all engineering systems (demineralised water supply, power supply, suction, draining into a special stainless steel sewer, radiation control). The equipment consists of an electro-chemical and ultra-sound decontamination pool with accessories (devices for the preparation of decontamination solutions, power sources, ultra-sound, devices for secondary RAW treatment, handling tools, radiation control devices, air-conditioning).

The table below provides a brief overview of the parts of the technology.

Table A.II.8./01

Processing capacities and the focus of technologies and worksites for RAW processing and treatment

Item	**Location**	**Worksite/ Technology**	**Annual processing capacity**	**RAW processed**	**Activity of processed RAW**	**Operation or other processing technology as a source of processed RAW**	**Type of operation**
Package of technologies forming part of the „RAW processing and treatment technology“							
1.	BRAWPC (building 808)	Concentration	$750 m^3$	non-combustible liquid RAW	Volume activity limits for exposure to LRAW: beta-gamma $40x10^9$ Bq/m^3 alpha $60x10^3$ Bq/m^3 Nuclide composition: ^{54}Mn, ^{60}Co, ^{137}Cs, ^{110}Ag, ^{134}Cs	Decommissioning of A1 NPP, V1 NPP, V2 NPP, building 41	continuous
2.	BRAWPC (building 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 $300x10^9$ Bq/m^3 alpha $300x10^3$ Bq/m^3 ✓ non-thickened RA liquids: beta, gamma $200x10^9$ Bq/m^3 alpha $450x10^6$ Bq/m^3 ✓ solid RAW beta, gamma $20x10^9$ Bq/m^3 alpha $450x10^3$ Bq/m^3 ✓ reinforced RAW for cementation beta, gamma $200x10^9$ Bq/m^3	All technologies and worksites producing non-combustible LRAW	continuous

					Max. mass activity alpha 4,000 Bq/g		
3.	BRAWPC (building 808)	Sorting	50t	Earlier solid RAW from A1 NPP operation	Σ volume of β, γ activity of sorted SRAW must be under 1.5 GBq/m^3. Maximum surface (non-fixed) contamination in ISO container: - up to 3 Bq/cm^2 for loose particles - up to 30 Bq/cm^2 for parts in undamaged PE foil 30 Bq/cm^2	RAW storage areas *Note:* *The surface dose rate of the barrel containing RAW in contact may not exceed 10 mGy/hour.*	1-shift
4.	BRAWPC (building 808)	Incineration	240t	Combustible solid and liquid RAW	Σ specific mass activity β, γ of SRAW may not be over 6MBq/kg. Σ specific mass activity α of SRAW may not be over 100 kBq/kg. Σ specific volume of β, γ activity of incinerated LRAW may not be over 37 GBq/m^3. Σ specific volume activity α of incinerated LRAW may not be over 370 MBq/m^3.	All technologies and worksites producing combustible RAW	continuous (under reconstruction)
5.	BRAWPC (building 808)	HP pressing	420t	Sorted non-combustible, but pressable RAW	Σ volume activity β, γ of SRAW must be under $1x10^9$ Bq/m^3	All technologies and worksites producing pressable RAW	continuous

6.	Bituminisation lines (BL, building 809)	PS 44 and PS100	270m^3	Liquid RAW (concentrates) from the process of A1 NPP decommissioning	✓ RA concentrates: - beta, gamma volume activity max. 1x10^{8}Bq/dm^3 ✓ RA sorbents: - beta, gamma volume activity max. 1x10^{8}Bq/kg		continuous
7.	Bituminisation lines (BL, building 809)	Discontinuous BL (DBL)	48m^3	Ra-ion exchangers	The maximum limit value of the volume activity for ^{60}Co is 2.08x10^8 Bq/m^3 (the calculation for other radionuclides is specified in the operating rule).	Facilities producing ion exchangers – A1 NPP, V1 NPP	continuous
8.	Building 41	Waste water treatment plant (WWTP)	3,000m^3	Active waste waters from RAW processing lines and from the process of A1 NPP decommissioning process	The specific beta and gamma activity may not exceed 3.7x10^6 Bq/dm^3 (i.e. low-activity LRAW)	All technologies and worksites producing liquid RAW	continuous
9.	Building 34	Metallic RAW processing unit*	500t	Metallic RAW from A1 NPP decommissioning, Stage II	With specific β and γ activity of up to 10,000 Bq/cm^2 , with specific α activity of up to 1,000 Bq/cm^2	item No. 26	2- shift
10.	Building 32	Processing of AC filters	15t	AC filters from A1 NPP operation and decommissioning	With dose rate of up to 10 μGy/h[1)]		1- shift
11.	Building 34	Large-capacity decontamination line (LCDL)*	500t	Solid non-fragmented RAW from the A1 NPP decommissioning, Stage II	The specific beta and gamma activity of processed metallic RAW may not exceed 10 kBq/cm^2. The specific alpha activity of processed metallic RAW may not exceed 1,000Bq/cm^2.	item No. 9	2- shift

Package of technologies located in the former operation buildings of the A1 NPP							
12.	Building 44/10 (mobile)	Sludge fixation unit (SFU)	150 barrels/year	Sludge phases from tanks of external buildings concentrated in the tank 1/3 or 1/2 in building 44/10 of A1NPP	Sludge with total mass gamma activity of up to 1.64GBq/kg of sludge suspension.	Building 44/10	2-shift
13.	Building 44/20 (mobile)	Contaminated concrete treatment unit (CCTU)	270t	Contaminated concrete from A1 NPP decommissioning	Concrete with surface activity of over 0.3Bq/cm^2		1- shift
14.	Building 44/10 (mobile)	Contaminated soil sorting unit (CSSU)	1,800t	Contaminated soil from A1 NPP decommissioning	Sorting range: 300Bq/kg – 300,000Bq/kg		2- shift
15.	Building 44/20	Sorting unit in building 44/20	approx. 5 barrels per day	Solid RAW from A1 NPP facility, stored in certified storage areas of the main production block (MPB)	Maximum surface (non-fixed) contamination in ISO container: - loosely placed parts of 3Bq/cm^2 - parts in undamged PE foil of up to 30Bq/cm^2		1- shift
16.	Building 28	Equipment for the decontamination of gas-holders DEZAPLYN	5 pcs	Contaminated gas-holders from the A1 NPP	N/A	item No. 26	1- shift
17.	Mobile	Concrete blocks grinding and sorting unit	N/A		With specific β and γ activity of up to 10,000Bq/cm^2 , with specific α activity of up to 1,000Bq/cm^2	item No. 26	2- shift

Technologies located in the former main production unit of the A1 NPP							
18.	Building 30	Vitrification unit (VICHR)	3m^3	Chrompik III from the A1 NPP decommissioning, Stage II	up to 10^{11} Bq/dm^3		continuous
19.	Building 30	Unit for spent nuclear fuel treatment for transportation purposes (UTF)	30 pcs	Disposal of cases from the long-term storage facility (with fixed sludge of cooling media (chrompik, dowtherm)	The dose rate on the surface of the equipment may not exceed 2mGy/h.	item No. 20	1- shift
20.	Building 30	New draining bed (NDB)	Not specified in the project	Draining of sludge phases from CLS	The dose rate on the surface of the equipment may not exceed 2mGy/h.	item No. 19,21	1- shift
21.	Building 30	Unit for the treatment of cases from the long-term storage facility (UTCLS)	Discontinuous operation 15 pcs	Fragmentation of cases from the long-term storage facility before decontamination	The dose rate on the surface of the equipment may not exceed 2mGy/h.		1- shift
22.	Building 30	Decontamination node (DN) in "O-P" corridor	Not specified in the project	Decontamination of objects or disassembled parts of equipment from Stage II of A1 NPP decommissioning which cannot be decontaminated by the large-capacity decontamination line due to increased contamination (mainly CLS framents)		item No. 21	1- shift
23.	Building 30	Dowtherm treatment unit	4,000dm^3	Dowtherm (purpose – reduction of its specific activity which enables its processing by incineration at the	6.17×10^{10} Bq After treatment, Dowtherm must have the lowest possible activity	item No. 4	1- shift

				BRAWPC incinerator)	level, as only thus it can be accepted for incineration in the BRAWPC: - the specific volume $\sum\beta,\gamma$ activity of incinerated LRAW may not exceed $37GBq/m^3$. - the specific volume $\sum\alpha$ activity of incinerated LRAW may not exceed $370MBq/m^3$.		
24.	Building 30	SUZA DS – Sludge processing unit	Discontinuous operation According to the volume of RAW produced by DOW cleaning	Saturated sorbents discharged from a stainless steam vessel for dowtherm cleaning	$6.17x10^{10}$ Bq Total activity of the output product is under 4,000 4000Bq/g	item No. 23	1- shift
25.	Building 30	Hot chamber (HC) – Handling box	According to the requirements of the A1 NPP decommissioning project	Technological operations using high-pressure materials	The total beta and gamma activity of unshielded RA materials in the HC box may not exceed a value proportional to the activity of 1 TBq of a spot source containing the RA-nuclide ^{60}Co. The dose rate of gamma radiation may not exceed 300mGy/h.		1- shift

26.	Mobile rail equipment	Unit for the fragmentation of large-sized metallic RAW	According to the requirements of the A1 NPP decommissioning project	Large-sized metallic RAW from the disassembly of bearing structures of fuel charging machines ZS I and ZS II in the O-P corridor to be processed at the metallic RAW processing unit	N/A	item No. 17, 22	1- shift
27.	Mobile	Fragmentation unit FRAGIS I		Storage of equipment and tools aimed for the liquidation of machine equipment	N/A		1- shift
28.	Mobile	Decontamination unit FRAGIS II		Metallic RAW from A-1 NPP decommissioning	With contamination over 10^4Bq/cm^2 for beta and gamma radionuclides or 10^3 Bq/cm^2 for alpha radionuclides	item No. 5	1- shift

*Explanations: * The increase of the original shift capacity was assessed under an independent assessment process completed in February 2013.*

1) Activity of filters which were processed during test operation. The limits and conditions set by the NRA SR do not specify the limit activity and the dose rate for filters that can be processed by such equipment.

SYSTEM OF STORAGE OF PROCESSED RAW

The RAW aimed for processing or intermediate products of RAW processing are stored in several buildings of the Proponent.
An accompanying letter for RAW with relevant data is issued for each stored RAW package, marked in accordance with the respective internal regulation.

1. *Shelter for FCC (building 807)*

As an extension of the PS 07 operating unit, the BRAWPC serves for the storage of 24 cemented FCCs seasoning before being transported to the National Radioactive Waste Repository in Mochovce.

It is composed of a steel bearing structure, partly covered with trapezial zinc-coated sheet. The entire area is reinforced by a concrete surface suitable for storing concrete blocks of 12,000kg/pc.

2. *Certified storage facilities in building 32*

The storage facilities serve for storing solid waste from the NPP operation and decommissioning, as well as institutional RAW until processed by means of the processing technology.

The following storage facilities exist:

a) Storage room 30 – the total storing capacity of solid RAW is 2,508 pcs of 200l MEVA barrels stored on metal pallets PS 15/4 *(dimensions: 1,200 x 1,200 x 1,300mm, retaining tank volume: 205 l, carrying capacity: 1,200 kg)*; the max. total activity of stored RAW is $1.256x10^{14}$ Bq;

b) Storage room 54 – the total storing capacity of solid RAW is 1,216 pcs of 200 l MEVA barrels stored on metal pallets PS 15/4, the max. total activity of stored RAW is $5.922x10^{13}$ Bq,

c) Storage room 97 – the total storing capacity of solid RAW is 2,050 pcs of 200 l MEVA barrels; the max. total activity of stored RAW is $9.984x10^{13}$ Bq,

d) Storage room 106 – the total storing capacity of solid RAW is 1,480 pcs of 200l MEVA barrels, or max. 1,048 pcs of 200l MEVA barrels, and max. 1,134 pcs of filter elements; the max. total activity of stored RAW is $7.208x10^{13}$ Bq.

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

3. *Certified storage area in building 34*

As in the previous case, the storage room serves for storing solid (non-combustible) waste from the NPP operation and decommissioning and institutional RAW until its processing by the given processing technology. It is located in room 1 and its total storing capacity is 2,860 pcs of 200l MEVA barrels placed on metal pallets PS 15/4. The maximum activity of stored RAW may not exceed 5.29TBq. MEVA barrels are stored four on each pallet PS 15/4. The pallets are placed one on another in two or three layers depending on the construction height of storage boxes. For full use of the storage capacity, the barrels can be placed in two layers without pallets.

The weight of a barrel containing RAW may not exceed 450kg, and the total value of barrels on a storage pallet may not be over 1,200kg. The surface dose rate of a barrel with RAW when in contact may not exceed 0.7mGy/h, and the surface smearable barrel contamination for beta and gamma radionuclides and low toxicity alpha radionuclides must be under (or equal to) 3 Bq/cm^2, and for other alpha radionuclides it must be under (or equal to) 0.3 Bq/cm^2 (measured from a surface of min. $100cm^2$).

4. *Building 723*

The building serves as an interim storage facility for solid or fixed radioactive waste in packaging units (final products of bituminisation lines in building 809, combustible RAW, fragmented metallic RAW in approved packing units).
The total activity of all stored packaging units with solid or fixed RAW in the building may not exceed 1.9 TBq. The maximum dose rate on the surface of the stored packaging unit may not be over 4 mSv/h. At the same time, all packages must have their surface contamination non-fixed $\leq$ 0.03 Bq/cm^2 for toxic alpha RN, and $\leq$ 0.3 Bq/cm^2 for beta, gamma and low toxicity alpha RN.

Its storing capacity is 800 MEVA barrels in two layers on another, placed in special pallets with retaining tanks of 1216 PS 15/4.

The side building no. 723 (storage area II) also serves for storing barrels. MEVA barrels with final products from the bituminisation line are stored in the same way as in the main hall – 4 barrels in special pallets with retaining tanks of 1216 PS 15/4 type, in two layers in separated areas to have enough space for the handling of pallets by a fork-lift truck, space for parking the truck, and space for the control of stored RAW. The storage capacity of the storage facility II is 60 pallets, i.e. 240 barrels.

The controlled zone of the building no. 723 is connected to the controlled zone in building no. 809, i.e. they have a common access area.

5. *Building 839 – storing space for low activity soil and bioclar sludge*

The building serves as a temporary storing space for low activity soil and Bioclar sludge, and is sheathed to prevent diffusion of stored RA substances in the environment. The access to the building is ensured by two approach ramps with gates.
Sludge and low contamination soil are stored in the concrete bed of the building. This storing space was opened in 1984 and was designed for storing 3,240m^3 of soil and sludge with a mass activity of 3,000Bq/kg to 10,000Bq/kg.

II.9. PROPOSED ACTIVITY OPTIONS

Further to the notice of the MoE SR No. 7243/2012-3.4/hp of 02 October 2012 issued on the basis of the Proponent´s justified request, the proposed activity was submitted to the assessment process as a single option. Under the comments procedure related to the Plan, no request was raised to assess a new activity option to be reflected in the Assessment Scope No. 2671/2013-3.4/hp of 11 April 2013.

The activity is therefore proposed as a single option ***(option 1)*** and represents the operation of technologies serving for the processing and treatment of low and medium active RAW produced during the A1 NPP decommissioning (in Stage II at present), as well as RAW from the V1 NPP decommissioning (currently at Stage I), and RAW from the operation of the NPP and from various fields of human activities, such as research, medicine, etc. (institutional radioactive waste).

The other option assessed under the law is the ***zero option,*** i.e. the state where the assessed activity would not be implemented.

II.10. TOTAL ESTIMATED COSTS

The set of technologies has been installed gradually since 1970s when the accident of the A1 Nuclear Power Plant occurred (now being decommissioned). The technologies have gone through many modifications and innovations, as well as organisational and formal changes, and it is therefore difficult to provide the total costs invested exclusively in the given package of technologies in its current form.
To illustrate the costs of their implementation, we can correctly state that the construction of the very core of the processing technologies (BRAWPC) required investments at a total amount of approx. SKK 1,900 million, and the supply of bituminisation equipment another approx. SKK 250 million. The costs of the reconstruction of the BRAWPC and BL which was performed in 2012 attained EUR 6,291,684.00. The financially more costly option of the RAWPTT NPP (in its current form) is expected to cost of approx. EUR 178,558,000 thousand.

II.11. AFFECTED MUNICIPALITY

Municipality affected by the location of the facility:

Trnava District: Jaslovské Bohunice

Municipalities situated within the area and marked as affected for the purposes of this document:

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

II.12. AFFECTED SELF-GOVERNING REGION

Trnava Self-Governing Region

II.13. AFFECTED AUTHORITIES

Area Environmental Office Trnava – replacing the Regional Environmental Office Trnava which acted as the approving authority for the activity
District Environmental Office Piešťany
District Environmental Office Trnava
Regional Directorate of the Fire and Rescue Corps in Trnava

+ other authorities involved:
MoE SR (Department of Environmental Risks, Section of Waters, Section of Geology and Natural Resources), Bratislava
Labour Inspectorate, Nitra
Technická inšpekcia, a. s. (Technical Inspection), Head Office Bratislava
Regional Building Office in Trnava, Land Planning Department
Slovenský vodohospodársky podnik, š.p., Odštepný závod Piešťany
Railway Transport Regulatory Office, Bratislava
Slovak Environmental Agency, Banská Bystrica
Regional Public Health Office in Trnava
Regional Land Office in Trnava – currently Department of the District Office in Trnava
District Office Trnava, Department of Construction and Housing Policy – currently Department of the District Office in Trnava

II.14. APPROVING AUTHORITY

Nuclear Regulatory Authority of the SR
Public Health Authority of the SR

District Office Trnava – replacing the Regional Environmental Office Trnava as the original approving authority

II.15. DEPARTMENTAL AUTHORITY

Ministry of Economy of the SR

II.16. STATEMENT ON IMPACTS OF THE PROPOSED ACTIVITY BEYOND STATE BORDERS

Pursuant to Art. 40, par. 1, letter b) of Act No. 24/2006 Coll. on Environmental Impacts Assessment, the assessment of impacts reaching beyond state borders refers to such proposed activities to be implemented within the territory of the Slovak Republic and listed in Annex 13, or proposed activities listed in Annex 8 which can have a serious environmental impact reaching beyond the state borders.

According to item 3 of Annex 13, "Facilities designed exclusively for nuclear fuel production or enrichment, spent nuclear fuel processing or storage, and radioactive waste disposal and processing" are subject to such assessment.

The technologies and worksites described above meet the definition of RAW processing in accordance with NRA SR Decree No. 30/2012 Coll. on laying down the details of requirements for the processing of nuclear materials, radioactive waste and spent nuclear fuel, which defines radioactive waste processing as an activity aimed "to separate radionuclides from radioactive waste, change their composition and reduce the volume thereof in order to promote safety and the economic efficiency of radioactive waste treatment" (Art. 7).

Hence, despite the fact that the given technologies and worksites represent, due to their nature, a source of minimum impacts affecting a limited area in the surroundings of the proposed activity location (refer to Chapter B.II.5), the proposed activity is subject to international assessment under Act of the NC SR No. 24/2006 Coll. on Environmental Impacts Assessment.

It should be noted in this regard that the **European Commission** issued an opinion on 09 June 2009 pursuant to Article 37 of the Treaty on Euratom on the plan for the disposal of radioactive waste arising during the 2nd decommissioning phase of the Bohunice A-1 Nuclear Power Station NPP decommissioning which involves the RAW treatment procedures. This opinion states that, in conclusion, the Commission is of the opinion that, both in normal operation and in the event of an accident of the type and magnitude considered in the General Data, the implementation of the plan for the disposal of radioactive waste arising from the 2nd decommissioning phase of the Bohunice A-1 nuclear power plant in the Slovak Republic, **is not liable to result in radioactive contamination of the water, soil or airspace of another Member State** (the opinion and the full text of the accompanying report is available at the Proponent at request, and the publishable part is available at http://eurlex.europa.eu/JOHtml.do?uri=OJ:C:2009:131:SOM:SK:HTML, published in 2009 as document C 131/52 of the Official Journal of the European Commission).

To provide an actual picture of the impacts of the given activity parallel with other nuclear facilities within the locality (i.e. all Proponent´s facilities together with V2 NPP operated by SE, a.s.), the maximum individual effective doses of ionising radiation to representative persons in the neighbouring countries in 2012 are indicated below (source: Annual Report on the Environmental Impacts of Nuclear Facilities at Jaslovské Bohunice Location, 2012, SE-EBO):

Austria (part of sector 167)	4.09×10^{-9} Sv/year
Czech Republic (part of sector 178)	8.74×10^{-9} Sv/ year
Hungary (part of sector 96)	5.77×10^{-9} Sv/ year

For comparison, the limit value for a total individual effective dose rate per person of a critical group for all routes of exposure from all nuclear facilities within the area is $250{,}000 \times 10^{-9}$ Sv/year (pursuant to Government Regulation No. 345/2006 Coll. on basic safety requirements for the protection of health of workers and inhabitants against ionising irradiation).

B. INFORMATION ABOUT DIRECT ENVIRONMENTAL AND HEALTH IMPACTS OF THE PROPOSED ACTIVITY

Besides the data on the designed inputs and outputs of the given activity, the chapters below also contain information about the actual values of inputs and outputs of the RAWPTT nuclear facility operation and of the A1 NPP decommissioning worksites in 2011 (and 2012), provided in the available (monitored) structure.

The designed processing capacities and volumes of processed RAW in the reference years are shown in Chapter B.I.3.

I. INPUT REQUIREMENTS

I.1. LAND

The technologies and worksites for RAW processing and treatment are located in the existing buildings of the decommissioned A1 NPP site, or in its vacant premises. Hence, the proposed activity does not require new occupation of land, i.e. land from the ALR or FLR.

I.2. WATER

The modifications of the activity do not require any ***implementation stage*** with inputs in the form of water consumption beyond normal volumes.

During the operation of RAW processing and treatment technologies in Jaslovské Bohunice, the ***drinking water*** consumption depends, for example, on the drinking and hygienic needs of the staff. The drinking water supply for employees within the Proponent´s company site is ensured by means of a drinking water distribution network owned by the Proponent. In 2011, the total drinking water consumption within the Jaslovské Bohunice site was 176,550m^3.

Additional water consumption is also tied to RAW processing and treatment works, such as:

- ✓ treatment of chemical additives, for example, during bituminisation, flushing (decontamination) of equipment, laboratory needs, etc. (demineralised water);
- ✓ cooling of the air-conditioning system, condenser, some operation tanks, flue gases from the incinerator, etc. (cooling water);
- ✓ heating of tanks with concentrates, bitumen, etc. (hot water or steam).

Cooling waters and demineralised water are supplied by the V1 NPP; hot water is supplied by means of the exchanger station (ES) of the start-up and stand-by boiler room (building 441); and steam is supplied by the V2 NPP through the exchanger station of 441 V1 NPP.

The water demands of the given technologies are shown in the table below.

Table B.I.2./01

Demands for demineralised water, steam, hot water and cooling water

Item	Worksite/Technology	Water demand			
		Deminera-lised water	Cooling water	Hot water	Steam
1.	Concentration	X	X	-	X
2	Cementation	-	X	-	-
3.	Sorting	-	-	-	-
4.	Incineration	-	X	-	X
5.	High-pressure pressing	-	-	-	-
6.	PS 44 and PS100	X	X	-	X
7.	Discontinuous BL (DBL)	X	X	-	X
8.	Waste water treatment plant (WWTP)	X	X	-	X
9.	Metallic RAW processing unit	-	-	-	-

10.	AC filter processing	-	-	-	-
11.	Large-capacity decontamination line (LCDL)	X	-	-	X
12.	Sludge fixation unit (SFU)	-	X	-	-
13.	Contaminated concrete treatment unit (CCTU)	-	-	-	-
14.	Contaminated soil sorting unit (CSSU)	-	-	-	-
15.	Sorting unit in building 44/20	-	-	-	-
16.	Equipment for the decontamination of gas-holders DEZAPLYN	X	-	-	-
17.	Concrete blocks grinding and sorting equipment	-	-	-	-
18.	Vitrification unit (VICHR)	X	X	-	X
19.	Fuel treatment unit (FTU)	X	-	-	-
20.	New draining bed (NDB)	X	-	-	-
21.	Treatment of cases from the long-term storage facility (TCLSF)	X	-	-	-
22.	Decontamination node (DN) in O-P corridor	X	-	-	-
23.	Dowtherm treatment equipment	X	-	-	-
24.	SUZA DS – sludge processing equipment	X	-	-	-
25.	Hot chamber (HC) – Handling box	-	-	-	-
26.	Unit for the fragmentation of large-size metallic RAW	-	-	-	-
27.	Fragmentation equipment FRAGIS I	-	-	-	-
28.	Decontamination equipment FRAGIS II	X	-	-	-

Note: *The steam in the DN of the "OP" corridor has meanwhile been disconnected.*

The consumption of cooling technological water within the area of the decommissioned A1 NPP, i.e. by the entire RAWPTT NPP in the reference year 2011 reached 24,742m^3. Provided that the full processing capacity of the technologies is used, a qualified estimate suggests that the consumption of cooling technological water would attain approx. 27,500m^3/year.

The consumption of demineralised water within the A1 NPP site, including RAWPTT NPP in the given year reached 5,887m^3. If the full processing capacity of the technologies is used, demineralised water consumption would reach, according to the Proponent´s qualified estimate, approx. 6,500m^3/year.

Heat consumption through steam or hot water supplies is described in Chapter IV.1.4.

Where needed, ***fire water*** will be supplied from the fire distribution system within the A1 NPP site.

I.3. RAW MATERIALS

The modification of the given activity only requires supplies of technological components for the ***implementation stage.***

At the time of operation of the set of the relevant technology, the main inputs of the facility activities are RAW aimed for processing and treatment.

The available information about the processing capacities of the given technologies and RAW amounts processed in 2011 and 2012 is provided in the table below.

Table B.I.3./01
Processing capacities of the technologies and RAW volumes processed in 2011and 2012

Item	Worksite/Technology	Annual processing capacity (designed)	Year 2011	Year 2012
1.	Concentration	750m^3	454m^3	51.3m^3
2	Cementation	1,100m^3	545m^3	672.32m^3
3.	Sorting	50t	5t	47t
4.	Incineration	240t	85t	49t
5.	High-pressure pressing	420t	254t	288t
6.	PS 44 and PS100	270m^3	270m^3	45m^3
07.	Discontinuous BL (DBL)	48m^3	0m^3	20.6m^3
8.	Waste water treatment plant (WWTP)	3,000m^3	1,586m^3	1,420m^3
9.	Metallic RAW processing unit	500t	280t	188.5t
10.	AC filter processing	15t	3t	11.5t
11.	Large-capacity decontamination line (LDL)	500t	200t	158t
12.	Sludge fixation unit (SFU)	150 barrels/year per 1 shift	263 barrels/3 shifts	205 barrels/2 shifts
13.	Contaminated concrete treatment unit (CCTU)	270t	150t	150 t
14.	Contaminated soil sorting unit (CSSU)	1,800t	450t	1,212t
15.	Sorting unit in building 44/20	approx. 5 barrels a day*	0t	0t
16.	Equipment for the	5 pcs	new equipment	3 pcs

	decontamination of gas-holders DEZAPLYN			
17.	Concrete blocks grinding and sorting equipment	-*	new equipment	430t
18.	Vitrification unit (VICHR)	3m^3	0m^3	0m^3
19.	Fuel treatment unit (FTU)	30 pcs	9 pcs CLS	12 pcs CLS
20.	New draining bed (NDB)	-*	960dm^3	0
21.	Treatment of cases from the long-term storage facility (TCLSF)	15 pcs	14 pcs CLS	10 pcs CLS
22.	Decontamination node (DN) in O-P corridor	-*	**	10 pcs of upper parts of CLS
23.	Dowtherm treatment equipment	4,000dm^3	385dm^3	500dm^3
24.	SUZA DS – sludge processing equipment	-*	2.800 kg	3,825kg
25.	Hot chamber (HC) - Handling box	-*	**	RAW handling
26.	Unit for the fragmentation of large-size metallic RAW	-*	preparatory stage	designing
27.	Fragmentation equipment FRAGIS I	-*	- Note: this equipment serves for warehousing of used devices and tools	- Note: this equipment serves for warehousing of used devices and tools
28.	Decontamination equipment FRAGIS II	-*	new equipment	0

Explanatory notes: * not strictly determined, ** observes the A1 NP decommissioning process.

In order to process them, the used technologies/worksites require inputs from other auxiliary materials and raw materials, such as chemical substances for decontamination, pH adjustment, reinforcement matrices (cement, road asphalt, SIAL, glass), packages (barrels, FCCs), fragmentation gases (acetylene, oxygen, argon), sorbents, etc. Other inputs include compressed air.

I.4. ENERGY SOURCES

The modifications of the Proponent´s activity do not require any ***implementation stage*** with energy demands beyond normal level.

The operation of the activity requires supplies of electric energy, heat energy (heat for heating purposes and for technology is supplied from the V2 NPP) and natural gas (serves as fuel for LOOS boiler to produce steam for building 809 and auxiliary fuel for the BRAWPC incinerator).

I.5. TRANSPORT AND OTHER INFRASTRUCTURE REQUIREMENTS

The modifications of the Proponent´s activity do not require any ***implementation stage*** with transport demands beyond normal level.

The road connection of the NPP site in Jaslovské Bohunice is ensured from two directions – through Jaslovské Bohunice in the direction to Trnava, and through the municipality of Žlkovce to the 1st class road Bratislava – Trenčín. The connection to the railway network is secured by a 8.1km long spur track which was originally built for the purposes of the A1 NPP, and currently serves for the entire site. The spur track is connected to the railway in the direction of Piešťany – Trnava – Bratislava, and leads to the railway station Veľké Kostoľany with a storage track for its operation. The roads serve for the transport of personnel and materials to the Proponent´s site in Jaslovské Bohunice.

The frequency of freight transport (road and rail) related to the operation of RAW processing and treatment technologies in Jaslovské Bohunice is provided in the table below.

Table B.I.5./01

Transport requirements (freight transport) in 2011

Transport	*Trucks*	*Rail wagons*
Delivery of auxiliary substances and raw materials, such as cement, lime, bitumen, chemicals, etc.	68 (contractor)	0
Delivery of packages: Barrels FCCs	 1 (contractor) 137	 17 wagons 0
Disposal of inactive waste	121 trucks	5 wagons (sale of 5 transformers)
Delivery of RAW from the nuclear facility Mochovce to Jaslovské Bohunice	1 FP LRAW operation 11 SE-EMO operation	0
Disposal of RAW from Jaslovské Bohunice to FP LRAW	1	0
Disposal of seasoned FCCs to NRAWR Mochovce	127	0

Note: RAW transport will require one truck for 40 barrels or 2 FCCs; four wagons are available for rail transport with 3 FCCs per wagon.

If the maximum processing capacity of the technology is used, a Proponent´s qualified estimate suggests an increase in the total transport requirements by approx. 120 trucks per year for the transport of raw materials, packages and waste, and by 80 transports of FCCs to the NRAWR.

With approx. 250 working days per year and with the transport requirements described above, the average frequency of freight transport in 2011 was is 1–2 trucks. In the case of a conservative estimate (i.e. planning of maximum transport requirements), the frequency would increase to approx. 2-3 trucks.

Passenger transport relates to the transport of Proponent´s employees and visitors, and the estimated frequency during working days is approx. 400 cars, yet it is not possible to determine the precise proportion of cars related to the operation of the given technology.

With regard to technical infrastructure, the RAW processing and treatment technologies linked to the RAWPTT NF and A1 NFF are connected to the existing A1 NPP technical infrastructures, such as power distribution and drinking water distribution systems, sewage and rain water sewer system, natural gas distributions.

I.6. LABOUR FORCE REQUIREMENTS

The modification of the Proponent´s activity will most probably be ensured on a contracting basis.

The ***operation*** of the facilities and worksites, including safeguarding works, such as monitoring, maintenance, etc., is ensured by approx. 270 employees. Some of them work within departments which perform works for the entire technology complex. Other employees execute their work in direct relation to the individual RAW processing and treatment worksites. Some worksites are, however, operated directly by contractors, such as CCPU and CSPU, and some safeguarding activities are also ensured on a contractual basis.

II. OUTPUT DATA

II.1. AIR

The modifications of the given activity do not require any ***implementation stage*** with outputs beyond normal levels.

II.1.1. SPOT SOURCES

The ***operation*** of the RAW processing and treatment technology in Jaslovské Bohunice is not connected to any air pollution source under the legislation on air protection in spite of the fact that BRAWPC includes a unit for RAW incineration (consensus between the competent state administration authorities). The operation of ***energy source*** - the LOOS boiler (medium sources of air pollution, gas fuel) indirectly relates to the given technology, as it generates steam for the bituminisation lines (building 809).

Table B.II.1./01

Overview of emissions of common pollutants from related energy sources (year 2011, 2012)

Sources	Year	Fuel	Pollutant (t/year)				
		Natural gas (m^3)	SP	SO_2	NO_x	CO	$C_{org.}$
LOOS boiler	2011	1,593	0.000121	0.000014	0.002362	0.000954	0.000159
	2012	11,443	0.00087	0.0001	0.01696	0.00685	0.00114

Note: In May 2012, there was an outage of steam supply from V2 NPP, as a result of which the equipment was operated to a larger extent for the purpose of steam and hot water production for RAWPTT.

Hence, the technologies are the source of only waste air extracted from the operating premises of the different worksites and conducted away through the air-conditioning system to the outlets (vent chimneys), as well as flue gases from the RAW incinerator which are also conducted away, after being treated, to one of the vent chimneys. The extracted air is contaminated with radionuclides and common pollutants (for example, VOCs can be released during bitumen handling after heating; or the environment can get dustier during cementation and handling of dusty materials; and VOCs can also be released during grinding and fragmentation of metallic RAW and concrete, etc.). Besides radionuclides, flue gases from the RAW incinerator also contain common pollutants from waste incineration which are monitored within the following scope: solid pollutants (SP), NO_x, SO_2, HCl, HF, TOC, CO, heavy metals, and PCDD/F type substances.

The table below shows the ***points of discharge of waste air*** and their volumes.

Table B.II.1./02

Discharges to the atmosphere

Discharge	Outlets of AC facilities (building no.)	Discharged air volume – designed capacity	Volume of air discharged in 2011
Chimney of building 46, Part A	28, 30, 32, 34	Total 3.8×10^5 m^3/h	Total 1.01×10^9 m^3
Chimney of building 46, Part B	809, 41	Total 1.5×10^5 m^3/h	Buildings 809 and 41: 3.72×10^8 m^3
Chimney of building 808	808, 44/10, 44/20, SFU	Total 98,600m^3/h	Total 4.88×10^8 m^3

Note: Building 46 is an iron-concrete monolithic chimney 100m high with a vent diameter of 4.25m, and divided by a vertical wall.
The chimney of building 808 is made of steel with circle cross-section of Φ2.150 mm and with the upper edge of the chimney at +40.00m above the ground.

All extracted air where an activity is assumed, as well as relevant amounts of common pollutants are filtered using optimally designed filtration equipment aimed to reduce their activity before entry to vent chimneys.

The activity of discharged air is ***monitored*** in order to balance and assess the impacts on the dose burden within the following scope:

a) Strontium ^{90}Sr
b) Radionuclides ^{54}Mn, ^{57}Co, ^{60}Co, ^{65}Zn, ^{94}Nb, ^{110m}Ag, ^{125}Sb, ^{134}Cs, ^{137}Cs, ^{144}Ce
c) Radionuclides emitting alpha radiation 238Pu, 239+240Pu, 241Am
d) Tritium.

Samples of aerosol filters are taken to analyse their activity, and the replacement of filters is performed in compliance with the relevant operating rules (15-INŠ-705).

After being supplied to the analytical laboratory, the samples of aerosol filters are divided according to their origin and required analyses as follows:

- ✓filters to determine total α and β activity;
- ✓filters for gamma spectrometry analysis;
- ✓stand-by aerosol filters from operated stand-by sampling devices.

To determine the total α and β activity, the *i*MATIC automatic measuring system of alpha/beta activity is used; the gamma spectrometry analysis is performed by means of the CANBERRA gamma spectrometry system.

The discharges of ^{3}H, ^{131}I and ^{14}C from the Proponent´s vent chimneys are not limited by the decision of the Chief Hygienist of the SR and are monitored for the purpose of complex balancing and assessment of their impacts on the critical group of the population. In order to assess the impacts of radioactive discharges on the dose burden to the population, the Chief Hygienist of the SR recommends monitoring the activity of tritium ^{3}H in gas effluents from the JAVYS vent chimneys in relation to the given operating units, and the gas form of the iodine ^{131}I radioisotope in the BRAWPC vent chimney. The Chief Hygienist of the SR proposed to monitor the activity of ^{14}C only in the vent chimneys of other ISSF and of the decommissioned V1 NPP.
The Proponent monitors tritium discharges from building 809 (venting chimney 46/B), MPB (venting chimney 46/A) and building 808.

The PHA SR defined the following guide values (***limits***) for air discharges into the atmosphere by the decommissioned units of the A1 NPP and RAWPTT (Decision No. OOZPŽ/7119/2011 of 21 October 2011):

Table B.II.1./04

Limits for discharges into atmosphere

Annual limit	***Vent chimney***		
	Building 46 A	***Building 46 B***	***Building 808***
Mixture of long-lasting nuclides under point b)	658MBq	141MBq	141MBq
^{90}Sr	19.6MBq	4.2MBq	4.2MBq
Mixture of alpha nuclides under point c)	6.16MBq	1.32MBq	1.32MBq

As mentioned above, neither a guide value nor an intervention level have been set for tritium, but only the investigation level of $3.0x10^{11}$ Bq/quarter-year which applies to any vent chimney. This is due to the fact that the given nuclear facility is not a nuclear power plant in operation with tritium discharged during nuclear processes.
The relevant Decision also specifies other investigation and intervention levels.

The ***limits for common pollutants*** and the conditions for the observance of these limits (with regard to the practice of competent authorities according to which the incinerator of radioactive waste is not a source of air pollution pursuant to the air protection legislation) are approved by the Nuclear Regulatory Authority of the SR, while the scope of monitored pollutant parameters is based on the legal requirements for air protection. The current limits prior to refurbishment (approved by NRA SR Decision No. 495/2010 of 20 December 2010) were extended by limit values for PCCD/F type of substances under NRA SR Decision No. 1130/2012 of 19 December 2012 as follows.

Table B.II.1./05

Limits for common pollutants from waste incineration

Pollutant	***Emission limit (mg/m^3)***
Solid pollutants	30
TOC	20
HCl	30
HF	2
SO_2	300
NO_x	500
CO	100
Hg, Tl, Cd total	0.2
As, Ni, Cr, Co total	1
Pb, Cu, Mn total	5
PCDD/F	$0.1ng/m^3$

Note: The limits applicable for nominal operation of the incinerator, for dry gas under standard conditions of 101.32kPa and 0îC, and with oxygen content of 11% vol in flue gases.

These limit values are considered complied with if, during a calendar year, concurrently:

– in the case of continuous measurement:
  - no 24-hour mean value may exceed the emission limit;
  - none of 97% of all half-hour mean values may exceed 1.2 multiple of the emission limit;
  - none of the half-hour mean values may exceed 2 multiple of the emission limit.

– in the case of one-time measurements:
  - the arithmetic average of individual emission values may not exceed the emission limit value;
  - all individual emission values are under or equal to 1.2 multiple of the emission limit.

With regard to the ***activity of gas effluents***, the following activities related to the relevant vent chimneys were measured.

Table B.II.1./06

Discharges into the atmosphere – RAWPTT + A1 NPP, year 2011

	Building 46 A		***Building 46 B***		***Building 808***	
	Discharge	***% of annual limit***	***Discharge***	***% of annual limit***	***Discharge***	***% of annual limit***
Air volume [m^3]	1.01E+09		3.72E+08		4.87E+08	
Strontium $^{89}Sr+^{90}Sr$ [kBq]	***53.616***	0.27	***19.592***	0.47	***57.248***	1.36
Aerosols: [MBq]						
^{51}Cr	0.124		0.0356		0.089	
^{54}Mn	0.025		0.0085		0.022	
^{59}Fe	0.037		0.0144		0.021	
^{57}Co	0.028		0.0053		0.016	
^{58}Co	0.021		0.0082		0.020	
^{60}Co	0.025		0.0092		0.024	
^{65}Zn	0.044		0.0189		0.028	
^{94}Nb	0.004		0.0007		0.002	
^{95}Nb	0.020		0.0095		0.024	
^{95}Zr	0.029		0.0117		0.017	
^{103}Ru	0.022		0.0081		0.021	
^{106}Rh	0.068		0.0131		0.033	
^{110m}Ag	0.026		0.0111		0.024	
^{124}Sb	0.020		0.0076		0.019	
^{125}Sb	0.011		0.0022		0.006	
^{134}Cs	0.024		0.0089		0.023	
^{137}Cs	0.788		0.0886		0.147	
^{141}Ce	0.023		0.0086		0.013	
^{144}Ce	0.083		0.0195		0.053	
^{55}Fe	-		-		-	

Total aerosols [MBq]	***1.419***	0.22	***0.2898***	0.21	***0.602***	0.43
Aerosols alpha: [kBq] ^{238}Pu $^{239+240}$Pu ^{241}Am	 0.666 4.566 5.938		 0.174 0.378 0.746		 0.567 0.462 0.793	
Total alpha aerosols [kBq]	***11.169***	0.18	***1.298***	0.10	***1.822***	0.14

The table and charts below illustrate the stability of outputs of the assessed activity.

Table B.II.1./07

Discharges to the atmosphere – RAWPTT + A1 NPP, year 2012

	Building 46 A		***Building 46 B***		***Building 808***	
	Discharge	***% of annual limit***	***Discharge***	***Discharge***	***% of annual limit***	***Discharge***
Air volume [m^3]	1.02E+09	-	4.43E+08	-	4.21E+08	-
Strontium $^{89}Sr+^{90}Sr$ [kBq]	***78.825***	*0.402*	***10.973***	*0.261*	***37.731***	*0.898*
Tritium ^{3}H [GBq]	*184.693*	-	*54.504*	-	*0.610*	-
Aerosols: [MBq] ^{51}Cr ^{54}Mn ^{59}Fe ^{57}Co ^{58}Co ^{60}Co ^{65}Zn ^{94}Nb ^{95}Nb ^{95}Zr ^{103}Ru ^{106}Rh ^{110m}Ag ^{124}Sb ^{125}Sb ^{134}Cs ^{137}Cs ^{141}Ce ^{144}Ce ^{55}Fe	 - 0.014 - 0.011 - 0.027 0.040 0.013 - - - - 0.019 - 0.037 0.016 1.638 - 0.035 -		 - 0.005 - 0.004 - 0.005 0.014 0.004 - - - - 0.006 - 0.013 0.005 0.065 - 0.028 -		 - 0.013 - 0.010 - 0.014 0.035 0.012 - - - - 0.015 - 0.025 0.015 0.291 - 0.084 -	
Total aerosols [MBq]	***1.850***	*0.281*	***0.150***	*0.106*	***0.515***	*0.365*

Alpha aerosols: [kBq]						
^{238}Pu	0.575		0.109		0.283	
$^{239+240}Pu$	6.573		0.172		0.291	
^{241}Am	12.035		0.573		0.433	
Total alpha aerosols [kBq]	***19.184***	*0.311*	***0.854***	*0.065*	***1.007***	*0.076*

Chart B.II.1./01

Comparison of strontium discharges with set guide values (kBq/year)

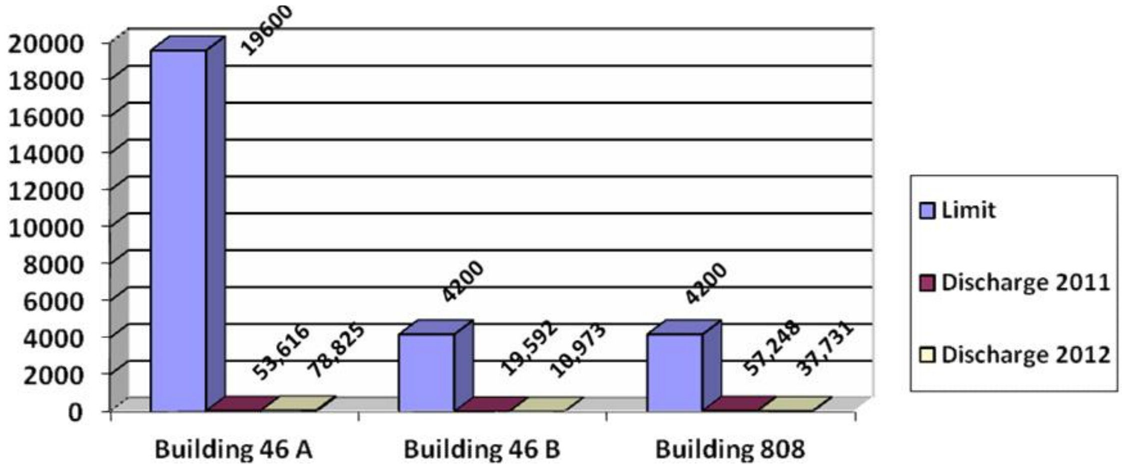


Chart B.II.1./02

Comparison of discharges of radionuclides emitting beta and gamma radiation to set guide values (MBq/year)

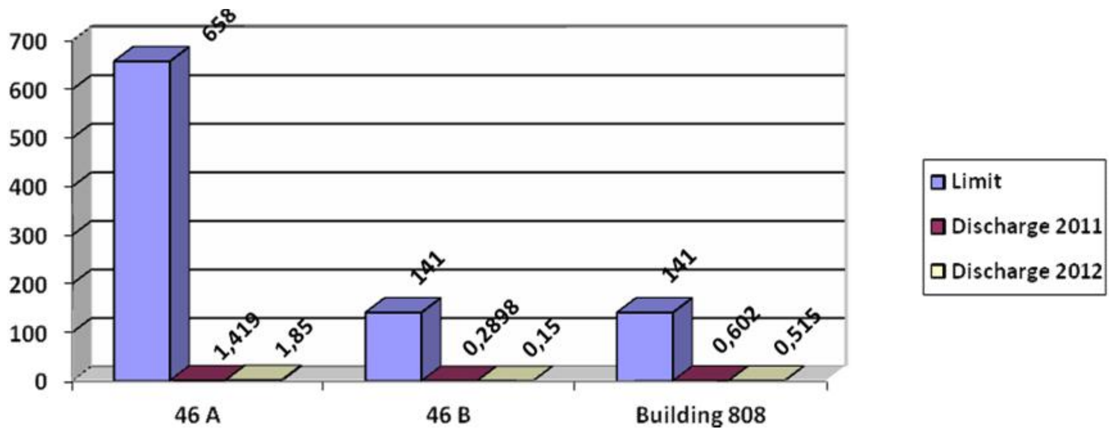
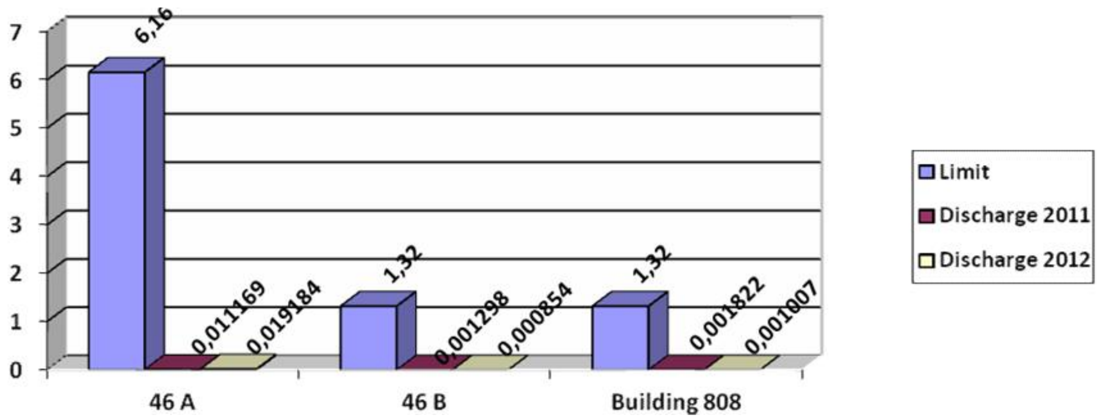


Chart B.II.1./03

Comparison of discharges of radionuclides emitting alpha radiation to set guide values (MBq/year)



The data above indicates that the gas effluents <u>meet the set limits</u> for their activity with a large margin.

With respect to the potential impact of the increased capacity of LCDL units and metallic RAW processing units which was described in detail under a separate assessment process (launch of operation planned in 2014), it can be concluded that even under a very conservative approach with an expected increase of the vent chimney´s discharge activity (building 46A) proportional to the increase in the capacity of the given units (this approach is based on the fact that all vent systems of buildings 28, 30, 32 and 34 are connected to building 46A, on the actual proportion of radionuclides, etc.) the activity of gas effluents from this vent chimney would be largely under the set limits (max. around 1% of the limit value).

With regard to the completed and approved refurbishment/innovation of the BRAWPC, no significant impacts on the activity of gas effluents from the given vent chimney (building 808) is expected due to compliance with the limits for the activity.

As far as the planned technical modification of the technologies is concerned (e.g. adding a piece of equipment for the fragmentation of large-sized metallic RAW in MPB for their further processing by RAWPTT), it can be stated that no relevant impacts on the discharges from the vent chimney (building 46A) are expected since the equipment is designed as a covered (container) unit and has its own suction and filtering system. If increased activity of gas effluents occurred under a conservative estimate, the limits related to the operation of this equipment would be largely met.

The following can be stated with regard to the emissions of ***common pollutants*** discharged from the RAW incinerator which is connected to the vent chimney of building 808.

After reconstruction, the incinerator has been in test operation since August 2013. The permit to use the facility was issued by Decision of the NRA SR No. 72/2013 which came into force and entered into effect on 24 January 2013.

Compliance with the emission limits for solid pollutants, NO_x, SO_2, HCl, HF, TOC and CO is monitored by means of the automatic monitoring system which underwent, the refurbishment, the inspection of conformity performed by the accredited measuring group EnviroTeam Slovakia, s.r.o., Košice on 16 – 22 November 2012.
Heavy metals and PCDD/F type of substances are monitored in a discontinuous way.

In the event of failure to comply with the set limits, the operating rule 10-TPP-806 BRAWPC Incinerator, approved by the NRA SR, imposes “prohibition of all works which represent the source of exceeding the set emission limits”.

The results of continuous monitoring are assessed in the form of weekly and monthly protocols sent from the operating unit to the Proponent´s Environment Protection Department which controls the evaluation of compliance with the emission limits. The data on discharged pollutants is subsequently sent to the NRA SR as the supervisory body in the form of an Environmental Report prepared by the Proponent on an annual basis.

The following table provides data on the total annual emissions in the reference year 2011, and, to have a full picture, in the year 2012.

Table B.II.1./08

Volumes of common pollutants from the BRAWPC incinerator, years 2011 and 2012

Pollutant	***Year 2011 (kg)***	***Year 2012* (kg)***
HCl	0.54	23.84
HF	0.113	0.82
Hg+Tl+Cd	0.034	0.054
As+Ni+Cr+Co	0.33	0.29
Pb+Cu+Mn	0.205	0.24
SO_2	4.05	107
NO_X	676.66	62.93
CO	57.93	17.17
Solid pollutants	5.61	3.55
TOC	12.47	11
Operating hours	4.851	2.671
Volume of incinerated liquid RAW (m^3)	*5.3*	*0.3*
Ion exchangers (m^3)		*18.06*
Volume of incinerated solid RAW (t)	*79.4*	*30.572*

*Explanatory note: * test operation August – December; the operation conditions were relatively instable with frequent start-ups and shut-downs*

With respect to the hourly mass flow of common pollutants with direct impact on the immission situation in the surroundings of the source, the results of the monitoring system suggest that the volume of flue gases is approx. 1,873Nm^3/h of dry flue gases in relation to reference oxygen (data from 2012).

During the reconstruction of the incinerator, the following flue gas properties were considered during the preparation of the Plan on the basis of the Proponent´s qualified estimate:

- Volume of dry flue-gases: from approx. 1,800 to 2,400Nm^3/h;
- Temperature: 90°C to 106°C;
- Estimated humidity: approx. 33%;
- Estimated oxygen volume: 6 to 8%.

Under the chosen conservative approach, the Proponent considered the least favourable condition at the level of emission limits defined on the basis of a qualified estimate of the volume of flue gases, their operation oxygen, etc., as shown in the table below (while regarding the conditions for fulfilment of the emission limits).

Table B.II.1./09

Amounts of pollutants from the BRAWPC incinerator – least favourable (model) situation (for flue gas flow of 2,400Nm^3/h, operation oxygen 6 vol. %)

Pollutant	**Emission limit [mgxm^{-3}]**	**Emission value applied [mgxm^{-3}]**	**Note**	**Hourly emission [kgxh^{-1}]**
Solid pollutants	30	60	None of the half-hour mean value may exceed the double amount of the set emission limit	0.22
SO_2	300	600		2.16
NO_X	500	1000		3.61
TOC	20	40		0.14
HCl	30	60		0.22
HF	2	4		0.01
CO	100	200		0.72
Hg, Tl, Cd total	0.2	0.24	All measured emission values must be under or equal to 1.2 times the set emission limit	0.000865
As, Ni, Cr, Co total	1	1.2		0.004327
Pb, Cu, Mn total	5	6		0.021636
PCDD/F	0.1ng/m^3	0.12ng/m^3		0.000433mg/h

The least favourable emission situation described above was used for the ***immission and transmission assessment of activity*** with regard to common pollutants from RAW incineration. The dispersion study was prepared for the purposes of the Assessment Report by RNDr. Gabriel Szabó (May 2013, Annex No. 6 for full wording), qualified person for immission and transmission assessment under Art. 19 of Act of the NC SR No. 137/2010 on Air.

The models of the dispersion of studied pollutants suggest that the maximum calculated values of immission concentrations for all studied pollutants occurs at a distance of approx. 400m from the chimney base, and the values exponentially decrease with a larger or smaller distance.

Specifically, it can be concluded in respect of pollutants that according to the modelling of basic pollutants dispersion the contribution of the given source is up to 2.6 µg.m^{3} in the case of maximum hourly concentration of nitrogen dioxide (NO_2), which is less than 1.3% of the limit value; and up to 9.4 µg.m^{-3} for SO_2, which is less than 3% of the limit value. The contribution to contamination with regard to CO is under 0.25% of the limit value. The maximum contribution of the source to the daily average concentration PM_{10} is maximum 0.8µg.m^{-3}, which is max. 1.6% of the limit value.

The contributions of maximum hourly concentrations of pollutants which are not basic indicators, but have a “S” value defined for determining the minimum chimney height recommended as the limit value (HF, HCl and groups of Hg, Tl, Cd and As, Ni, Cr, Co and Pb, Cu, Mn, – total) are under 2% of the relevant values, even if the strictest “S” values are applied. With regard to HF and the group of Hg, Tl, Cd, the calculated values are under 0.1% of the “S” value.

With respect to PCDD/CDF type of substances without an “S” value defined, the calculated maximum hourly concentrations reach 1.88fg.m^{-3}, which is 1.9% of the applied value recommended by WHO as a limit value.

Further to this information, the dispersion study concludes that given the structure of current sources of air pollution and the emission rate of other technologies within the area of operation of the given source, the activity does not significantly change the air pollution situation neither in the long term nor in the short term due to the operation of the activity.

Hence, the assessed activity as a source of emissions of air pollutants with its emission and technological parameters meets all legal requirements for air protection even in the worst operation and dispersion conditions (conservative approach).

The dispersion study also dealt with determining the minimum chimney height to ensure the dispersion of pollutants. Nitrogen oxides (NO_x expressed as NO_2) appeared to be the most critical substance of all emitted pollutants (critical emissions flow, considering the respective “S” values), while the minimum chimney height for NO_x expressed as NO_2 from table values is 19m for the planned mass flow, i.e. the current chimney height of 40m has been evaluated as oversized given the current needs of the incinerator.

On the basis of the results of model calculations (considering the gradual transformation of NO to NO_2) according to which the maximum hourly concentration outside of the plant area only attains 1.5% of the “S” value and limit value (i.e. the requirement for a 50% reserve is fulfilled with a large margin), it can be concluded that a chimney height of 10m would be sufficient for the purposes of the incinerator.

No limit value and “S” coefficient are defined for PCDD/F type of substances, and no such values are recommended. However, a concentration of 100 fg/m^3 for these substances is proposed by WHO as an indicative value for municipal air. The results of model calculations of dispersion for this pollutant show that the maximum hourly concentration is under 2% of this value. The chimney height is therefore appropriate.

II.1.2. DIFFUSE SOURCES

Diffuse sources related to the given activity include, for example, the handling of dusty materials during cementation, RAW grinding and fragmentation, etc. However, air from the controlled zone is, after being cleaned, extracted and released to municipal air in points (see above). Diffuse sources are therefore not considered further.

II.1.3. LINE SOURCES AND MOBILE SOURCES

In connection with the operation of the given technologies, there is a need to deliver raw materials (e.g. cement, bitumen, etc.), auxiliary substances and materials (e.g. packages) for RAW processing, and to carry away FCCs to the NRAWR and inactive waste to the respective place of designation. Such transport (for frequency see Chapter B.I.5.) is a source of common pollutants from fuel combustion in motors (mostly NO_x, SP, VOC).

II.2. WASTE WATERS

The modifications of the Proponent´s activity do not require any ***implementation stage*** with outputs beyond normal levels.

In the ***operation*** premises of the A1 NPP decommissioning technology and RAWPTT, the Proponent has a separated sewer network.

The rain water sewer system drains waters from the roofs of buildings, roads and reinforced areas within the company site. After a dosimetric control is carried out, the rain water is drained through the open Manivier channel outside of the Municipality of Žlkovice to the Dudváh river at river kilometre 10.1.

Sewage waters from JAVYS buildings are drained through the sewer system to the waste waters mechanic and biological treatment plant of V1 NPP (BIOCLAR), which is currently managed by the Proponent. Treated waste waters are drained to the SOCOMAN pipe collector.

Industrial waters which can be contaminated with oil substances are conducted to the central gravity de-oiling equipment; after cleaning, the waters are drained for treatment by clarification with additive cooling water at SE, a.s. – EBO V2.

The technological (special) sewer system is connected to the bulk tanks of the active waters treatment buildings within the adjacent area (buildings 41 and 809 for RAWPTT and A1 NPP); after treatment and control, the waste waters are drained together with sink waters, in an organised way, through the SOCOMAN pipe collector to the Váh river (river kilometre 101.8).
Waste waters from the recovery pumping of ground waters in A1 NPP are also drained to the Váh river.

Active waste waters from RAWPTT and A1 NPP decommissioning are, for example:

- ✓ used decontamination solutions,
- ✓ flushing waters,
- ✓ special sewer draining *(contaminated waste waters from floors of the operating units, condensate draining from air conduits, coolers and filters of vent systems, condensate draining from chimneys, showers, wash basins and laboratory washing tables)*,
- ✓ emergency discharge of distillates from the evaporator,
- ✓ emergency discharge of washing water (flue gas washer),
- ✓ waters collected in emergency bowls,
- ✓ emergency draining of tanks in the different workstations
- ✓ pumping of leaks,
- ✓ etc.

The collected active waste waters are treated in buildings 41 and 809 by means of evaporation and final cleaning of breed condensates at the ion exchanger filtering station (radioactive concentrates are extracted from the evaporator for bituminisation purposes).

The types of active waste waters produced at the different worksites and the points of their collection, processing and subsequent discharge in the environment, as well as volumes discharged in 2011 are provided in the table below. This table indicates that waste waters can be only discharged to the Socoman sewer from buildings 809 and 41 (and only exceptionally from building 808).

Table B.II.2./01

Active wastewaters from individual worksites and the points of their collection, processing and discharge

Item	**Worksite/ Technology**	**Type of wastewater /LRAW**	**Point of collection (building no.)**	**Point of processing (building no.)**	**Discharge in the environment m^3/year 2011**
1.	Concentration	breed condensate	808.41	41.808	-
2	Cementation	rinsing water	808	808	-
3.	Sorting	-	-	-	-
4.	Incineration	washing liquid	808	808	-

5.	High-pressure pressing	-	-	-	-
6.	PS 44 and PS100	breed condensate, sorbent, heating steam condensate	809	809.41	1,663.5
7.	Discontinuous BL (DBL)	breed condensate, liquid phase	809	809.41	-
8.	Waste water treatment plant (WWTP)	- breed condensate, sorbent, - heating steam condensate	41 41	41 809	0 4,268.7
9.	Metallic RAW processing unit*	-	-	-	-
10.	AC filter processing	-	-	-	-
11.	Large-capacity decontamination line (LCDL)*	decontamination solution	34	809.41	-
12.	Sludge fixation unit (SFU)	rinsing water	SLU	SLU	-
13.	Contaminated concrete treatment unit (CCTU)	-	-	-	-
14.	Contaminated soil sorting unit (CSSU)	-	-	-	-
15.	Sorting unit in building 44/20	-	-	-	-
16.	Equipment for the decontamination of gas-holders DEZAPLYN	used decontamination solution, rinsing water	28	809	-
17.	Concrete blocks grinding and sorting equipment	-	-	-	-
18.	Vitrification unit (VICHR)	breed condensate	30	809.41	-
19.	Fuel treatment unit (FTU)	-	-	-	-

20.	New draining bed (NDB)	rinsing water	30	Building 30 (handling storage tank)	-
21.	Treatment of cases from the long-term storage facility (TCLSF)	rinsing water, decontamination solutions	30	809	-
22.	Decontamination node (DN) in O-P corridor	decontamination solution RA sludge	30 30	809.41 808	-
23.	Dowtherm treatment equipment	rinsing water	30	809	-
24.	SUZA DS – sludge processing equipment	rinsing water	30	809	-
25.	Hot chamber (HC) – Handling box	-	-	-	-
26.	Unit for the fragmentation of large-size metallic RAW	used decontamination solutions	at the point of operation – mobile device	809.41	-
27.	Fragmentation equipment FRAGIS I	-	-	-	-
28.	Decontamination equipment FRAGIS II	used decontamination solutions	at the point of operation – mobile device	809.41	-

Explanatory notes: building 808 – BRAWPC, building 809 – BL and DBL, building 41 – WWTP, building 30 – main reactor of A1 NPP, building 28 – gas management building

In 2011, the following volumes of waste waters were discharged from all of Proponent´s facilities in Jaslovské Bohunice:

Váh	961,117m^3
Dudváh	315,360m^3

Of these waters, the volume of technological waste waters from the RAWPTT (i.e. buildings 809 and 41) discharged through the SOCOMAN sewer system to the Váh River was 5,932m^3 (see table above). In case the full processing capacity of the technology is used, a qualified estimate suggests a production of approx. 10,500m^3/year of waste waters.

Also waters from recovery pumping of ground waters from drill N-3 at A1 NPP are drained to the SOCOMAN system, and their volume was 189.645m^3 in 2011.

The characteristic features of these waters and their comparison with the limits defined in the discharge permit issued by the Regional Environmental Office Trnava are provided in the following tables.

Table B.II.2./02

Average concentration of chemical pollutants discharged to the recipient VÁH, year 2011, 2012

Chemical indicators of pollution (mg/l)	Average concentration of discharged pollutants (mg/l) Year 2011	Average concentration of discharged pollutants (mg/l) Year 2012	Maximum allowed concentration (Decision of REO - 1/2006/00273/Fr)
Acidity, alkalinity – pH	7.819	7.734	9.00
Biochem. oxygen consumption - BOC_5	4.558	2.935	8.00
Chemical oxygen consumption – $ChOC_{Cr}$	11.458	10.847	30.00
Insoluble substances – IS	14.167	14.667	20.00
Soluble substances – SS	376.333	390.750	1,000.00
Ammonia – $N\text{-}NH_4^+$	1.387	1.217	4.00
Nitrates – NO_3^-	17.886	20.885	50.00
Sulphates – SO_4^{2-}	31.504	27.958	150.00
Chlorides – Cl^-	20.478	24.126	100.00
Non-polar extracted substances – NES	0.035	0.027	0.35
Total phosphates – $P_{total.}$	0.456	0.479	2.00
Iron – Fe	0.161	0.109	2.00
Hydrazine hydrate - N_2H_4	0.000	0.000	N/A
Detergents – PAL	0.051	0.049	0.50

Table B.II.2./03

Average concentration of chemical pollutants discharged to the recipient DUDVÁH, year 2011, 2012

Chemical indicators of pollution (mg/l)	Average concentration of discharged pollutants (mg/l) Year 2011	Average concentration of discharged pollutants (mg/l) Year 2012	Maximum allowed concentration (decision of REO - 1/2006/00273/Fr) (mg/l)
Acidity, alkalinity – pH	8.445	8.3083	9.00
Chemical oxygen consumption – $ChOC_{Cr}$	13.917	16.5000	30.00
Insoluble substances – IS	16.667	17.1667	40.00
Soluble substances – SS	368.833	308.000	1,000.00
Sulphates – SO_4^{2-}	78.550	62.008	150.00
Chlorides – Cl^-	21.142	20.306	100.00
Non-polar extracted substances – NES	0.033	0.022	0.35
Total phosphates – $P_{total.}$	0.292	0.185	2.00
Iron – Fe	0.366	0.260	2.00
Hydrazine hydrate – N_2H_4	<0.020*	<0.020*	2.00

*Explanatory note: * The value of the N_2H_4 indicator is under the detection level of the measuring device by means of atomic emission spectrometry with induction bound plasma. At present, N_2H_4 is not discharged in waste waters, and has not been used by JAVYS, a. s. since the 2nd half-year 2010.*

NOTE:

During the internal comments procedure related to the document, the District Office in Trnava, Department of Environment Protection, issued a new Decision No. OU-TT-OSŽP2-2013/00026/Gl effective since 11 November 2013 on permitting the discharge of waste waters and waters from surface draining, changing the conditions of discharge of rain waste waters to the Dudváh recipient, as a result of which it is currently without volume limits and quality limits. The quality and volume requirements will refer to waters drained to the Dudváh recipient only in case also sewage, technological or low activity waters are also discharged due to a shutdown or failure.

In order to monitor and evaluate the dose burden, the Proponent is obliged to monitor the following indicators in the case of discharges to the hydrosphere under PHA SR Decision No. OOZPŽ/7119/2011 of 21 October 2011:

i. 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
ii. Strontium ^{90}Sr
iii. Radionuclides emitting alpha radiation ^{238}Pu, $^{239+240}Pu$, ^{241}Am

The PHA SR decision sets the following guide values (limits) for:

Váh river

- ✓ Tritium
  annually $1.0x10^{13}$ Bq, quarterly $2.5x10^{12}$ Bq
- ✓ Other fissile and corrosive products
  annually $1.2x10^{10}$ Bq, quarterly $3.0x10^{9}$ Bq

Dudváh river

a) Tritium
annually $3.7x10^{10}$ Bq, quarterly $9.25x10^{9}$ Bq
b) Other fissile and corrosive products
annually $1.2x10^{8}$ Bq, quarterly $3.0x10^{7}$ Bq

The discharges in 2011 and their activity are shown in the table below.

Table B.II.2./04

Discharges to the hydrosphere, RAWPTC + A1 NPP, year 2011

Type of discharge	*Váh recipient*		*Dudváh recipient*	
	Discharge	*% of annual limit*	*Discharge*	*% of annual limit*
Water volume (m^3)	195,577		66	
Gamma spectrometry analysis (MBq)				
^{51}Cr	0.695		0.006	
^{54}Mn	0.960		0.008	
^{55}Fe	-		-	
^{59}Fe	1.816		0.016	
^{57}Co	0.639		0.005	
^{58}Co	0.861		0.007	
^{60}Co	1.194		0.011	
^{65}Zn	2.619		0.025	
^{95}Zr	1.508		0.013	
^{94}Nb	0.08		0.001	
^{95}Nb	0.893		0.008	
^{103}Ru	0.879		0.007	
^{106}Rh	7.729		0.070	
^{110m}Ag	1.338		0.013	
^{124}Sb	0.829		0.007	
^{125}Sb	0.243		0.004	
^{131}I	1.108		0.009	
^{134}Cs	0.992		0.008	
^{137}Cs	16.626		0.023	
^{141}Ce	1.132		0.009	
^{144}Ce	5.039		0.040	
Total (MBq)	**47.1802**		**0.290**	
Remediation pumping (MBq)	5.224		0	
Alpha spectrometry				

analysis ^{238}Pu $^{239+240}$Pu ^{241}Am **Total (MBq)**	 0.036 0.037 0.029 **0.102**		 **0**	
^{89}Sr+ ^{90}Sr (MBq)	**2.926**		**0**	
Corrosive and fissile products (MBq)	**55.4322**	0.46	**0.290**	0.242
Tritium ^{3}H (GBq)	**346.42**	3.46	**1.740**	0.005

The stability of outputs of the assessed activity is illustrated in the tables and charts below.

Table B.II.2./05

Discharges to the hydrosphere, RAWPTT + A1 NPP, year 2012

Type of discharge	***Váh recipient***		***Dudváh recipient***	
	Discharge	***% of annual limit***	***Discharge***	***% of annual limit***
Water volume (m^{3})	201,600		63	
Gamma spectrometry analysis (MBq) ^{51}Cr ^{54}Mn ^{55}Fe ^{59}Fe ^{57}Co ^{58}Co ^{60}Co ^{65}Zn ^{95}Zr ^{94}Nb ^{95}Nb ^{103}Ru ^{106}Rh ^{110m}Ag ^{124}Sb ^{125}Sb ^{131}I ^{134}Cs ^{137}Cs ^{141}Ce ^{144}Ce **Total (MBq)**	 - 0.403 - - 0.218 - 0.515 1.049 - 0.382 - - - 0.556 - 1.112 - 0.395 10.511 - 1.269 **16.410**		 - 0.007 - - 0.002 - 0.007 0.017 - 0.007 - - - 0.009 - 0.017 - 0.007 0.050 - 0.020 **0.143**	
Remediation pumping (^{60}Co) (MBq)	5.103		0	
Alpha spectrometry analysis ^{238}Pu $^{239+240}$Pu ^{241}Am	 0.0378 0.0425 0.0357		 0.00001 0.00001 0.00001	

Total (MBq)	**0.116**		**0.00004**	
^{90}Sr (MBq)	**1.412**		**0.019**	
Corrosive and fissile products (MBq)	**23.041**	0.19	**0.162**	0.135
Tritium ^{3}H (GBq)	**228.90**	2.29	**0.693**	0.002

Note: The difference in the monitored radionuclides compared to 2011 is the result of changes in the extent of monitoring under Decision of the PHA SR No. OOZPŽ/7119/2011; the limit values defined in this decisions were used to assess compliance with the limits in both years.
In 2011 and 2012, extremely low activity surface (rain) waters were discharged to the Dudváh river under the programme PRG-82/5110/A1/2009 "Programme for the extraction, sorting and treatment of waste from pool 38/3 in building 38" – this activity has been completed.

Chart B.II.2./01

Comparison of discharges to the current limits – tritium (GBq/year)

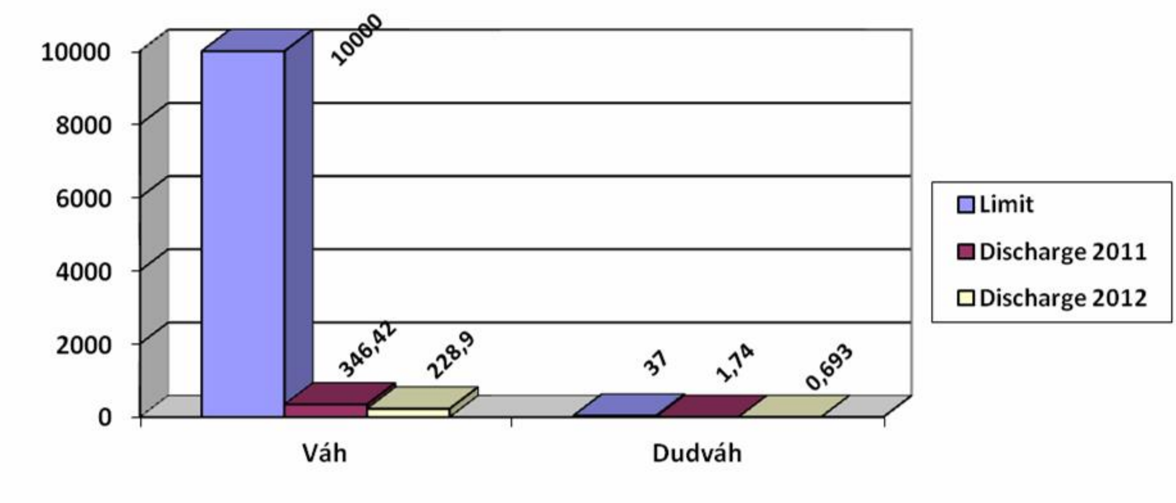
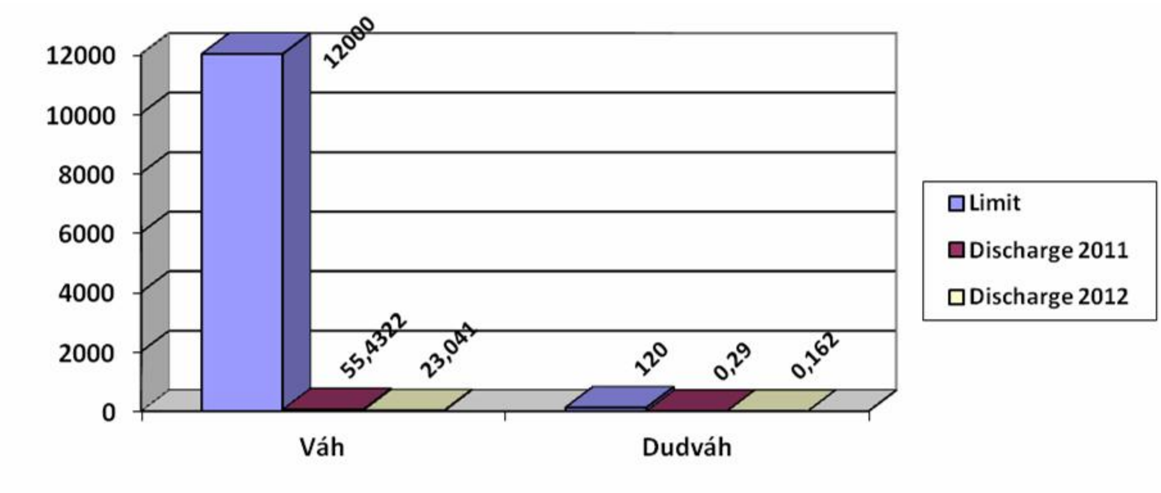


Chart B.II.2./02

Comparison of discharges to the current limits – corrosive and fissile products (MBq/year)



This data suggests that liquid discharges meet the set limits (guide limits for activity) with a large margin.
With regard to the potential impacts of increased capacity of the LCDL worksites and the processing of metallic RAW which was discussed in detail under a separate process of assessment (planned launch of operation in 2014), it can be concluded that not even under a very conservative approach assuming increased activity of discharges to the hydrosphere (Váh recipient) proportional to the increase of the capacity of the given worksites (this approach is based on the fact that these discharges include all liquid discharges from the RAWPTT and A1 NPP worksites, on the actual proportion of radionuclides, etc.), the activity of liquid discharges to this recipient would be under the set limit with a large margin (less than 10% of the limit value).
With regard to the completed and approved reconstruction/innovation of the BRAWPC, no major impact on the activity of related liquid discharges is expected, since the limits of activity for waste and the worksites´ processing capacity are complied with.
As concerns technical modifications of the given technologies (e.g. addition of equipment for the fragmentation of large-sized metallic RAW in MPB for further processing by the RAWPTT), no relevant impacts on liquid discharges of the assessed activity are expected. If increased activity of liquid discharges was considered under a conservative estimate, the limits for the operation of these technologies would be met with a large margin.

<u>The activity of discharged waters</u> is controlled as follows:

- ✓ Waters from building 41

All waters discharged from building 41 in real time are jointly monitored for volume gamma activity. Blowdown water drained to the SOCOMAN is continuously measured for total gamma activity by MR 100 before leaving building 809 or 41. This device continuously evaluates and records the measured activity values. When the set limit value of the activity is exceeded, the respective fitting is automatically closed and blocked, resulting in the shutdown of all outlets from building 41 to the SOCOMAN system. Besides continuous measurement, the MR 100 monitors continuously take samples of discharged waters once in 24 hours. The sampling is ensured by shift technicians of radiation safety, and the measurement and analysis of samples is performed in radio-chemical laboratories.

- ✓ Waters from building 809

In room 003 in building 809, water samples are taken from the pipeline by MR 100 monitoring device the operation of which is described with connection with building 41.

- ✓ Waters from recovery pumping

During the recovery pumping of ground waters, samples of the pumped water are regularly taken in line with the “Monitoring Programme for Standard Operation of Recovery Pumping of Ground Waters in Building 106”. The next control follows the last point.

- ✓ Waters from the main production block (MPB)

This is cooling water of the inserted cooling circuit and condensate of the heating steam from the VICHR line. These waters are monitored at the confluence of all discharged waters; see last point.

- ✓ Control of discharged waters leaving the A1 NPP site

All waters discharged above are monitored within the A1 NPP site by two identical MR 100 type of devices. The devices are installed in room 005 in building 809, and besides the signalling of increased levels they automatically close and block the respective fitting M-214 (building 590/ V1 site).

For the sake of completeness, it should be noted that the discharged waters are monitored jointly with waters from the V1 NPP in the measuring facility P 368 by MR 100 device before being drained to the SOCOMAN.

It should also be added that the waters discharged through the storm sewer are monitored, before being discharged to the Manivier, by the waste waters control station WWCS (building 880) which is also equipped with the MR 100 device.

With regard to the draining regime, waste waters can be classified, according to activity monitoring, as follows:

- ✓ <u>Continuously discharged waters</u> – used cooling water and water from recovery pumping of ground waters.

  The start of draining is not documented by a draining protocol or analysis protocol. As noted above, the draining is ensured by continuous measurement of the volume activity and, in the case of increased activity, it is closed and blocked by automatic closing of the fitting before entering the V1 NPP sewer system.

- ✓ Discontinuously discharged waters – water collected in storage tanks (treated breed condensate, heating steam condensate, water from collection wells, etc.).

  Again, as noted above, a representative sample is taken before discharging such waters, the required analyses are performed, and a protocol on water discharge is issued by means of the computer network (ARSOZ application). The protocol indicates the tank number and the water volume aimed to be discharged. The results of the analyses are recorded by the competent laboratory worker an in the laboratory log, and the protocol on water discharge is completed with data on the volume activity β, γ and tritium. In case the volume activity of corrosive and fissile products is under $37 Bq/dm^3$, the applicant for water discharge must indicate in the protocol the requested water flow rate upon discharge and the required dilution if the tritium value exceeds $1.95x10^5$ Bq/dm^3.

The concentrations of common pollutants in discharged waters in the Proponent´s operating units are continuously measured in building 368 for waters discharged by the SOCOMAN sewer system to the Váh river, and in building 900 for waters discharged from retention tanks to which the storm sewer is connected – Dudváh recipient. The monitored indicators include pH, conductivity, flow-rate, silt content, chemical consumption of oxygen, NO_3 and non-polar extracted substances. The other indicators of common pollution are monitored by means of accredited sampling and analyses in compliance with the relevant decisions.

II.3. WASTE

The modifications of the Proponent´s activity do not require any ***implementation stage*** with outputs beyond normal values.

The RAWPTT ***facility*** and A1 NPP decommissioning are the source of ***common*** (inactive) operation ***waste*** in reasonable amounts, such as mixed municipal waste (200301, O), various packaging materials (e.g. mixed packages 150106, O, plastic packages PET 150102, O, paper and cardboards 150101, O, packages containing dangerous substances, 150110, N), waste from administrative activities (e.g. waste cartridge 80317, N), waste from the maintenance of equipment and spaces (e.g. absorbents, filtration materials, cloths containing dangerous substances, 150202, N), etc. All waste is handled in compliance with the relevant legislation with an emphasis on the prevention of its production and on recycling wherever possible. The table below shows its estimated production in 2011 (it is not always possible to define the exact proportion of waste from the given technologies in the total amount of waste produced by the Proponent).

Table B.II.3./01

Production of inactive waste, year 2011

Catalogue no.	*Waste*	*Category*	*Amount (in t/year)*
080317	Waste printing toner containing dangerous substances	N	0.205
080409	Waste adhesives and sealants containing organic solvents or other dangerous substances	N	0.265
090104	Fixer solutions	N	0.190
130502	Sludges from oil/water separators	N	4.080
130802	Other emulsions	N	0.275
150110	Packaging containing residues of or contaminated by dangerous substances	N	0.850
150202	Absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by dangerous substance	N	0.065
160213	Discarded equipment containing hazardous components other than those mentioned in 16 02 09 to 16 02 12	N	0.335 (monitor)*
160213	Discarded equipment containing hazardous components other than those mentioned in 16 02 09 to 16 02 12	N	0.155 (fluorescent lamps)**
160506	Laboratory chemicals, consisting of or containing dangerous substances, including mixtures of laboratory chemicals	N	0.295
160601	Lead batteries	N	1.270
170503	Soil and stones containing dangerous substances	N	0.570
180108	Cytotoxic and cytostatic medicines	N	0.007
Subtotal			8.562
150101	Paper and cardboard packaging	O	0.840
150102	Plastic packaging	O	0.390
150106	Mixed packaging	O	0.585
160214	Discarded equipment other than those mentioned in 16 02 09 to 16 02 13	O	4.080
170101	Concrete	O	534.843
170401	Copper, bronze, brass	O	0.3208
170402	Aluminium	O	0.275
170407	Mixed metals	O	120.640
170411	Cables other than those mentioned in 17 04 10	O	1.525
170604	Insulation materials other than those mentioned in 17 06 01 and 17 06 03	O	27.715
170904	Mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17	O	2.500

	09 03		
200301	Mixed municipal waste	O	32.874
Subtotal			726.5878
Total			***735.1498***

*Note: Pursuant to Annex No. 1 to Decree of the MoE SR No. 315/2010 Coll. on the Treatment of Electric Equipment and Electric Waste, this kind of waste is classified as *category 3: Information technology and telecommunication equipment, **category 5: Lighting devices.*

In case the full processing capacity of the technology is used, the Proponent´s qualified estimate assumes production of approx. 965.5 t/year of such inactive waste.

Specific waste arising as a result of the proposed activity is ***radioactive waste,*** or waste materials contaminated by radioactive substances. Waste produced in direct relation with the performed activities as secondary waste include, for example: protective tools, air-conditioning filters, saturated sorbents (ion exchangers), saturated decontamination solutions, blaster fillers, worn out cutting and grinding materials, and active coal; all such waste is processed and treated by the RAWPTT NF.
These materials are handled by the RAWPTT operation units depending on their properties. In general, the following can be stated concerning the treatment of RAW: secondary solid radioactive waste is sorted directly in the operation units, taking into account the possibilities of its further processing, as:

- ✓ solid combustible RAW,
- ✓ solid pressable RAW,
- ✓ solid non-combustible and non-pressable RAW.

II.4. NOISE AND VIBRATIONS

The modifications of the Proponent´s activity do not require any ***implementation stage*** with outputs beyond normal levels.

The sources of noise from RAWPTT ***operation*** and A1 NPP decommissioning include various types of technological equipment, such as pumps, mixers, defragmentation equipment, air-conditioning, etc. All these pieces of equipment are installed within the internal, closed premises of the building. With regard to the external area, the relevant source of noise is the air-conditioning outlet to the vent chimney.
In connection with the external area, the relevant source of noise also includes freight transport within and outside the site with irregular frequency, operating exclusively during day hours on working days (see Chapter B.I.5.).

Pursuant to Decree of the MoH SR No. 549/2007 Coll. laying down the details of admissible levels of noise, infra-sound and vibrations and the requirements for the objectivisation of noise, infra-sound and vibrations in the environment (as amended), the maximum admissible noise level Laq,p for the Proponent´s site as area of category IV is 70dB during day, evening and night hours.

The generation of vibrations of appropriate intensity is also related to some technological equipment (e.g. sliding devices for FCCs, etc. with occurrence within its immediate vicinity), and to traffic in the facility surroundings (using freight cars with a semi-trailer).

II.5. RADIATION AND OTHER PHYSICAL FIELDS

RAWPTT and the A1 NPP decommissioning technology serve for the processing and treatment of RAW that contains various radionuclides with various activities (for more details see Chapter A.II.8.). As a result of these activities, the technology is the source of waste air and waste waters containing RAS released to the environment (for more details see Chapters B.II.1. and B.II.2.). Materials from the decommissioning are also released to the environment, and their activity allows such release (e.g. soils, concrete, metallic waste, etc.).

The A1 NPP premises and surroundings, including RAWPTT, are under the impact of ionising radiation.

In general, radiation protection of the population is regulated by Government Regulation No. 345/2006 on the protection of health of workers and citizens against ionising radiation, per which the limit value of individual effective dose per person from a critical group, together for all irradiation routes of exposure from all nuclear facilities within the location may not exceed 250 μSv/year.

For the RAWPTT facility and A1 NPP decommissioning (including interim storage facility for spent fuels), the PHA SR stipulated, by Decision No. OOZPŽ/7119/2011 of 21 October 2011, the requirement to ensure that “the effective dose caused by RAS released into the air and surface water for a representative person of the population” does not exceed the basic limit value of 12μSv/year (i.e. $12\text{x}10^{-6}$Sv/year).

For the reference year 2011, the ESTE AI programme, version 3.30 (with updated demographic and agricultural data as of October 2011) identified for all Proponent´s facilities within the site, on the basis of actual meteorological measurements and actual discharges, the uninhabited sector 1 north from the Proponent´s site as the sector with highest calculated impacts, where the age category of 2-12 years can be considered as the potential critical group. The calculated total effective dose and exposure by all considered routes would be 7.01E-08 Sv. Sector 76 (Ratkovce, Žlkovce) has been identified as the inhabited sector with the maximum total effective dose, where the age category of 2–12 years has been identified as a critical group. The calculated total effective dose in this category per representative person is $4.14\text{x}10^{-8}$Sv/year. These values are several orders of magnitude lower than the basic limit value for the given part of the Proponent´s facilities within the site.

For illustration, the highest individual effective dose (for all Proponent´s facilities within the site) in 2012 was calculated for the uninhabited sector 1 (north from the JAVYS site) where the age category of 2 – 7 years would be the potential critical group, while the calculated total effective dose for all irradiation routes would be $6.63\text{x}10^{-8}$Sv/year. With regard to inhabited sectors, the highest individual effective dose was identified in sector 76 (Ratkovce, Žlkovce), where the age category of 2 – 7 years was defined as a critical group and the calculated total effective dose for all routes of irradiation to a representative person was 3.98×10^{-8} Sv/year.

With regard to the potential impacts of increased capacity of the LCDL worksites and the processing of metallic RAW which was discussed in detail under a separate process of assessment (planned launch of operation in 2014), it can be concluded that not even under a very conservative approach assuming increased activity of discharges to the hydrosphere (Váh recipient) and atmosphere proportional to the increase of the capacity of the given worksites (this approach is based on the fact that these discharges include all liquid discharges from the RAWPTT and A1 NPP worksites, on the actual proportion of radionuclides, etc.), the individual effective dose for a person from a critical group would be under the set limit with a large margin (values several orders of magnitude lower).

With regard to the completed and approved reconstruction/innovation of the BRAWPC, no major impact on the individual effective dose generated by the operation is expected, as the limits of activity for waste and the processing capacity of the worksites are complied with. The same applies to the planned modification of the activity by installing equipment for the fragmentation of large-sized metallic RAW in the MPB for their further processing at the RAWPTT.

The following can be said to get a picture of the radiation burden of the population with regard to discharges at the level of set activity limits:
An update of the Pre-Operation Safety Report for the RAWPTT is currently at the stage of approval. For the purposes of safety analyses, the report also defines the individual effective dose for normal operation of the NF under the conservative approach (i.e. for limit activities of discharges under the NRA SR Decision /see Chapters B.II.1 and B.II.2./)

Table B.II.5./01

Values of gas discharges from the venting chimneys of buildings within the JAVYS (buildings 46, 808, 809) area per calendar year *(calculated per limit values on the basis of actually measured values in 2007)*

Nuclide	Discharge [Bq/year]	Nuclide	Discharge [Bq/year]
Cr-51	3.820E+07	**Ru-103**	4.550E+06
Mn-54	2.780E+06	**Ag-110m**	4.380E+06
Co-57	2.220E+06	**Sb-124**	3.520E+06
Co-58	3.070E+06	**Cs-134**	3.160E+06
Co-60	8.440E+06	**Cs-137**	8.200E+08
Fe-59	6.880E+06	**Ce-141**	5.450E+06
Zn-65	7.190E+06	**Ce-144**	1.720E+07
Sr-89	6.420E+06	**Pu-238**	2.150E+06

Sr-90	2.160E+07	**Pu-239**	3.170E+06
Zr-95	5.480E+06	**Am-241**	3.490E+06
Nb-95	3.770E+06	**Total**	9.731E+08

Note: All discharges to the atmosphere were calculated for the venting chimney of the BRAWPC.

Table B.II.5./02

Values of limit discharges from JAVYS area per calendar year *(calculated per limit values on the basis of actually measured values in 2007)*

Nuclide	Discharge [Bq/year] Dudváh	Discharge [Bq/year] Váh
H-3	3.700E+10	1.000E+13
Cr-51	1.730E+06	1.730E+08
Mn-54	2.460E+06	2.460E+08
Co-57	1.370E+06	1.370E+08
Co-58	2.370E+06	2.370E+08
Co-60	8.580E+06	8.580E+08
Fe-59	5.200E+06	5.200E+08
Zn-65	6.210E+06	6.210E+08
Sr-89	0.000E+00	0.000E+00
Sr-90	1.300E+07	1.300E+09
Zr-95	4.290E+06	4.290E+08
Nb-95	2.460E+06	2.460E+08
Ru-103	2.190E+06	2.190E+08
Ag-110m	3.470E+06	3.470E+08
Sb-124	2.100E+06	2.100E+08
I-131	2.280E+06	2.280E+08
Cs-134	2.190E+06	2.190E+08
Cs-137	1.870E+07	1.870E+09
Ce-141	2.460E+06	2.460E+08
Ce-144	1.040E+07	1.040E+09
Pu-238	1.010E+07	1.010E+09
Pu-239	7.030E+06	7.030E+08
Am-241	1.140E+07	1.140E+09
Total less tritium	**1.200E+08**	**1.200E+10**

The effective doses for the population were calculated by means of the RDEBO programme system with innovated databases. The highest values of individual effective doses (ID) from the atmosphere (9.80×10^{-8} Sv) were calculated for the age group of adults (critical age group) in the uninhabited zone 73, i.e. in south-east direction at a distance of 500m from the SE-EBO, and in the inhabited zone 63 (3.27×10^{-8}Sv) in east-south-east direction at a distance of 2 to 3km (at the border of the hygienic protection zone). The calculated ID is mostly due to the nuclides: ^{137}Cs, ^{90}Sr, ^{239}Pu a ^{241}Am, and the internal irradiation from inhalation and ingestion is crucial in this regard.

The highest values of individual effective doses from the hydrosphere – from limit discharges to the Váh river (4.31×10^{-6} Sv) were calculated for the age group of adults in zone 92 in south-east direction at a distance of 15–20km – at the outlet of the SOCOMAN sewer system to the Váh river. The highest values of individual effective doses from limit discharges to the Dudváh river (6.47×10^{-6} Sv) were calculated in zone 89 in south-south-east direction at a distance of 5 to 7km- at the outlet of the Manivier channel to the Dudváh river. Nuclides ^{238}Pu and ^{239}Pu contribute to the largest extent to the calculated ID for adults; for other age groups it is nuclides ^{60}Co and ^{90}Sr; the ingestion of fish is the main route of exposure for adults, and for other age groups it is stay on sediments and ingestion of drinking water and food contaminated by irrigation.

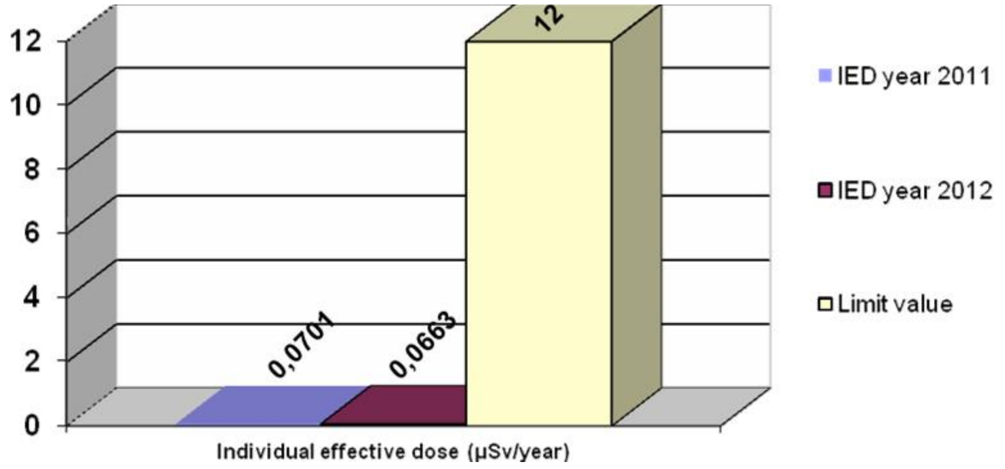
The highest values of individual effective doses of 4.31×10^{-6} Sv from limit discharges to the atmosphere and hydrosphere – Váh river – were calculated for the age group of adults in zone 104 in south direction at a distance of 15–20km. The highest values of individual effective doses of 6.47×10^{-6}Sv from limit discharges to the atmosphere and hydrosphere – Dudváh river – were calculated for the age group of adults in zone 89 in south-south-east direction at a distance of 5 to 7km at the outlet of the Manivier channel to Dudváh river. Nuclides ^{238}Pu and ^{239}Pu contribute to the largest extent to the calculated ID for adults; for other age groups it is nuclides ^{60}Co and ^{90}Sr; the ingestion of fish is the main route of exposure for adults, and for other age groups it is stay on sediments and ingestion of drinking water and food contaminated by irrigation. The main route of exposure is from the hydrosphere.

Hence, it can be stated that the <u>maximum individual doses of 6.5µSv is lower than the criterion for limit discharges</u> from the nuclear facilities A1 NPP, RAWPTT and ISSF, i.e. 12µSv.

The chart below provides a comparison of the actual individual effective dose generated by the operation of the Proponent´s equipment in 2011 and 2012 with a limit set by the PHA SR for the given technologies (including ISSF).

Chart B.II.5./01

Comparison of annual individual effective doses from the Proponent´s NF to the limits defined for the given technologies



The radiation control of employees is also governed by Government Regulation No. 345/2006 Coll. on basic safety requirements for the protection of health of workers and citizens against ionising radiation.

Pursuant to Art. 11, par. 1 of this Decree, the limits for the irradiation of workers are as follows:

a) effective dose of 100mSv during five consequent calendar years, while the effective dose may not exceed 50mSv in any calendar year;
b) equivalent dose for the lens of the eye of 150 mSv per calendar year;
c) equivalent dose for skin of 500mSv in a calendar year, determined as the average dose at an area of one cm^2 of the most irradiated skin irrespective of the size of the irradiated skin area;
d) equivalent dose for hand-arms from fingers up to the forearm, and for legs from feet up to ankles of 500mSv in a calendar year.

For illustration, the maximum annual individual doses from external exposure within the controlled zone of the A1 NPP and RAWPTT in the reference year 2011 were as follows:

- JAVYS worker – 10.485mSv;
- contractor´s worker – 10.698mSv.

Besides what has been indicated above, the given activity does not constitute a relevant source of any other irradiation or physical field.

II.6. ODOUR AND OTHER OUTPUTS

The A1 NPP decommissioning technology and RAWPTT do not represent a relevant source of pollutant discharges into the municipal environment that would change the odour conditions in the surroundings.

The technology does not represent a source of heat emissions into the external environment beyond normal levels.

II.7. ADDITIONAL DATA

The activity has already been present in the affected location for a longer period of time, and operation thereof (including in relation to the planned adjustments) do not require any landscape interventions.

C. FULL DESCRIPTION AND ASSESSMENT OF ENVIRONMENTAL AND HEALTH IMPACTS

Note:
The relevant investigation levels form the basis for the assessment of the level of contamination of the individual environmental components within the given territory by radionuclides and of the level of present ionising radiation in this chapter.

II.1. GEOMORPHOLOGICAL CONDITIONS

The affected area and the major part of the affected region form part (Mazúr, Lukniš in *Atlas krajiny SR*, 2002) the Alpine-Himalayan system, Pannonian Basin subsystem, Western Pannonian Basin province, Little Hungarian Plain, Danubian Lowland region, Danubian Hills unit, Trnava Hills sub-unit and Trnava Table part. The affected area also touches another part of the Trnava Hills – the Little Carpathian Hills (north-west) and the subunit Lower Váh River Plain, Dudváh Wetland part (south-east).

II.2. GEOLOGICAL CONDITIONS

GEOLOGICAL STRUCTURE

From the geological aspect, the assessed area is located in the northern foreland of the Danube basin, in the Blatno depression. The Blatno depression is a tertiary sedimentary basin because its filler is dominated by tertiary sediments of sea origin. The quaternary cover consists of humid clays and loess loam (Trnava Loess Table), as well as alluvial clays and terraces along the Váh river.

ENGINEERING-GEOLOGICAL CONDITIONS

The engineering-geological conditions are characterised as simple:

0.0 – 1.5m	Anthropogenic sediments
(1.5 – 2.4m)	Residues of original clay-humus (absent at some places)
1.5 – around 15.0m	Loess loam (Quaternary – Pleistocene)
15.0 – 17.0m	Silty clays (Quaternary – Pleistocene? – possibly Pliocene)
under 17.0m	Gravel sediments – Trnava formation (Tertiary – Pliocene – Ruman)

HYDROGEOLOGICAL CONDITIONS

The affected positions of quaternary rocks (anthropogenic sediments, clay-humus, loess loam) do not have a coherent ground water level developed. The ground water body developed in the Pliocene gravel bed sediments. The ground water level is at approx. 151m above the sea level (approx. 19–20m under the ground level within the assessed area).

SLOPE MOVEMENTS AND EROSION PROCESSES - *exogenous geodynamic phenomena*

The flat and slightly ondulated relief of the area surrounding the Jaslovské Bohunice NPP site does not create the conditions for major exogenous geodynamic phenomena.

SEISMICITY – *endogenous geodynamic phenomena*

According to base studies, the most intensive earthquake in Jaslovské Bohunice would reach 6 – 6.5°MCS corresponding to 4.2 of the Richter scale.

MINERAL DEPOSITS

The most important mineral deposits within the affected area and its immediate vicinity are deposits of flammable natural gas tied to sediments of sea origin of Baden age of the Trnava bay within the Danube basin (approx. 2km north from the Jaslovské Bohunice NPP site).

CONTAMINATION OF THE ROCK ENVIRONMENT

The rock environment can get contaminated as a result of contamination of other environmental elements (see other chapters).

II.3. SOIL CONDITIONS

Almost the entire area of the Jaslovské Bohunice NF is situated on originally muck brown earth which changed to anthrosol at places of construction. At a larger scale, regosol (RM) type of soil can also be identified within the affected area in the vicinity of water flows and erosion furrows.

Pursuant to Act of the NC SR No. 220/2004 Coll. on Agricultural Land Protection and Use, mainly agricultural soils of quality class 2, 3, 4 and 6 are present in the vicinity of the NF site.

SOIL QUALITY AND LEVEL OF CONTAMINATION

According to the Land Atlas (Atlas krajiny - Ján Čurlík, Peter Šefčík, 2002), soils within the affected are classified as non-contaminated and relatively clean soils.

With regard to the presence of ***radioactive substances*** in soils, the mass activity of soil is monitored within the affected area. Samples are taken once a year: in spring for grass surfaces, and in autumn for topsoil. The on-site INSITU gamma spectrometry is also performed twice a year – in spring and in autumn.
It can be concluded on the basis of measured values that the intervention level of was not exceeded in any of the samples taken to determine the volume activity of soils in 2011.

II.4. CLIMATE CONDITIONS

The climate of the affected area is characterised as a lowland, predominantly warm climate; the territory is part of the A3 climate zone (warm, moderate dry climate with moderate winters).

The meteorological conditions in Jaslovské Bohunice throughout the past 35 years have been as follows (in average):

- Average air temperature (ºC): 9.4
- Maximum air temperature (ºC): 36.6
- Minimum air temperature (ºC): -26.1
- Average temperature of the coldest month (January) (ºC): -1.5
- Average temperature of the warmest month (July) (ºC): 19.5
- Average air humidity (%): 75.0
- Average annual rainfall (mm): 533.0
- Prevailing wind direction: NW
- Average wind speed (m/s): 3.9
- Average number of days with a snow cover: 40.0
- Average snow height (in cm) in the winter period (November – March): 5.3
- Maximum snow height (in cm) throughout the past 35 years: 47.0

With regard to risk assessment the data on extreme rainfall is also important – it was determined as 65l/s/ha (5.85mm in 15 minutes).

II.5. AIR POLLUTION

With regard to ***common pollutants***, it can be stated that no controlled air quality zone exists within the affected area and that there were over twenty large and medium-sized sources of pollution in 2011 recorded in the NEIS system (National Emission Inventory System).
The immission situation related to common pollutants is not monitored within the affected area. Pursuant to the environmental regionalisation of the SR, the location and its surrounding were classified as areas with moderate air pollution.

Given the air contamination of the affected area by ***radionuclides gas discharges,*** the activity of aerosols and deposition within the area and in its surroundings is monitored.
The activity of aerosols is measured through continuous taking of samples. The monitoring stations around Jaslovské Bohunice monitor ^{137}Cs, and also ^{90}Sr and $^{239/240}$Pu at some locations.
In 2011, there were 11 cases of exceeding the intervention level of the volume activity of aerosols at the teledosimetry system stations (values over the minimum detectable activity /MDA/). Any excess values were not caused by the SE-EBO operation or operation of the Proponent´s equipment in any of these cases.
The deposition activity is monitored at selected stations in parallel with aerosol samples. The deposition samples are processed by means of large-volume coagulation followed by gamma spectrometry analysis.
On the basis of the measured values it can be concluded that the set intervention level was not exceeded in any sample during the reference year 2011.

II.6. HYDROLOGICAL CONDITIONS

SURFACE WATERCOURSES

From the hydrological point of view, the axis of the assessed area is the Váh river running approx. 8km east from the Jaslovské Bohunice NF site. The affected area forms part of lowland river basin of Dudváh which joins Váh river approx. 16km SSE at Siladice municipality.
The NF site stretches out to two drainage basins: the drainage basin of the Manivier watercourse (drainage canal) and the drainage basin of the Pečeňady Canal. Both watercourses are class IV watercourses and have the character of a lowland watercourse.
Given the distance from rivers, the terrain and the elevation of the locations, it can be concluded that the NF site cannot be directly threatened by floods from the nearby watercourses and water dams.

<u>*CONTAMINATION OF SURFACE WATERS*</u>

In the surroundings of the Jaslovské Bohunice NF, the contamination of surface watercourses is monitored within the ČMS Waters only at the Trakovice profile at the Horný Dudváh watercourse. Given the character of the locality, the monitoring only focuses on the activity of surface waters. The values measured at the profile meet the requirements of Annex No. 1 to the Government Regulation No. 269/2010 Coll. laying down the requirements for attaining good water conditions.

With regard to the presence of ***radioactive substances*** in surface waters within the affected area and it surrounding, the monitoring system monitors the volume activity of surface waters and the mass activity of sediments given the NF operation.
<u>*The activity of surface waters*</u> is monitored once per month at a sample of 50 litres. The samples are processed using a radio-chemical method, and the ^{3}H content is determined by means of liquid scintillation spectrometry. ^{90}Sr is analysed only in case the investigation level of beta activity is exceeded. The gamma spectrometry analysis of surface waters is also performed once in a month. The measured values suggest that none of the samples taken to determine the volume activity of surface waters or the mass activity of sediments exceeded the investigation level in the reference year 2011.

<u>*GROUND WATERS*</u>

With regard to hydrogeological zoning, the affected area forms part of the Q 050 ground waters zone – "Trnava Hills Quaternary".
Near the Jaslovské Bohunice NF site, this zone is represented by a hydrogeological compound of eolic sediments of the quaternary with the function of regional isolators (eQp) – loess and loess loam of the Pleistocene – Holocene age.

<u>*CONTAMINATION OF GROUND WATERS*</u>

The contamination of ground waters by ***common pollutants*** is monitored at the waters partial monitoring system at Šulekovo (quaternary formation) and Radošovce (pre-quaternary formation). The indicators monitored at the sampling stations complied with the requirements of the Government Regulation 496/2010 Coll. amending the Government Regulation No. 354/2006 Coll. laying down the requirements for water aimed for human consumption and for the control of the quality of water aimed for human consumption, with the exception of FE_{total} concentration (≥0.2 mg/l) in Radošovce.

With regard to the presence of ***radioactive substances***, the volume activity of drinking waters and the volume activity of ground waters are monitored within the affected area and its surroundings.
<u>*The volume activity of drinking waters*</u> is monitored once in a quarter-year in a sample of 10 litres, determining the content of the total beta activity and ^{3}H content.
The measured values suggest that none of the samples taken to determine the volume activity of drinking waters exceeded the intervention level in the reference year 2011.
<u>*The volume activity of ground waters*</u> is monitored in radiation control drills (RCD) within the affected area and its surroundings. Water samples of 10 litres are taken twice a year –

in spring and in autumn. The samples are processed using a radio-chemical method, and the ^{3}H content is determined by means of liquid scintillation spectrometry. The measured values suggest that none of the samples taken to determine the volume activity of ground waters nearby the nuclear facilities site exceeded the investigation level in the reference year 2011. The ^{3}H activity was exceeded in one case at a drill situated directly within the SE-EBO site.

With respect to the contamination of ground waters by radionuclides within the affected area, it should be mentioned that as a result of tritium contamination the main source of which is the A1 NPP site, recovery pumping of ground waters has been carried out in building 106 (N-3 drill) since 1999 with the aim to prevent the spreading of contamination beyond the source area. The complex analysis of the results of monitoring of ground waters contamination by radionuclides, including long-term development, and the modelling prognosis of further development of the radiation situation suggest that the identified and projected (including under the most conservative estimate) volume activities of tritium in ground waters under the municipalities within the affected area are low , and from the radiobiological point of view their level cannot exceed 1/100 of the exposure limit for the population under Art. 15 of Government Regulation No. 345/2006, i.e. the potential effective dose from ingestion for a critical person cannot exceed 10 μSv/year (all limit indicators under current legislation and international recommendations are higher than the actual values).

II.7. FAUNA AND FLORA

Phytogeographical description and restored vegetation

From the point of view of phytogeographical classification, the affected area is situated in the Trnava Hills (Trnavská pahorkatina), in a hilly region, lowland zone, oak subzone. The major part of the affected area pertains to the Trnava Table sub-district, and Small Carpathian Hills sub-district also stretch out to the affected area from north-west (Atlas krajiny SR, 2002).

The potential natural vegetation of the Trnava Loess Table is a short-grass steppe with xerophilous vegetation or peripannonian oak and hornbeam forests. It would be oak and turkey oak forests at hillsides, and hard alluvial forests – ash, elm and oak forests – at the bottomland of lowland watercourses.
At present, the affected area forms part of a cultural land with prevailing agricultural production. The original vegetation of the affected area was transformed into predominantly agriculture-intensive lands surrounding the nuclear facility sites.

Fauna

According to zoogeographical regionalisation, the affected area is located in the steppe province (*Atlas krajiny SR*, 2002).

DAMAGE AND CONTAMINATION OF BIOTOPES

Due to the specific use of the affected area for operating nuclear facilities, the environmental monitoring of the contamination by radionuclides focuses, besides air, soil and waters, also on some parts of the food chain (fodder, milk and others) which, to a certain degree, reflect the contamination of natural biotopes within the affected area. All values measured in the reference year suggest that the intervention levels of volume activity were not exceeded in none of the agricultural commodities and other live natural products within the affected area.

II.9. PROTECTED AREAS UNDER SPECIAL REGULATIONS AND THEIR PROTECTION ZONES

The affected area and its surroundings falls under the first level of nature and landscape protection pursuant to Act No. 543/2002 Coll. on Nature and Landscape Protection as amended.

The closest ***large protected area*** to the Jaslovské Bohunice nuclear facilities is the Small Carpathian Protected Landscape Area, the border of which runs west from the site at a distance of 10km.

The closest ***small protected areas*** are:

- Protected area Dedova jama (approx. 6km east from the NF site)
- Protected site Malé Vážky (approx. 7km south-east from the NF site)
- Protected site Trnavské rybníky (Trnava Fishponds) (approx. 17km south-west from the NF site).

The closest ***protected bird areas*** are the protected bird area SKCHVU054 Špačinsko-nižnianske polia which stretches out directly to the cadastral territory of Jaslovce, Bohunice, Radošovce or Malženice and its closest border is situated at an approx. distance of 1km north from the NF site.

As for ***areas of European importance*** situated at a wider surroundings of the affected area, we can mention SKUEV0267 Biele hory (approx. 21km west from the NF site), SKUEV0174 Lindava (approx. 27km south-west from the NF site), SKUEV0277 Nad vinicami (approx. 18km west from the NF site), SKUEV0175 Sedliská (approx. 12km south-east from the NF site), and SKUEV0074 Dubník (approx. 20km south from the NF site).

There is no officially ***protected tree*** within the affected area.

There are no ***wetlands*** of national and regional importance within the affected area; there are, however, two wetlands of local importance within the cadastral territories of the affected municipalities.

No ***area protected for water management*** purposes stretches out to the affected area.

II.10. TERRITORIAL SYSTEM OF ECOLOGICAL STABILITY

Among others, the following elements of the TSES are defined in the vicinity of the affected area at regional and supra-regional level: Váh river (supra-regional Bk), Dudváh river (regional Bk), Blava (regional Bk), Dedova jama (regional Bc). No TSES is in direct contact with the affected area.

II.11. POPULATION

POPULATION OF THE AFFECTED AREA

Table C.II.11./01

Population of affected municipalities as of 31 December 2011

District	***Municipality***	***Population***			***Population density per km²***
		Total	***Males***	***Females***	
Trnava	Jaslovské Bohunice	2,015	1,019	996	100
	Radošovce	426	205	221	59
	Malženice	1,379	670	709	93
	Dolné Dubové	649	322	327	65
Piešťany	Veľké Kostoľany	2,708	1,369	1,339	111
	Pečeňady	511	254	257	60
	Nižná	529	258	271	66
Hlohovec	Ratkovce	329	175	154	74
	Žlkovce	638	325	313	80
Total		***9,184***	***4,597***	***4,587***	**-**

(Source: Statistical Office of the SR, 2013)

AGE STRUCTURE OF THE POPULATION IN THE AFFECTED AREA

Table C.II.11./02

Age structure of the population of the affected municipalities as of 31 December 2011

MUNICIPALITY	Pre-productive age		Productive age				Post-productive age	
	Population	%	Population – females	%	Population – males	%	Population	%
Jaslovské Bohunice	338	16.8	596	29.6	692	34.3	389	19.3
Radošovce	58	13.6	131	30.8	144	33.8	93	21.8
Malženice	263	19.1	429	31.1	444	32.2	243	17.6
Dolné Dubové	91	14.0	193	29.8	224	34.5	141	21.7
Veľké Kostoľany	461	17.0	781	28.9	908	33.5	558	20.6
Pečeňady	70	13.7	147	28.8	181	35.4	113	22.1
Nižná	76	14.4	140	26.5	171	32.3	142	26.8
Ratkovce	54	16.4	94	28.6	116	35.3	65	19.7
Žlkovce	100	15.7	181	28.4	218	34.2	139	21.7

(Source: Statistical Office of the SR, 2013)

INDUSTRY

Industrial production in the affected area primarily focuses on electric energy generation from nuclear fuel. The other industrial activities and capacities within the affected area are of minor importance, e.g. packaging plant for bitumen mixtures in Veľké Kostoľany, concrete works in Malženice (AGS Trnava, s.r.o.), etc.

AGRICULTURE

Agricultural production (after energy industry) is the most common activity within the affected area. The affected area has very good natural conditions for the growing of various types of agricultural crops.

FOREST MANAGEMENT

The forest coverage of the area is very low.

SERVICES

The community amenities in the affected municipalities depend on the population size. In the municipalities with up to 500 inhabitants, services and community amenities are based on demand, the number of their users and economic efficiency. Municipalities with over 500 inhabitants provide more complex and wider services and more extensive community amenities, but their development and type also depend on the above-mentioned indicators.

RECREATION AND TOURISM

In general, the affected area does not have suitable conditions for weekend and holiday recreation.

TRANSPORT

Three basic types of transport are operated in the affected districts of Trnava, Hlohovec and Piešťany covering the affected area: road, railway and air (military airport in Piešťany).

Road transport

The road network of the affected districts are formed by 1st, 2nd and 3rd class roads and the D1 motorway Bratislava – Trnava – Piešťany – Trenčín; within the affected area it is only 1st, 2nd and 3rd class roads. The Jaslovské Bohunice NF site is connected to the road network through road III/504015 in two directions – connecting road through Jaslovské Bohunice to Trnava, and road to the municipality of Žlkovce continuing to the 1st class road Bratislava – Trenčín (approx. 5.5km).

Railway transport

The affected area is not crossed by any passenger transport railways. The area is connected to the railway network by a separate spur track which was originally constructed for the purposes of the A1 NPP and currently serves for the entire NF site.

II.12. CULTURAL AND HISTORIC LANDMARKS AND SITES

No cultural or historic landmarks and sites exist directly at plots affected by the given activity and within its immediate vicinity.

II.13. ARCHAEOLOGICAL SITES

No known archaeological sites can be found directly at plots affected by the given activity and their immediate vicinity. Some archaeological findings, however, are reported within the cadastral territories of affected municipalities.

II.14. PALEONTOLOGICAL SITES AND IMPORTANT GEOLOGICAL SITES

No paleontological and geological sites exist within the affected area.

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

Air pollution

In 2011, there were 24 large and medium-sized sources of air pollution by common pollutants registered in the NEIS system (National Emission Inventory System). Large and medium-sized sources of air pollution include mainly sources related to energy (e.g. boiler rooms, diesel aggregates, etc.) and agriculture (e.g. grain dryers, livestock production, collection line, etc.). Pumping stations are represented to a minor degree, and there are also operation units for surface treatment of metals, concrete works and a unit for the production of concrete pavement, road elements and building blocks. Some exclusively energy sources are operated directly within the Jaslovské Bohunice NF site. The Proponent also operates a radioactive waste incinerator within this site.

The operation and decommissioning of the NF in Jaslovské Bohunice represents a specific source of air pollution, in particular of gas discharges of radionuclides:

- Block V-2, owned by the Slovak Electricity Company (Slovenské elektrárne – SE EBO (V-2 NPP));
- Block V-1, owned by the Nuclear and Decommissioning Company (JAVYS – JE V1) – at the stage of decommissioning;
- decommissioned block A1 owned by the Nuclear and Decommissioning Company (JAVYS – JE A1);
- Other nuclear facilities owned by JAVYS:
  - RAWPTT NF (Technologies for RAW processing and treatment);
  - ISSF NF (Interim storage of spent fuel in Jaslovské Bohunice).

In all cases, gas discharges are monitored and subsequently assessed in relation to the set guide values (annual limits). Information concerning SE-EBO operation is (together with the evaluation of liquid radioactive discharges) regularly (on a monthly basis) published on the website: http://www.seas.sk/sk/spolocnost/zivotne-prostredie/vplyv-prevadzok/atomove-elektrarne-bohunice
The evaluation of gas discharges from the Proponent´s operation units (JAVYS, a.s.) is published together with other information (also on a monthly basis) on the website: http://www.javys.sk/sk/informacny-servis/eko-informacie

Table C.II.15./03

Data from the measurement and evaluation of radioactive discharges from JAVYS sources to the atmosphere – reference year 2011

	Building 46 A		***Building 46 B***		***Building 808***		***ISSF***		***V1***	
	Discharge	***% of annual limit***	***Discharge***	***% of annual limit***	***Discharge***	***% of annual limit***	***Discharge***	***% of annual limit***	***Discharge***	***% of annual limit***
Air volume [m^3]	1.01E+09		3.72E+08		4.87E+08		5.00E+08	-	4.17E+09	-
Noble gases [TBq]									***2.058***	0.10
Iodine ^{131}I [MBq]									***0.423***	0.00
Strontium $^{89}Sr+^{90}Sr$ [kBq]	***53.616***	0.27	***19.592***	0.47	***57.248***	1.36	-	-	***22.883***	0.02
Carbon ^{14}C [GBq]									27.228	-
Aerosols: [MBq]										

^{51}Cr	0.124		0.0356		0.089		0.036		0.229	
^{54}Mn	0.025		0.0085		0.022		0.010		0.185	
^{59}Fe	0.037		0.0144		0.021		0.014		0.057	
^{57}Co	0.028		0.0053		0.016		0.008		0.017	
^{58}Co	0.021		0.0082		0.020		0.012		0.025	
^{60}Co	0.025		0.0092		0.024		0.044		1.914	
^{65}Zn	0.044		0.0189		0.028		0.020		0.081	
^{94}Nb	0.004		0.0007		0.002		-		0.029	
^{95}Nb	0.020		0.0095		0.024		0.012		0.005	
^{95}Zr	0.029		0.0117		0.017		0.015		0.044	
^{103}Ru	0.022		0.0081		0.021		0.011		0.026	
^{106}Rh	0.068		0.0131		0.033		0.035		0.085	
^{110m}Ag	0.026		0.0111		0.024		0.014		0.100	
^{124}Sb	0.020		0.0076		0.019		0.010		0.027	
^{125}Sb	0.011		0.0022		0.006		-		0.011	
^{134}Cs	0.024		0.0089		0.023		0.012		0.046	
^{137}Cs	0.788		0.0886		0.147		0.031		0.407	
^{141}Ce	0.023		0.0086		0.013		0.013		0.033	
^{144}Ce	0.083		0.0195		0.053		0.026		0.146	
^{55}Fe	-		-		-		-		5.987	
Total aerosols [MBq]	***1.419***	0.22	***0.2898***	0.21	***0.602***	0.43	***0.322***		***9.456***	0.01
Alpha aerosols: [kBq]										
^{238}Pu	0.666		0.174		0.567		0.480		0.111	
$^{239+240}Pu$	4.566		0.378		0.462		0.355		1.301	
^{241}Am	5.938		0.746		0.793		0.412		1.086	
Total alpha aerosols [kBq]	***11.169***	0.18	***1.298***	0.10	***1.822***	0.14	***1.248***		***2.499***	0.01
Total aerosols [MBq]							***0.351***	0.12		

Table C.II.15./04

Data from the measurement and evaluation of radioactive gas discharges from the V2 NPP operated by SE-EBO – reference year 2011

		SE EBO (JE V2)		
Type of discharge		***Discharge***	***Annual limit***	***% of annual limit***
Noble gases	(TBq)	8.508	2,000	0.425%
Iodine ^{131}I – aerosol and gas form:				
Iodine ^{131}I – aerosol form	(MBq)	0.215		
Iodine ^{131}I – gas form	(MBq)	0.249		
Total iodine ^{131}I	(MBq)	0.463	65,000	0.0007%
Aerosols:				

^{51}Cr	(MBq)	1.406		
^{54}Mn	(MBq)	0.170		
^{59}Fe	(MBq)	0.152		
^{57}Co	(MBq)	0.047		
^{58}Co	(MBq)	0.456		
^{60}Co	(MBq)	0.408		
^{65}Zn	(MBq)	0.160		
^{95}Nb	(MBq)	0.268		
^{95}Zr	(MBq)	0.169		
^{103}Ru	(MBq)	0.090		
^{106}Rh	(MBq)	0.191		
^{110m}Ag	(MBq)	0.676		
^{124}Sb	(MBq)	0.223		
^{134}Cs	(MBq)	0.064		
^{137}Cs	(MBq)	0.078		
^{141}Ce	(MBq)	0.117		
^{144}Ce	(MBq)	0.387		
^{75}Se	(MBq)	0.838		*
^{181}Hf	(MBq)	0.025		*
Total aerosols	(MBq)	5.930	80,000	0.0074%
^{76}As	(MBq)	1,002.841		**
Strontium ^{89}Sr,^{90}Sr:				
^{89}Sr	(kBq)	38.017		
^{90}Sr	(kBq)	21.693		
Total ^{89}Sr+^{90}Sr	(kBq)	59.710	140,000	0.043%
Alpha aerosols:				
^{238}Pu	(kBq)	0.361		
^{239,240}Pu	(kBq)	1.402		
^{241}Am	(kBq)	1.176		
Total alpha aerosols	(kBq)	2.939	20,000	0.015%

Notes:
** Radionuclides included in the balance as per point 8 of the Decision of the PHA OOZPŽ/6774/2011 (measured values only); activities included in the calculation of doses.*
*** Radionuclide not included in the balance as per point 8 of the Decision of the PHA OOZPŽ/6774/2011 (short-living radionuclide with a half-life shorter than 8 days); activity included in the dose calculation.*

No immission monitoring of common pollutants within the affected area is performed; with regard to the operation of nuclear facilities, the activity of aerosols in the air and the fallout activity are monitored. For more details on the extent of air contamination as a result of pollution see Chapter C.II.5.

Water contamination

<u>Ground waters</u>

The main source of contamination of ground waters by common pollutants within the affected area and its vicinity is agricultural production and infiltration of polluted surface waters. Locally, it can also be sources in the form of minor uncontrolled dump-yards, badly isolated cesspools, or illegal catch-drains, etc.

With respect to the contamination of ground waters by radionuclides, it is necessary to mention tritium contamination at the NF site the main dissemination source of which is the A1 NPP site and as a result of which recovery pumping of ground waters has been performed since 1999 in building 106 (drill N-3) with the aim to prevent the spreading of this kind of contamination outside of the source site. The ground waters contamination by tritium as a result of the leakage of low activity waters from the SOCOMAN wastewater drainage system was also monitored; however, the activity level has decreased to the level of natural background.
Details on the results of monitoring of this kind of contamination and on the prognosis of its further development, including further details on the contamination of ground waters and monitoring results, are provided in Chapter C.II.6.

Surface waters

The main sources of common contamination of surface waters within the affected area and its vicinity are industrial sources of surface waters contamination, households (locally, absence of a public sewer system connected to a WWTP can be a problem, e.g. the municipality Nižná, as of 31 December 2011; source: www.statistics.sk). Surface flush waters from agricultural sites also represent a source of contamination of surface water courses within the affected area (the sites used for agriculture purposes within the affected areas represent vulnerable areas pursuant to Government Regulation No. 617/2004, i.e. pursuant to Art. 30 of Act No. 184/2002 Coll. these are areas used for agricultural purposes, from which rain waters are drained to surface waters or penetrate ground waters where the concentration of nitrates is above 50mg/litre or can exceed this value in the near future).

The SE-EBO appears to be the most important industrial producer of wastewaters in the affected area, and is allowed to discharge up to 3,626,640m3 of waste waters to the Váh recipient per year. The data concerning the recent years is provided in the table below.

Table C.II.15./05

Volume of waste waters discharged from SE-EBO (m^3/year)

	Year 2011	***Year 2012***
Total discharged waters	3,249,542	3,544,966
Industrial waste waters	3,192,615	3,494,207
Sewage waste waters	56,927	50,759

In the reference year 2011, all monitored parameters of discharged waste waters met the prescribed limit values, and no exceeding of allowed values for pollutants was reported, as shown in the table below.

Table C.II.15./06

Limits set for common pollutants in waste waters from SE-EBO

Indicator	*Allowed limit concentration (mg/lit)*
Biochemical oxygen consumption – BOC_5	8
Chemical oxygen consumption - $CHOC_{Cr}$	30
Insoluble substances – IS	20
Soluble substances SS_{105}	1,200
$N\text{-}NH_4^+$	4
NO_3^-	80
SO_4^{2-}	350
Cl^-	180
Non-polar extracted substances – NES	0.35
Total phosphates – P_{total}	1.5
Fe	2
N_2H_4	2
Detergents – PAL	0.5
pH	6-9
T	28°C before point of discharge to recipient

The contamination of radionuclides in the reference year 2011, which also met the set limits, is shown in the table below:

Table C.II.15./07

Active discharges of SE-EBO into hydrosphere (Váh recipient, year 2011)

		SE EBO (V2 NPP)		
Type of discharge		*Discharge*	*bil.limit*	*% of annual limit*
Discharged water volume	(m^3)	19,853		-
Tritium ^3H	(GBq)	9,533.716	20,000	47.669%
Corrosive and fissile products:				
Gamma spectrometry analysis				
^{51}Cr	(MBq)	3.776		
^{54}Mn	(MBq)	1.240		
^{59}Fe	(MBq)	0.888		
^{57}Co	(MBq)	0.314		
^{58}Co	(MBq)	1.347		
^{60}Co	(MBq)	1.310		
^{65}Zn	(MBq)	1.050		
^{95}Zr	(MBq)	0.762		
^{95}Nb	(MBq)	0.537		
^{103}Ru	(MBq)	0.438		
^{106}Rh	(MBq)	1.351		

^{110m}Ag	(MBq)	0.939		
^{124}Sb	(MBq)	1.482		
^{131}I	(MBq)	0.653		
^{134}Cs	(MBq)	0.852		
^{137}Cs	(MBq)	3.521		
^{141}Ce	(MBq)	0.619		
^{144}Ce	(MBq)	2.510		
^{75}Se	(MBq)	0.479		*
^{181}Hf	(MBq)	0.006		*
Total gamma	(MBq)	24.073		
Strontium ^{89}Sr,^{90}Sr:				
^{89}Sr	(kBq)	31.119		
^{90}Sr	(kBq)	95.066		
Suma ^{89}Sr+^{90}Sr	(MBq)	0.126		
Alpha spectrometry analysis				
^{238}Pu	(kBq)	0.889		
$^{239,240}Pu$	(kBq)	20.607		
^{241}Am	(kBq)	3.253		
Total alpha	(MBq)	0.025		
Corrosive and fissile products – total	(MBq)	24.224	13,000	0.186%

Notes:
** Radionuclides included in the balance as per point 8 of the Decision of the PHA OOZPŽ/6774/2011 (measured values only); activities included in the calculation of doses.*

The contamination of wastewaters drained from SE-EBO compared to the allowed limits is published on a monthly basis on the following website: http://www.seas.sk/sk/spolocnost/zivotne-prostredie/vplyv-prevadzok/atomove-elektrarne-bohunice.

Another important producer of waste waters in the affected area is the Proponent – the company JAVYS, a. s.
Storm waters, sewage waters after mechanical and biological treatment and treated technological waste waters (SOCOMAN pipe collector, Váh recipient, river km 101.8) are drained from the surface draining units (open Manivier canal joining Dudváh river after the municipality of Žlkovce at river km 10.1). Waste waters from recovery pumping of ground waters in the A1 NFF are also drained to Váh river. JAVYS, a. s. is allowed to discharge 4,730,400 m3/year to the Dudváh recipient, and 4,415,040 m^3/year to the Váh recipient.

Details on the volumes and quality of waste waters drained by JAVYS, a. s. in the reference year 2011 are provided in Chapter B.II.2.

The table below shows the contamination of discharged waste waters by radionuclides.

Table C.II.15./10

Active discharges from JAVYS sources to the hydrosphere – year 2011

Type of discharge	Váh recipient				Dudváh recipient			
	RAWPTT + A1 NPP		V1 NPP		RAWPTT+ A1 NPP		V1 NPP	
	Discharge	% of annual limit	Discharge	% of annual limit	Discharge	% of annual limit	Discharge	% of annual limit
Water volume (m^3)	195,577		9,175		66		0	
Gamma spectrometry analysis (MBq)								
^{51}Cr	0.695		0.039		0.006			
^{54}Mn	0.960		0.124		0.008			
^{55}Fe	-		0.929		-			
^{59}Fe	1.816		0.054		0.016			
^{57}Co	0.639		0.043		0.005			
^{58}Co	0.861		0.049		0.007			
^{60}Co	1.194		0.880		0.011			
^{65}Zn	2.619		0.123		0.025			
^{95}Zr	1.508		0.034		0.013			
^{94}Nb	0.08		0.021		0.001			
^{95}Nb	0.893		0.063		0.008			
^{103}Ru	0.879		0.027		0.007			
^{106}Rh	7.729		0.098		0.070			
^{110m}Ag	1.338		6.591		0.013			
^{124}Sb	0.829		0.050		0.007			
^{125}Sb	0.243		0.037		0.004			
^{131}I	1.108		0.045		0.009			
^{134}Cs	0.992		0.281		0.008			
^{137}Cs	16.626		10.411		0.023			
^{141}Ce	1.132		0.032		0.009			
^{144}Ce	5.039		0.281		0.040			
Total (MBq)	**47.1802**		**20.214**		**0.290**			
Recovery pumping (MBq)	5.224		-		0			
Alpha spectrometry analysis								
^{238}Pu	0.036		0.002					
$^{239+240}Pu$	0.037		0.020					
^{241}Am	0.029		0.014					
Total (MBq)	**0.102**		**0.037**		**0**			
^{89}Sr+ ^{90}Sr (MBq)	**2.926**		**2.497**		**0**			

Corrosive and fissile products (MBq)	**55.4322**	0.46	**22.747**	0.17	**0.290**	0.242		
Tritium ^{3}H (GBq)	**346.42**	3.46	**576.61**	28.83	**1.740**	0.005		

Details on the extent of contamination of surface waters within the affected area are described in Chapter C.II.6.

Contamination of Soil and of the Geological Environment

Within the affected area and its vicinity, agricultural activities constitute the major source of contamination of soil and of the geological environment. In general, the soils of the agricultural land reserves are more contaminated with nitrogenous substances and heavy metals than the soils of the forest land reserves.
Illegal waste dumps, illegal waste water discharged via catch-drains, or badly insulated cesspools, as well as transport in the vicinity of transport routes (deposition or flush waters from roads) and pending environmental burdens represent a special local pollutant for the geological environment.

The following locations closest to the Jaslovské Bohunice NF site are identified in the Environmental Burdens Information System:

- Category A: Probable environmental burden:
  - PN (014) / Rakovice – aluminium, type of activity: municipal landfill, approx. 7.8km north-east from the Jaslovské Bohunice NF site;
  - PN (005) / Nižná – municipal solid waste landfill, type of activity: municipal waste landfill, approx. 4km north from the Jaslovské Bohunice NF site within the defined affected area;
  - TT (006) / Malženice – former compressor station; type of activity: pipeline, approx. 4km south from the Jaslovské Bohunice NF site within the defined affected area;
- Category B: Confirmed environmental burden:
  - TT (008) / Špačince – municipal solid waste landfill, type of activity: municipal waste landfill, approx. 8km south-west from the Jaslovské Bohunice NF site;
  - HC (1844) / Leopoldov – locomotive depot, Cargo a.s., type of activity: railway depot and station, approx. 8.8km south-east from the Jaslovské Bohunice NF site;

- Category C: Recovered/recultivated locality:
  - HC (006) / Leopoldov – pumping station, type of activity: fuel pumping station, approx. 9.5km south-east from the Jaslovské Bohunice NF site;
  - TT (001) / Dolné Dubové – municipal solid waste landfill, type of activity: municipal waste landfill, approx. 5.5km west from the Jaslovské Bohunice NF site.

According to the data recorded in the Environmental Burden Information System, no assumed or confirmed environmental burdens are recorded directly within the Jaslovské Bohunice NF site.

Tritium release is a specific source of contamination of the geological environment within the A1 NPP site, which is the reason for long-year recovery pumping with the aim to prevent its spreading outside of the source area (for more details see above in this chapter).
Deposition with radionuclides content constitutes a specific source of soil contamination within the affected area, and is subject to mandatory monitoring (see again the text above).

Information on soil contamination and on its impacts is detailed in Chapter C.II.3.

Waste

The affected area is situated on the border of the districts of Trnava, Piešťany and Hlohovec which produced a total of 472,212.35 tons of waste in 2011. The prevailing method of waste treatment is liquidation by landfilling (over 39%). However, up to around 50% of all waste is recycled.

Table C.II.15./11

Waste production and treatment in the districts of Trnava, Piešťany and Hlohovec (year 2011)

District	Material recycling [t]	Energy recycling [t]	Other recycling [t]	Liquidation by landfilling [t]	Liquidation by incineration without energy use [t]	Other liquidation [t]	Other treatment [t]	Total [t]
Hlohovec	28,620.37	16,833.18	15,011.69	23,305.90	455.86	11,056.14	9,142.04	104,425.17
Piešťany	28,570.30	3.40	2,516.63	49,108.10	231.12	5,776.32	178.90	86,384.78
Trnava	50,392.83	470.16	94,245.94	115,118.03	642.39	7,772.97	12,760.08	281,402.40
Total	**107,583.5**	**17,306.74**	**111,774.26**	**187,532.03**	**1,329.37**	**24,605.43**	**22,081.02**	**472,212.35**
Share (%)	22.8	3.7	23.7	39.7	0.3	5.2	4.7	

The municipalities within the affected area have mainly waste collection yards for some types of municipal waste. Waste is transported outside of the affected area for recycling or liquidation.

Noise and vibrations

Transport (road and railway) represents a major source of noise within the affected area, and some noise is locally also generated by various industrial and agricultural activities.
Within the affected area, the SE-EMO and the Proponent´s operation units (e.g. turbines) form a source of noise.
Since it is part of an industrial site, this location is subject to the Decree of the MoH SR No. 549/2007 Coll. laying down the details of permissible levels of noise, infra-sound and vibrations and the requirements for the objectivisation of noise, infra-sound and vibrations in the environment (as amended) as per which the following maximum permissible noise levels for territories of category IV may not be exceeded:

For external areas: $L_{Aeq,p}$ = 70dB(A) during day, evening and night hours	For office premises: $L_{Aeq,p}$ = 65dB(A)

Sources of radiation and other physical fields

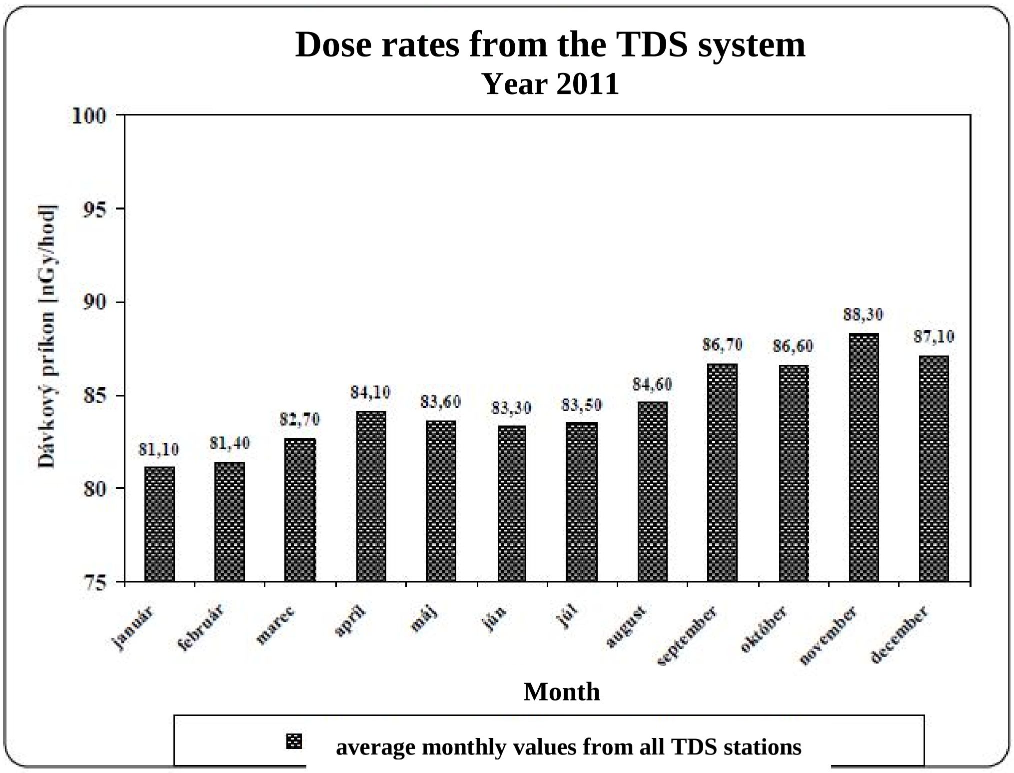
There are 5 nuclear facilities within the affected area:

- Block V-2, owned by the Slovak Electricity Company (Slovenské elektrárne – SE EBO (V-2 NPP));
- Block V-1, owned by the Nuclear and Decommissioning Company (JAVYS – V1 NPP) – at the stage of decommissioning;
- decommissioned block A1 owned by the Nuclear and Decommissioning Company (JAVYS – A1 NPP);
- Other nuclear facilities owned by JAVYS:
  - RAWPTT NF (Technologies for RAW Processing and Treatment);
  - ISSF NF (Interim Storage of Spent Fuel in Jaslovské Bohunice).

Given the building design of the nuclear facilities, the ionising radiation present in this area relates to the existence of radionuclides released to the environment (for more details see above in this chapter).

The measurement of the dose rate in the surroundings of the nuclear facilities site is performed continuously at 24 stations of the teledosimetric system. The chart below shows the average results of the monitoring performed at the stations within the affected area in the reference year 2011.

Chart C.II.15./01



Information with the results of monitoring from the different stations is published on a monthly basis on the website: http://www.seas.sk/sk/spolocnost/zivotne-prostredie/vplyv-prevadzok/atomove-elektrarne-bohunice.

All values obtained by measuring suggest that the intervention levels were not exceeded for any measured dose rates in the reference year 2011.

For the sake of completeness, the table below shows the results of the calculation of the population´s radiation burden in the vicinity of the nuclear facilities site as a result of liquid and gas discharges throughout the past 5 years.

Table C.II.15./12

Highest annual effective E doses for a representative person of the population calculated from liquid and gas discharges of radioactive substances from SE-EBO and JAVYS facilities

Year	*E (nSv/year)*	*Locality*	*Critical group*
2007	224.0	Pečeňady	Children 12-17 years
2008	216.0	Pečeňady	Children 12-17 years
2009	207.0	Pečeňady	Children 12-17 years
2010	156.0	Pečeňady	Children 12-17 years

2011	41.4 (Javys, a.s.) 176.0 (SE-EBO)	Ratkovce, Žlkovce (Javys, a.s.) Pečeňady (SE-EBO)	Children 2-12 years (Javys, a.s.) Children 12-17 years (SE-EBO)

Note: Since 2011, it is only available as part of an independent assessment report for the operator Javys, a.s. and SE-EBO. ***(Source: Operators´ Radiation Reports)***

Current Health Condition of the Population

The health condition of the population in the vicinity of the nuclear power plants was specifically described in the study Health Condition of the Population in the Surroundings of Nuclear Power Plants in Slovakia with a Focus on an Analysis of Mortality Caused by Leukaemia (M. and H. Letkovičová, 2001).
In this document, morbidity caused by leukaemia[1] was evaluated by modern mathematical methods (cluster analysis using fuzzy logic), and the health condition analysis concerned the surroundings of the NF Jaslovské Bohunice and NF Mochovce.

On the basis of mathematical analyses, the authors affirm in the concluding part of the study with regard to Jaslovské Bohunice site that all the tests from all monitored periods suggest that the occurrence of leukaemia in all municipalities within the emergency zone of EBO is random and is not influenced by the situation in a concrete municipality and by any external impacts, including operation of the Jaslovské Bohunice NPP.
They also conclude that there is a balance of the entire EBO area in terms of:

- mortality caused by malignant tumours;
- total gross mortality rate of the population;
- number of years of a potentially lost life in 100,000 inhabitants;

that there are stable indicators (no dynamics, with preserved differences):

- mortality caused by cardiovascular diseases;
- percentage rate of early deaths;
- percentage rate of miscarriages;

and that the increased difference between locations only exists in one indicator:

- percentage rate of premature infants.

Not even a detailed analysis detected any differences in terms of direction, i.e. directional impacts of the nuclear facilities operation on the health condition of the population at a distance of 30km.
Also, no deterioration of indicators was discovered, and none of the indicators deviates from the Slovak average.

No recent complex studies exist at present on this topic and for the given locality.

[1] Leukaemia – group of diseases (diagnoses C91 – C95), manifested by malfunction of the bone marrow and blood; includes acute myeloid leukaemia (AML), chronic myeloid leukaemia (CML), acute lymphoblastic leukaemia (ALL) and chronic lymphocytic leukaemia (CLL).

III. EVALUATION OF THE EXPECTED ENVIRONMENTAL AND HEALTH IMPACTS OF THE PROPOSED ACTIVITY AND ESTIMATION OF THEIR SIGNIFICANCE

III.1. IMPACTS ON THE POPULATION

The inhabitants of Jaslovské Bohunice municipality in the cadastral territory of which the A1 FPP facility with the RAW processing and treatment technology is situated are directly affected by the facility operation.

For the purposes of this document, the inhabitants of municipalities situated within a diameter of approx. 5km from the centre of the affected part of the Proponent´s site are also considered as affected population. This centre was determined for the purpose of defining the affected area and describing its characteristics based on the Pre-Operation Safety Report (version from 2010) for RAWPTT where a common disaster area has been considered for the compound of the Proponent´s facilities which consists of the A1 NPP, RAWPTT, interim storage facility for spent fuel (ISFS) and an integral storage facility (IS) for RAW (pursuant to NRA SR Decree No. 55/2006 Coll. on the details of emergency planning in the case of accidents, and NRA SR Decision No. 97/2006) as an area delimited by the border of the neighbouring site of the V1 NPP, defined by the barrier of the guarded space of this nuclear facility. The first zone (A zone) with a 5km radius has been considered as affected area for the assessment of potential impacts on the natural and anthropogenic components of the environment and population pursuant to Decree of the Ministry of Interior of the SR No. 533/2006 Coll. on the details of protection of inhabitants against the effects of hazardous substances.
The reasonability of this approach is confirmed by the results of the calculation of the actual effective dose for population (refer to Chapter B.II.5), according to which, for example, the highest dose for all Proponent´s facilities at the location (7.01E-08 Sv) in 2011 was calculated for the uninhabited sector north from the Proponent´s site, where the age category of 2–12 years would be the potential critical group, and for the inhabited sector (4.14E-08 Sv) – sector 76 (Ratkovce, Žlkovce) at a 5km distance south-east, where again the age category of 2–12 years is the critical group.
On the basis of this approach we can assume that in case the impacts on the population within the most affected area are acceptable, the impacts are also acceptable for the population of the wider surroundings.

Hence, the inhabitants of nine municipalities are identified as affected:

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

The urban areas closest to the Proponent´s site are the urban areas of Jaslovské Bohunice and Radošovce municipalities at a distance of approx. 2km.

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Due to the absence of an ***implementation stage,*** no relevant impacts on the population will occur in connection with the proposed activity.

The ***operation*** of RAWPTT and A1 NFF decommissioning technology induce both positive and negative impacts, as well as direct and indirect impacts on the population.

The positive, yet indirect impacts on the population include the possibility of a systemic and comprehensive approach to the treatment of radioactive waste from the decommissioning of the A1 NPP which forms part of the affected area and whose operation ended in 1977 due to an accident, V1 NPP decommissioning, operation of other nuclear facilities in the SR, treatment of institutional RAW and captured radioactive materials, and the existence of stable jobs within the area.

The direct negative impacts of the respective activity on the affected population, given its nature, include contribution to the radiation burden of the area generated by the presence of processed radioactive materials and by the contribution of the assessed activity to radioactive discharges to the atmosphere and to surface waters.

With regard to *ionising radiation*, the limits for the protection of employees and the population are laid down in Government Regulation No. 345/2006 Coll. on basic safety requirements for the protection of the health of workers and citizens against ionising radiation.

Art. 15 of the Regulation specifies the limits of exposure of the population in the surroundings of a worksite with sources of ionising radiation as follows:
a) effective dose of 1mSv in a calendar year;
b) equivalent dose to the lens of the eye of 15mSv in a calendar year;
c) equivalent dose to the skin of 50mSv in a calendar year determined as an average dose to $1cm^2$ of most exposed skin irrespective of the size of the exposed area of the skin.
These radiation limits refer to average exposure of the critical group of the population calculated for all routes of exposure from all sources of ionising radiation and for all activities resulting in irradiation that can be taken into consideration.

The value of 1 mSv/year is based on the recommendations of the ICRP (International Commission on Radiological Protection) and has been incorporated in a number of national and international legal regulations. This limit is set so as to minimise the probability of deaths induced by artificial exposure.

Further to the applicable Government Regulation, the limit value of the individual effective dose per person from a critical group of 250μSv/year must also be met for all routes of exposure from all nuclear facilities within the area, i.e. this value represents ¼ of the effective dose limit for the population from artificial sources of radioactivity (1mSv/year).

For the RAWPTT facility operation and A1 NPP decommissioning (including interim storage facility for spent fuel) the PHA SR determined, by Decision No. OOZPŽ/7119/2011 of 21 October 2011, the requirement to ensure that “the effective dose caused by RAS released into the air and surface water for a representative person of the population” does not exceed the basic limit value of 12μSv/year (i.e. $12x10^{-6}$ Sv/year).

In the reference year 2011, the maximum individual effective dose calculated on the basis of actual meteorological measurements and actual discharges for all Proponent´s facilities for all considered routes of exposure for the inhabited zone 64 (Ratkovce, Žlkovce) where the age category of 2–12 years is the critical group was 4.14×10^{-8} Sv/year. Approx. 60% of the processing potential of core technologies was used in that year.
For the year 2012, the highest total individual effective dose (again for all NFs of the Proponent within the site) calculated for the uninhabited sector 76 (Ratkovce, Žlkovce) and for the critical group of the age category of 2–7 years was determined at the level of 3.98×10^{-8} Sv/year.

The aforementioned results suggest that the values generated by actual outputs of the given activity and other Proponent´s facilities within the Jaslovské Bohunice site are several orders of magnitude lower than the basic limit value for the respective part of the Proponent´s facilities.
This situation is not expected to change after the processing capacity of the LCDL worksites and units for the fragmentation of metallic RAW has increased, which was dealt by under an independent (already approved) assessment process and the implementation of which is currently at the stage of preparation, nor in relation to the implementation of technical modifications of the technologies, such as extension of the facility for the fragmentation of large-sized metallic RAW in the MPB for the purpose of its further processing at the RAWPTT.

For the purposes of updating the Pre-Operation Safety Report, the total individual effective dose for limit activities of discharges (see Chapters B.II.1 and B.II.2) under the NRA SR Decision was also calculated for the RAWPTT. The highest value of 6.47×10^{-6} Sv refers to the age group of adults in zone 89 in south-south-east direction at an approximate distance of 5 to 7km at the point of Manivier channel outlet to the Dudváh river. This value is only a half of the set limit value of 12µSv. To have an objective view of the dose burden of the population in the vicinity of the NF site in Jaslovské Bohunice, it should be mentioned that people receive in average 2.5mSv of the total dose per year from the natural radiation background.

The aforementioned results of the ***assessment of radiation consequences*** of the technologies operation and worksites suggest that the set limits are met with a large margin, and the actual effective doses per person is several orders of magnitude lower than the effective dose limit set for the facility by the PHA SR.

The potential risks of environment contamination by radionuclides and subsequent radiation impacts on the population as a result of the disruption or destruction of protection barriers (e.g. due to natural disasters /flood, earthquake, etc./ or disasters caused by human activities /plane crash, etc./) are detailed in Chapter C.III.19.

The population of the affected area can be potentially exposed to ionising radiation also in connection with RAW transportation. To avoid such risk, the transportation is carried out in compliance with ADR (European Agreement Concerning the International Carriage of Dangerous Goods by Road) and Decree of the MoH SR No. 545/2007 Coll. laying down the details of requirements to ensure radiation protection in activities causing irradiation and activities important with regard to radiation protection, i.e. RAW is transported in special transport containers chosen according to the activity and type of transported RAW. As per this Decree, the following must be ensured (Art. 27, par. 9):

i. under normal transport conditions, the dose rate may not exceed 2 mSv/h at any place of the external surface of the consignment or of the external package;

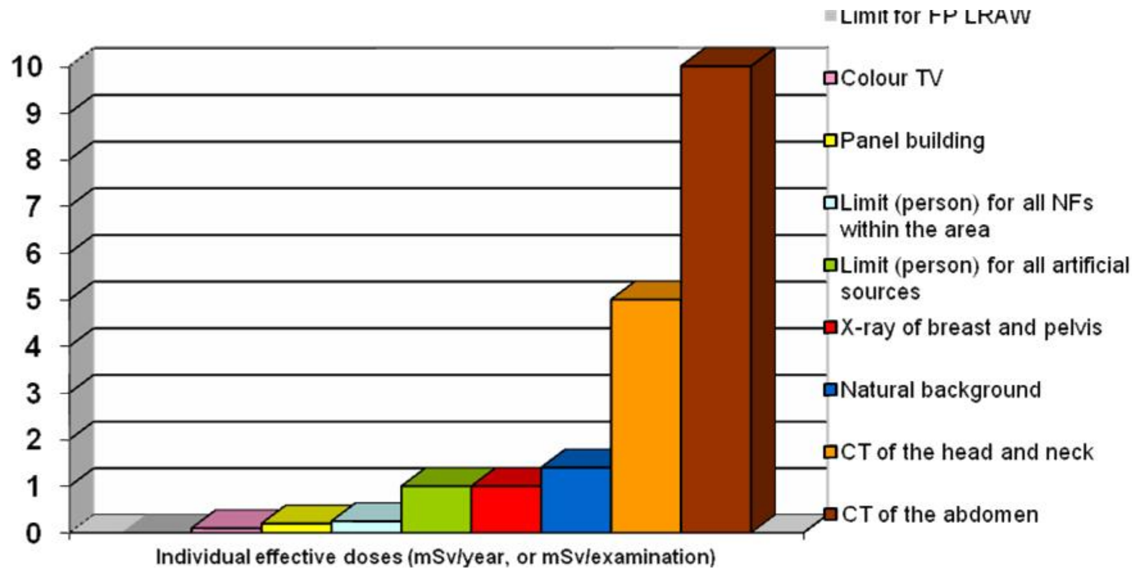
ii. under the conditions of exclusive use, the dose rate may not exceed 10 mSv/h at any place of the external surface of the consignment or of the external package;

iii. under normal transport conditions, the dose rate may not exceed 2 mSv/h at any place of the surface of the vehicle and the value of 0.1 mSv/h at a distance of 2m from the surface of the vehicle.

For illustration, the graph below provides a comparison of informative individual effective doses (IED) produced by various human activities, set general limits, and specific limits for the given technologies (including ISSF).

Chart C.III.1./01

Individual effective doses of various origin



The other impacts of the respective activity on the population of the affected area are:

✓ Emissions of common pollutants in the air

With regard to the given activity, emissions of common pollutants are mainly produced by the operation of the RAW incinerator, and to a smaller extent by the operation of the natural gas boiler ensuring steam supply to one of the processing lines and other operations during RAW processing, such as milling, grinding, handling of loose fixation matrices (cement, SIAL, etc.). If relevant, the emissions from all described activities are eliminated by suitable separating equipment (e.g.

textile filters, flue gas washers, etc.; natural gas incineration does not require the installation of separating equipment).
These emissions are not expected to have a relevant impact on the closest residential zone. A dispersion study has been prepared for the most important source of emissions of common pollutants – RAW incinerator, which shows compliance with all the set and recommended limits for immission concentrations for the protection of health even in the most exposed area.

✓ Emissions of common pollutants in waste waters
Discharged waste waters come from the personnel´s sanitary facilities, from surface storm water draining, from technologies and from the recovery pumping of ground waters. Their contamination by common pollutants respects the limits specified in the decisions of the competent state authority responsible for water quality protection;

✓ Related traffic load, including noise
With regard to traffic load within the area, the conservative approach (i.e. six drive-throughs are considered for maximum freight transport with a frequency of 2 – 3 trucks/day) and methodological disadvantage (i.e. traffic frequency on the affected road in the year of the last traffic count /2010/ without adjustments, applying the increase coefficient for the period of the preparation of the documentation /years 2012 and 2013/) four drive-throughs, as well as transport frequency on the affected road in the year of the last transport counting without adjustments using the increase coefficient for the period of the preparation of the documentation /2012 and 2013/) suggest that the contribution of the activity to the traffic load of the counting section affected by the traffic connection of the Jaslovské Bohunice NPP site would represent an increase of only 3.7% in freight transport and 0.5% in total transport.

✓ Feeling of mental discomfort in some individuals (indirect impact)

This feeling of discomfort arises from fears from the presence of a nuclear facility in the vicinity of their domicile. This impact of the NF operation within the area cannot be completely eliminated, but it is prevented by the NF operators within the area by large-scale monitoring of the impacts of the NF operation on the different parts of the environment and by publishing the results of the radiation burden monitoring, regular analysis of the impacts of NF operation on people´s health, etc.

In relation to ***other impacts*** of the activity which are detailed in the respective chapters (such as noise from installed technological equipment; production of common operational waste, etc.), it can be concluded that given the distance and location of the closest non-industrial area and the nature and design of the assessed activity, these impacts do not represent any source of major impacts on the affected population.

The health risks for the population arising from the assessed activity are analysed specifically and in detail in the Expert Opinion on the Assessment of Health Risks and Impacts by a competent person, MUDr. Jindra Holíkova, the full text of which forms part of this document as Annex 5, and the conclusions of which affirm that the assessment of the impacts of the given facility has not demonstrated any potential negative impacts on the health of people in its vicinity.

ACCEPTABILITY OF THE ACTIVITY BY THE AFFECTED POPULATION

Given the absence of negative comments by the population of the affected municipalities during the publishing of the submitted Plan, it is assumed that the affected population does not have substantial objections against the existence of the assessed facility.

This, however, does not exclude fears among the affected population from the operation of nuclear facilities (including the assessed one) in the vicinity of their domiciles.

III.2. IMPACTS ON THE GEOLOGICAL ENVIRONMENT, MINERALS, GEODYNAMIC PHENOMENA AND GEOMORPHOLOGICAL CONDITIONS

Due to the absence of an ***implementation stage,*** no relevant impacts will occur in this regard.

The impacts on the geological environment ***during operation***, whether direct or indirect – in the form of contamination, are irrelevant for common operation given the nature and design of the activity. The present contamination of the geological environment and ground waters by radionuclide discharges at the A1 NPP site is not the result of the given activity, but the consequence of the bad condition of the barriers of the crashed A1 NPP, to be removed along with the implementation of the assessed activity (recovery pumping of ground waters), and fully eliminated in the future (by completing the A1 NPP decommissioning).

The potential risk of contamination as a result of non-standard operating conditions (e.g. leakage in pipelines, tanks or facilities, failures of used equipment related to RAW leakage, etc.) can be prevented by emergency measures for the operation premises RAWPTT (sealed joints between floors and walls, water-proof floors and walls up to a reasonable height, sloped areas conducting to the active sewer system, storage of hazardous substances in accordance with Decree of the Ministry of Environment No. 100/2005 Coll., etc.).

The potential risks of the contamination of the environment as a result of the disruption or destruction of protective barriers (e.g. due to natural disasters /flood, earthquake, etc./ or disasters caused by human activities /plan crash, etc./) are detailed in the respective chapter C.III.19.

The risk of contamination of the geological environment by RAS related to transport is prevented by respecting the legislative requirements for radiation control and transport requirements in accordance with ADR. With regard to transport, the risk of certain contamination of the soil layer by leakage of hazardous substances from vehicles (e.g. oil, gasoline), removable by common remediation works, appears to be the most realistic risk. Such leakage, however, would not necessarily affect the geological environment in the case of early and effective intervention.

The ***mineral deposits*** are not affected by the activity.

The respective area is not located within a territory with active exogenous geodynamic phenomena (landslides, increased water or wind erosion, etc.), and the activity, given its nature, does not induce such phenomena at the affected location. The design of buildings and installation of the A1 NPP with the given technology took into consideration the results of the evaluation of the ***seismic risks*** within the affected area. Later re-assessment of the seismic risk of the location did not result in the need for seismic protection of the buildings either.

Given its location and nature, the proposed activity does not have any impacts on the local ***geomorphological conditions.***

III.3. IMPACTS ON THE CLIMATE CONDITIONS

The assessed activity comprises an incineration process which is the source of carbon dioxide as a greenhouse gas produced during natural gas incineration in the LOOS boiler and RAW incineration in the incinerator.
Major part of heat required for the facility operations is supplied by the V2 NPP.
The annual natural gas consumption in the reference year 2011 was 1,593m^3, which corresponds to approx. 3 tons of CO_2; after completion of the reconstruction which comprised the use of natural gas as support fuel (in 2012), the incinerator consumed approx. 97,193m^3, i.e. approx. 187 tons of CO_2 was released from the incineration of fossil fuels..
In relation to total CO_2 emissions in the SR which reaches tens of millions of tons of CO_2 per year, including traffic and agriculture, such emissions represents one ten-thousandth part of one per cent. The significance of such sources is therefore proportional to a small share of their CO_2 emissions compared to the total emissions of greenhouse gases in the SR.

The assessed activity is situated within the existing buildings of the large NFF site in Jaslovské Bohunice, which suggests that the activity has no relevant impacts on the local micro-climate, for example, in relation to changes in the development of the area, etc.

III.4. IMPACTS ON THE AIR

Due to the absence of a standard ***implementation stage,*** no relevant impacts on air will occur in this regard.

The ***operation of the*** RAWPTT technologies and A1 NPP decommissioning produce primarily waste air from the controlled zone spaces and from the technologies, and is contaminated by radionuclides. If the entire designed potential of installed air-conditioning systems is used, the amount of waste air would reach approx. 628,600m^3/h, discharged to the municipal air after being cleaned through three outlets (the vent chimney in building 46 is separated by a vertical screen in two parts, for more details see Chapter B.II.2.). In 2011 when approx. 60% of the processing potential of core technologies was used, the volume of waste air thus discharged reached 1.869x10^9 m^3 and

its activity met the limits defined by the PHA SR with a large margin (it was several orders of magnitude lower) (see Chapter B.II.1.). A comparable situation occurred in 2012. This proves the efficiency of the measures implemented to limit the impacts of the operation on air quality through gas discharges of radionuclides.
This situation is not expected to substantially change after the processing capacity of the LCDL worksites and units for the fragmentation of metallic RAW has increased, which was dealt by under an independent (already approved) assessment process, and is currently at the stage of preparation, nor in relation to the implementation of technical modifications of the technologies, such as extension of the facility for the fragmentation of large-sized metallic RAW in the MPB for the purpose of its further processing at the RAWPTT.

The potential risks of environment contamination (including air) as a result of the disruption or destruction of protection barriers (e.g. due to natural disasters /flood, earthquake, etc./ or disasters caused by human activities /plane crash, etc./) are detailed in Chapter C.III.19.

The operation of the RAW incinerator (part of the BRAWPC) is accompanied by the discharge of flue gases containing common pollutants as a result of waste incineration. The flue gases are discharged from the common chimney for extracted air owned by the BRAWPC building (40m high). The concentrations of pollutants in flue gases are monitored, and the scope of monitoring is based on the relevant air protection legislation.
In order to assess the impacts of the RAW incinerator operation on air quality through emissions of common pollutants, a qualified person prepared a dispersion study on the basis of a conservative estimate (considering the maximum acceptable volume flows), which showed compliance with all the set and recommended legal limits for immission concentrations for the protection of health with a large margin (the contribution of the assessed activity in the form of calculated maximum short-term immission concentrations did not exceed 3% of the respective limit values). At the same time, the assessed activity complies with the requirement for the minimum chimney height to ensure the dispersion of common pollutants (the chimney is higher by half compared to the required height).
Hence, the activity was evaluated as an activity without major impact on the long-term or short-term regime of air pollution within the affected area.

The RAW processing and treatment also produces other pollutants, such as solid pollutants with the handling of dusty materials during cementation or grinding, or VOC with the handling of heated bitumen, etc. If relevant, such pollutants are efficiently removed from the extracted air using special separation equipment. Given the height of the used venting chimneys discharging almost all air treated in this way and their existence proportional to the extent of the activities performed, the remains of such substances cannot have any relevant impacts on the immission situation in the surroundings.

The operation of the RAWPTT technologies and A1 NPP decommissioning also have an indirect proportional contribution to emissions produced by traffic. This Proponent´s contribution, however, does not have a major impact on the air quality of the affected area (for example, with freight transport outside of the site representing max. 0.5% share in the total traffic or internal traffic with 1-2 drive-throughs a day).

III.5. IMPACTS ON THE WATER CONDITIONS

Due to the absence of a standard ***implementation stage,*** no impacts on the water conditions occur.

The ***operation*** of the activity is accompanied by the production of common sewage and storm waste waters at volumes proportional to the area of the affected buildings and the size of the personnel. Waste waters are drained to a surface recipient: Dudváh river for storm waters, and Váh river for sewage waters. Before being discharged, sewage waste waters are treated at the WWTP of the V1 NPP. Waste waters are drained to the recipient pursuant to the Decision of the Regional Environmental Office Trnava (current wording). In the reference years 2011 and 2012, all limits set for chemical contamination of discharged waters were met. The activity of discharged storm waters is also monitored (see below).

The Váh river is the recipient of technological waste waters. The waste waters are drained to the recipient after being treated in the (active) waste water treatment plant (building 41) to reach the required activity level and after being monitored.
The activity level of waters drained from the RAWPTT NF and A1 NPP are specified in the Decision of the PHA SR. It can be stated on the basis of the monitoring that the set limits are met with a large margin; for example, in 2011, when almost 60% of the processing potential of the core operation units of the given technologies was used, the activity of radionuclides discharged to the hydrosphere did not reach in any of the monitored indicators more than 3.5% of the set limit (tritium). In 2012, the situation concerning compliance with the limits was even more favourable.
These results prove the efficiency of the measures implemented to limit the impacts of the operation´s impacts on water quality through liquid discharges of radionuclides.
This situation is not expected to substantially change after the processing capacity of the LCDL worksites and units for the fragmentation of metallic RAW has been increased which was dealt by under an independent (already approved) assessment process and the implementation of which is currently at the stage of preparation, nor in relation to the implementation of technical adjustments of the technologies, such as extension of the facility for the fragmentation of large-sized metallic RAW in the MPB for the purpose of its further processing at the RAWPTT.

The potential risk of water contamination as a result of non-standard operating conditions is prevented by the design of operation premises (sealed joints between floors and walls, water-proof floors and walls up to a reasonable height, sloped areas conducting to the active sewer system), and by the applied procedures which form part of the approved emergency plan. The potential risk of environment contamination as a result of the disruption or destruction of protection barriers (e.g. due to natural disasters /flood, earthquake, etc./ or disasters caused by human activities /plane crash, etc./) are detailed in Chapter C.III.19.

With regard to the flow conditions of recipients, it can be stated that the operator meets all issued consents and decisions for the draining of waste waters to the surface recipients Dudváh and Váh. The technological waters related to the given technologies the amount of which can be clearly specified in proportion to the total volume of waters discharged by the Proponent to the Váh recipient is only about 1%, including cases where the entire processing capacity of the respective technologies is used (in 2011).

The draining conditions of the location have long been influenced by the existence of the A1 NPP buildings which include the RAWPTT technologies.

Note:
The ground waters within the site are affected by their recovery pumping with regard to the A1 NPP decommissioning (though not in direct relation to the given technologies) in compliance with the respective decision of the Regional Environmental Office Trnava.

III.6. IMPACTS ON SOIL

Due to the absence of a standard ***implementation stage,*** no relevant impacts on soil will occur in this regard.

The ***operation*** of RAWPTT and A1 NPP decommissioning technologies is located within the existing buildings of the former A1 NPP site, i.e. the facility´s impact on the occupation of new land is irrelevant.

With regard to the potential impacts caused by contamination, it can be assumed in relation to common pollutants that under normal operating conditions the RAWPTT and A1 NPP decommissioning technology are not a source of common pollutants at amounts representing a risk to soil contamination, change in their chemical composition (acidation), etc. The existing soils in the surroundings of the assessed activity are classified as soils resistant or slightly prone to acidifying effects, and there is a medium risk of contamination of plant production by metals.

The impact of RAS discharges on soils, e.g. through rain fall or rain washing, is monitored with the comprehensive system of environmental impact monitoring of nuclear facilities in Jaslovské Bohunice; in the reference year 2011 (and in a long term), this impact was evaluated as minimal on the basis of the monitoring results. This situation is not expected to substantially change after the processing capacity of the LCDL worksites and units for the fragmentation of metallic RAW has been increased, which was dealt by under an independent (already approved) assessment process and the implementation of which is currently at the stage of preparation, nor in relation to the implementation of technical modifications of the technologies, such as extension of the facility for the fragmentation of large-sized metallic RAW in the MPB for the purpose of its further processing at the RAWPTT.

The potential risk of environment contamination in the surroundings of the facility as a result of non-standard operating conditions was assessed, for example, in the Pre-Operation Safety Report for RAWPTT which considered the area bounded by the border of the neighbouring area of the V-1 NPP nuclear facility site as the common disaster area considered for the compound of the Proponent´s facilities composed of the A1 NPP, RAWPTT, interim storage facility for spent fuel (ISSF) and an integral storage facility (IS) for RAW. The various emergency scenarios considered do not assume exceeding of the intervention levels and their guide values for immediate and subsequent measures. The facility operation will not create an area in the vicinity of the facility that would threaten life, health or property in the case of extraordinary events accompanied with the release of hazardous pollutants. The potential risk of environment contamination as a result of the disruption or destruction of protection barriers (e.g. due to natural disasters /flood, earthquake, etc./ or disasters caused by human activities /plane crash, etc./) are detailed in Chapter C.III.19.

Non-standard situations of common nature, such as transport (e.g. oil or gasoline leakage from motor vehicles into non-reinforced soil) can be solved by common remediation works. The leakage of RAS is prevented by observing the legal requirements for radiation protection and transport conditions in compliance with the ADR.

III.7. IMPACTS ON THE FAUNA, FLORA AND THEIR BIOTOPES

Due to the absence of a standard ***implementation stage,*** no relevant impacts on the fauna, flora, and their biotopes will occur.

The buildings in which the RAW processing and treatment technologies are installed form part of the NF compound in Jaslovské Bohunice. This compound is surrounded by a rural countryside with characteristic, predominantly agricultural use. The closest uninhabited areas outside of the given site are located in its direct vicinity, north from the Proponent´s buildings, and constitute arable land. This corresponds to the expected occurrence of fauna and flora (species of monoculture agricultural communities and synantropic species residing on the edge of human settlements), and poor species diversity.

The closest, less anthropogenically altered biotopes with the probability of bigger species diversity are the biotopes of the areas which form part of small protected zones, such as Dedova jama protected area approx. 6km eastwards from the NF site, etc.

These facts and the nature of the activity which is not associated with people´s dispersion in the adjacent, less anthropogenically altered biotopes suggest that the proposed activity does not represent a source of major direct impacts on the fauna, flora and their biotopes. This also applies to the indirect impact on the health condition of the fauna and flora in the given location (including their biotopes) on the basis of the conclusions of regular monitoring evaluation of soil activity, grass, aerosols, waters, sediments, snow falls, rain falls, agricultural production samples, fish and ambient dose equivalent rates, which assess the radiological impacts of the nuclear facilities compound (including the

Proponent´s activity) as minimal (the Slovak legislation does not define any standards for the exposure of non-anthropoid biotopes).

This situation is not expected to substantially change after the processing capacity of the LCDL worksites and units for the fragmentation of metallic RAW has been increased which was dealt by under an independent (already approved) assessment process and the implementation of which is currently at the stage of preparation, nor in relation to the implementation of technical modifications of the technologies, such as extension of the facility for the fragmentation of large-sized metallic RAW in the MPB for the purpose of its further processing at the RAWPTT.

As per Decree of the Ministry of Agriculture, Environment and Regional Development of the SR No. 360/2010 Coll. on air quality, average annual limit values have been set for common pollutants for the protection of ecosystems: 20 $\mu g/m^3$ for SO_2, and 30 $\mu g/m^3$ for NO_2. The immission concentrations of SO_2 within the affected area and its vicinity are between 1.001 – 5.0 $\mu g/m^3$, and the concentrations of NO_2 between 5.1 and 10.0 $\mu g/m^3$ (according to Slovakia´s regionalisation in 2010).
In this regard, the assessed activity can be a relevant source of emissions of common pollutants only in relation to the RAW incinerator operation. According to the dispersion study based on a conservative approach, the maximum short-term concentrations of such pollutants occur at a distance of approx. 400m from the respective venting chimney, and reach max. 9.4 $\mu g/m^{-3}$ (for SO_2). If we consider that the average annual concentrations subject to the limit for the protection of ecosystems are several orders of magnitude smaller than the calculated maximum short-term immission concentrations, there is no reason to consider the operation of this source as a risky contributor to the existing immission burden of the affected area with a negative impact on the health condition of the fauna, flora and its biotopes.

III.8. IMPACTS ON THE LANDSCAPE

Due to the absence of a standard ***implementation stage,*** no relevant impacts on the landscape and on its ecological stability will occur.

The RAW processing and treatment technology is situated in buildings within the NF site in Jaslovské Bohunice, designed as a standard industrial building area. The impact of the activity on the landscape scenery, its image and structure is practically irrelevant.

III.9. IMPACTS ON PROTECTED AREAS AND THEIR PROTECTED ZONES

The proposed activity is located at an area falling under the first, lowest degree of territorial protection pursuant to Act No. 543/2002 Coll. on Nature and Landscape Protection as amended. The implementation of the activity will therefore not affect directly any small or large protected area or their protection zones (the protected areas in the vicinity of the assessed activity and the distances are specified in Chapter C.II.9.).

Within the affected area, no protected trees, wetlands of national or regional importance have been designated. The wetlands of local importance located within the cadastral territories of affected municipalities are not in direct contact with the locality of the assessed activity.

Given the distances, the nature of the assessed activity and its outputs, direct impact on the subjects of nature and landscape protection is excluded.

With regard to indirect impacts of the given activity which are potentially relevant from the point of view of the distances of protected areas from the place of the activity only with respect to the contribution to radiation and immission burden, the following can be concluded:

- ✓ The data on the activity of the samples of soils, grass, aerosols, depositions, waters, sediments, rainfalls, samples of agricultural production, as well as ambient equivalent dose rates obtained by means of regular and long-term monitoring of the radiation load performed in the affected area in connection with the operation of the entire compound of nuclear facilities in Jaslovské Bohunice shows that their cumulative radiological impact is minimal (the Slovak legislation does not define any standards for the exposure of non-anthropoid biotopes). The assigned limits of the activity of discharges per nuclear facility within the area suggest that the given package of technologies (including ISSF) has the smallest share in the radiation load (the assigned limit for the total individual effective dose per inhabitant is only 60% of the limit for the decommissioned V1 NPP, and only 24% of the limit for the V2 NPP in operation).

  (Note: This situation is not expected to substantially change after the processing capacity of the LCDL worksites and units for the fragmentation of metallic RAW has been increased, which was dealt by under an independent (already approved) assessment process, and the implementation of which is currently at the stage of preparation, nor in relation to the implementation of technical modifications of the technologies, such as extension of the facility for the fragmentation of large-sized metallic RAW in the MPB for the purpose of its further processing at the RAWPTT.)

- ✓ With regard to the immission burden, the assessed activity as a source of emissions of common pollutants mainly from the RAW incinerator facility contributes with less than 3% of the limit values for human health protection to short-term immission concentrations under a conservative approach. Under Decree of the MoAERD SR No. 360/2010 Coll. on air quality, only average annual limit values are set for the protection of ecosystems: 20 μg/m^3 for SO_2, and 30 μg/m^3 for NO_2. In the affected area and its vicinity, the immission concentrations of SO_2 according to the regionalisation of the SR (2010) are between 1.001–5.0μg/m^3, and NO_2 concentrations between 5.1–10.0μg/m^3.

  According to the dispersion study, the maximum concentrations of pollutants from waste incineration are found at a distance of approx. 400m from the venting chimney, and reach max. 9.4 μg/m^3 (for SO_2). Since the average annual concentrations which are subject to the limit for ecosystems protection are several orders of magnitude smaller than the calculated maximum short-term immission concentrations, and the closest subject of interest of nature and landscape protection (SKCHVU054 Špačinsko-nižnianske polia) is situated at a distance of 1km from the border of the site, there is no reason to consider the operation of the given source to be a risk of unacceptable indirect adverse impacts on the health condition of the subject of protection.

The potential risk of contamination by radionuclides of the surroundings of the site with the RAW processing and treatment technology as a result of non-standard operating conditions was evaluated under the Pre-Operation Safety Report (for more details see Chapter C.III.19), which concluded that the operation of the facility would not create an area where life, health or property can be threatened in the case of extraordinary events accompanied by release of hazardous pollutants.

III.10. IMPACTS ON THE TERRITORIAL SYSTEM OF ECOLOGICAL STABILITY

The assessed activity is located outside of TSES elements, which excludes direct intervention into any element of the skeleton of the territorial system of ecological stability and subsequent impact on its function. At the same time, given its character and extent of impacts caused by the facility´s operation, it is not expected that the activity would break the functioning of the ties or influence the current health condition of TSES elements (see, for example, Chapter C.III.9.).

III.11. IMPACTS ON THE URBAN COMPLEX AND LAND USE

Due to the absence of an ***implementation stage,*** no relevant impacts on the urban complex and land use will occur.

The operation of the RAW processing and treatment technologies will not affect the structure of the given urban units.

The traffic connection affects the technical infrastructure of the site and the transport infrastructure of the affected area (the share of freight transport of the given activity in the traffic load, under a conservative approach and methodological disadvantage, is max. 3.7% of freight transport).

The RAWPTT technologies and A1 NPP decommissioning have only an indirect potential impact on the agricultural and forest management use of land through the facility´s contribution to the radiation burden of the area. This contribution is minimal (confirmed by regular systematic monitoring which also includes the monitoring of activities of certain agricultural commodities, such as milk, grass, meat, etc.), and does not represent a risk to health or property in the surroundings of the RAW processing and treatment facility not even under non-standard operating conditions.

The operation of the facility has a large impact on the industrial use of the area, since it represents for the nuclear energy facilities within the area (and outside of it) the possibility to treat the RAW produced by the facility operation and later by decommissioning in a safe and comprehensive way.

The production of inactive waste (approx. 735t in 2011; RAW is subject to a separate regime) comprising common operating waste, such as packaging materials, waste from maintenance of equipment and premises, municipal waste, etc., as well as recyclable waste from A1 NPP decommissioning (concrete, metals, earth, etc.) has minimum impacts on common waste management of the affected area.

No other impacts on the urban complex and land use are known.

III.16. OTHER IMPACTS

No other impacts of technologies operation than those listed above have been identified in the affected area that could influence the comfort and quality of life of the affected municipalities´ inhabitants or of the inhabitants of the more distant surroundings, natural environment or the landscape.

Given its nature and location, the implementation of the activity will not affect the cultural and historic sites, archaeological and paleontological sites, or any important geological localities or cultural values of intangible nature.

Under standard impacts on the different parts of the environment *occurring after expiry of the equipment lifecycle* and at the time of its liquidation related to the dismantling of the installed equipment and subsequent demolition and removal of buildings (noise, increased traffic load, dust, etc.), the level and extent of such impacts are expected to correspond to the extent of recovery works (i.e. impacts of little significance with limited territorial reach).

With regard to radiation impacts, the decommissioning of the RAWPTT facility (we only mention the RAWPTT facility because the technologies used to implement the tasks related to the 2nd stage of A1 NPP decommissioning will be included in the RAWPTT facility after completion of the set tasks) will be performed in compliance with the approved decommissioning plan which must always fully respect all requirements for radiation protection. The recommended option is to launch the decommissioning immediately after the operation has stopped, until complete vacation of the locality. A concept of decommissioning has been recently prepared (Conceptual Decommissioning Plan) which will be continuously updated (in relation to the planned NPP decommissioning; the RAWPTT will not be decommissioned before the second half or third fourth of this century).

In short, the decommissioning process will consist of the following steps:

- ✓ Pre-assembly decontamination (decontamination of the contaminated internal and external surfaces of technological equipment before disassembly);
- ✓ Disassembly of technological systems by rooms (systematic disassembly of technological equipment by NF rooms);
- ✓ Decontamination of building surfaces;
- ✓ Radiation survey of the constructional part (obtaining of data to find out whether the constructional part can be exempted from radiation control);
- ✓ Demolition of the constructional part.

The details of the expected contamination of premises, the amount of waste, etc. form a part of the concept of decommissioning, and will be updated during the RAWPTT operation depending on due changes. According to the recent version, the recommended option with 325 FCCs to be deposited at the NRAWR is expected to produce approx. 6,331.2 tons of non-recoverable waste and emissions of approx. 8.15×10^6 Bq in the form of gas and liquid discharges, and with a collective dose equivalent of 2.033manSv. To have an idea, the Proponent is allowed to annually discharge to the Váh recipient tritium with activity of 1.0×10^{13} Bq.
For the sake of completeness, it should be noted that the operated technologies will serve for partial liquidation of the technical components of respective worksites after expiry of their lifecycle during operation of the facility.

III.17. SPACE SYNTHESIS OF IMPACTS OF THE ACTIVITY WITHIN THE AFFECTED AREA

SYNTHESIS OF NEGATIVE IMPACTS

The negative impacts of the assessed facility include, in particular, a contribution, though minimal, to the radiation burden of the affected area.

From the point of view of the space synthesis of impacts, it can be concluded that the affected area is currently burdened by ionising radiation and RAS immission produced by the SE-EMO (V2 NPP), V1 and A1 NPP decommissioning, and by the operation of RAW processing and treatment technologies (RAWPTT) and interim storage of spent fuels (ISSF). At present, the construction of an Integral Storage Facility for RAW (ISF RAW) is under preparation.

The radiation load from these nuclear facilities in Jaslovské Bohunice and its surroundings is monitored in compliance with the SE-EBO monitoring plans. The results of monitoring as per individual parts of the environment concerning the reference year 2011 are presented in the respective chapters of this report.

The level of the “permissible” radiation burden at a nuclear location, like the surroundings of the Jaslovské Bohunice nuclear facilities compound, depends on the limit value of the individual effective dose per person of the critical group of 250µSv/year (as set by Government Regulation No. 345/2006 on basic safety requirements for the protection of the health of workers and citizens against ionising radiation), which is defined for all routes of irradiation from all nuclear facilities within the area altogether. This value represents ¼ of the general limit for an effective dose for the population from artificial radioactivity sources of 1mSv/year as per this Regulation.

The limit values of the individual effective dose per person of the critical group under the relevant decisions of the PHA SR are redistributed among the nuclear facilities as follows:

Table C.III.17./01

Limit values of the individual effective dose (IED) per person of a critical group

Nuclear facility	***Operated by***	***IED limit***	***Share in the IED limit value***
SE-EBO (JE V2)	SE, a.s.	50 µSv/year	20%
V1 NPP	Javys, a.s.	20 µSv/ year	8%
A1 NPP + RAWPTT + ISSF	Javys, a.s.	12 µSv/ year	4.8%
Total		*82 µSv/* year	*32.8%*

Note: No individual IED limit is designed for the ISF RAW.

As the data above suggests, the PHA SR allowed the use of only a third of the limit value of the individual effective dose to a person from the critical group for all nuclear facilities within the area under Government Regulation No. 345/2006 on basic safety requirements for the protection of the health of workers and citizens against ionising radiation (250 µSv/year).

The actual discharges from nuclear facilities generate an IED several orders of magnitude lower than the allowed limits.

Table C.III.17./02

Highest annual individual effective doses to a representative person of the population calculated from liquid and gas discharges of radioactive substances from SE-EBO and JAVYS facilities

Year	***IED (nSv/year)***	***Location***	***Critical group***
2007	224.0	Pečeňady	Children 12-17 years
2008	216.0	Pečeňady	Children 12-17 years
2009	207.0	Pečeňady	Children 12-17 years
2010	156.0	Pečeňady	Children 12-17 years
2011	41.4 (Javys, a.s.) 176.0 (SE-EBO)	Ratkovce,Žlkovce (Javys, a.s.) Pečeňady (SE-EBO)	Children 2-12 years (Javys, a.s.) Children 12-17 years (SE-EBO)
2012	39.8 (Javys, a.s.) 185.0 (SE-EBO)	Ratkovce,Žlkovce (Javys, a.s.) Pečeňady (SE-EBO)	Children 2-7 years (Javys, a.s.) Children 12-17 years (SE-EBO)

Note: Since 2011, it has been only available under a separate assessment for th operator Javys, a.s. and SE-EBO.
(Source: radiation reports of operators)

Hence, it is clear that in the given area the limit value of the individual effective dose to a person from the critical group under Government Regulation No. 345/2006 is not reached (not even as a result of the cumulation of the impacts of several nuclear facilities), i.e. there is no justified assumption of a significant negative impact of the assessed activity not even in concurrence with other existing burdens of a similar nature.

It should also be emphasised in this regard that the assessed activity does not constitute an independent contribution to the radiation burden of the area, but it is an activity that directly relates to the decommissioning of some nuclear facilities within the locality and to the activities of some nuclear facilities operated within the locality.

To a certain degree, there will be a synthesis of the impacts of the assessed activity with the impacts within the affected area with regard to noise emissions, common waste waters and pollutants in the air, and traffic load, yet, the contribution of the given activity to other existing environmental burdens is acceptable in all cases (i.e. it does not represent a risk of exceeding the recommended or set limits for the protection of the environment or health of the population. For more details see the previous chapters).

SYNTHESIS OF POSITIVE IMPACTS

The functioning and safety of treatment of RAW produced by the operation and decommissioning of nuclear facilities or other human activities (e.g. research, medicine) directly at the place of their occurrence is undoubtedly the most important positive impact of the assessed activity.

Another advantage of the location of the technologies for RAW processing and treatment is the existence of an extensive, complex monitoring system for the different impacts caused by the treatment of radioactive materials, including monitoring outputs from the period before commencement of this activity in the affected locality.

From a spatial point of view, however, there is no direct synthesis of positive impacts during the implementation of the assessed activity given their nature.

III.19. OPERATIONAL RISKS AND THEIR POTENTIAL IMPACT ON THE AREA

Due to the absence of a standard ***implementation stage,*** no relevant risks will occur with the respective activity in this regard.

Given its nature, the ***operation*** of the technologies for RAW processing and treatment has been assessed from the point of view of operational risks and potential impacts of extraordinary operating conditions, and in particular from the point of view of ***radiation safety.***

At present, after a periodical evaluation of nuclear safety has been conducted, an updated version of the Pre-Operation Safety Report for the RAWPTT NF is at the process of approval.
The conclusions of the safety analysis for the RAWPTT are described below.

Safety analysis for RAWPTT

A safety analysis was conducted for the safety report concerning the RAWPTT based on a conservative approach (i.e. full use of the processing and storage capacities of the planned operation nodes and premises, also with a view to the increased processing capacity of LCDL worksites and metallic RAW processing subject to a separate assessment process).

For the purposes of the safety analysis, the following operation events were considered pursuant to nuclear safety regulations:

- for internal causes – events/accidents usually accompanied by impacts on the operation staff;
- for external causes – events/accidents accompanied by impacts on the operation staff and the environment.

The following general matrix was used to assess the dangerous and initiation events identified:

CONSEQUENCES **Frequency of occurrence**	**BIG** **ID > 1 mSv** **CD > 5 mSv** **Damage > EUR 10,000** **Shutdown period > 30 days**	**MEDIUM** **0.1 < ID ≤ 1 mSv** **0.5 < CD ≤ 5 mSv** **Damage ≤ EUR 10,000** **10 days ≤ Shutdown period ≤ 30 days**	**SMALL** **ID ≤ 0.1 mSv** **CD ≤ 0.5 mSv** **Damage ≤ EUR 1,000** **Shutdown period ≤ 1 days**
HIGH **Probability 1** **Occurrence once per year**	**1A**	**1B**	1C
MEDIUM **Probability 0.1** **Occurrence once per 10 years**	**2A**	2B	2C
LOW **Probability 0.01** **Occurrence once per**	3A	3B	3C

CONSEQUENCES Frequency of occurrence	**BIG** **ID > 1 mSv** **CD > 5 mSv** **Damage > EUR 10,000** **Shutdown period > 30 days**	**MEDIUM** **0.1 < ID ≤ 1 mSv** **0.5 < CD ≤ 5 mSv** **Damage ≤ EUR 10,000** **10 days ≤ Shutdown period ≤ 30 days**	**SMALL** **ID ≤ 0.1 mSv** **CD ≤ 0.5 mSv** **Damage ≤ EUR 1,000** **Shutdown period ≤ 1 days**
100 years			

Explanatory note: ID – individual dose, CD – collective dose
The most serious threats that need to be analysed in details are 1A, 1B, 2A. It is necessary to define ways and implement measures to minimise their occurrence.
The next serious threats 3A, 2B, 1C need to be considered and assessed from the point of view of the optimisation of costs used to reduce the risks and efficiency of measures.
The least serious threats that can be neglected in analyses are the combinations 3B, 2C and 3C.

A) OPERATIONAL INCIDENTS CAUSED BY INTERNAL FACTORS

It is mainly incidents resulting in:

a) leakage of radioactive substances from the packaging unit, and the leakage is localised within the worksite or building;

b) damage to the packaging unit without leakage of radioactive substances;

c) failures of equipment or building structures, where the elimination of the causes of failure and restoration of the operating condition are accompanied by personnel dose burden.

The following initiating incidents were identified for the RAWPTT:

BRAWPC **–** condenser cooling outage; power supply outage; loss of regulating air pressure; loss of cooling water pressure; loss of steam pressure; over-flow of cement paste from the diagonal mixer outside of the container opening and its running down the external surface of the FCC and into the roll-way under the container; obstruction of the dosing ash tank outlet; leakage of dust particles during ash handling; solidification of the cement paste in the diagonal mixer in the event of power supply outage; pressure air outage; failure of the device condition signalling system (end switches and position detectors); loss of electric voltage (local, total); leakage of liquid combustible RAW in particular during its pumping from the transport container; obstruction of the tank or outlet or nozzle; problems with the batching of solid waste carried to the furnace; damage to the ash grinder; electric heater outage; leakage of contaminated washing solutions outside of the transport route; outage of the main blower; obstruction of the washing solutions routes and loss of function of combustion gas washers; contamination by liquids; contamination by active dust;

Bituminisation lines **–** pipe system leakage; tanks and technological equipment leakage; over-flow of barrels during fixed waste filling; over-flow of the bitumen operation tank;

rupture of the condenser pipes; rupture of the evaporator´s pre-heater with natural circulation; decanter failure; centrifuge failure; failures in the air-conditioning system; suction fan failure;

Waste water treatment station WWTP – over-filling of tanks, pipeline leakage, tank leakage;

Large-capacity decontamination line – failures of storage, measuring, preparatory and sedimentation tanks, steeping and decontamination pools, pipeline systems, distributions and fittings, pump seals, damage to the rubber hose at the discharge part of the submersion sludge pump; fall of the decontamination basket or other object to the decontamination pool or on the LCDL floor; failure of the blasting equipment;

Fragmentation unit – accidents during transportation: fall of contaminated burdens accidents during incorrect handling of contaminated materials; accidents related to the operation of air-conditioning equipment;

Unit for the processing of used air-conditioning filters – outage of the air-conditioning systems O-34F/2 and O-434/2, grinder failure during the grinding of air-conditioning filters; fall of a barrel filled with metallic filter fragments during transportation; rupture of a PE bag filled with solid combustible RAW; rupture of a barrel during the pressing of non-metallic fragments of used AC filters;

Certified RAW storage facilities – fall of a pallet with barrels from transport vehicles and damage to the barrel during pallet handling; failure of the transport vehicle during transportation or unloading of pallets with barrels; power supply outage while the personnel is present in the storage area; building structure failures; partial penetration of water in the storage area; electrical fire in the storage area.

According to the matrix shown above, these incidents were classified as 3B (least serious threats that can be neglected in analyses), or 2B (the measures aimed to liquidate the accidents should be considered and assessed from the point of view of the optimisation of costs used to reduce the risks and the efficiency of measures).

The analysis of these operating incidents suggests that the integrity of the building would not be affected, and the consequences of incidents can be eliminated by technical means in the RAWPTT buildings without affecting the environment. The probability of the personnel being exposed to increased radiation doses directly as a result of the incident is very small; the personnel can be exposed to increased radiation doses during the liquidation of accidents and repair of equipment; during these activities, however, the operation rules must be complied with in line with the ALARA principles, and the doses are regulated and minimised.

B) OPERATIONAL INCIDENTS CAUSED BY EXTERNAL FACTORS

The following incidents were considered as basic external initiating events that can cause uncontrollable course of events in the RAWPTT buildings during RAW processing and treatment:

- ✓ processing of waste which fails to meet the specification;
- ✓ fire;
- ✓ explosion;
- ✓ leakage;
- ✓ mechanic damage;
- ✓ earthquake;
- ✓ plane crash;
- ✓ flood;
- ✓ lightning and fragments of objects borne by wind.

The analysis of these operational incidents suggests that the building integrity can be disrupted in the event of an earthquake of over 8° MSK, plane crash or explosion.

The following events were identified as the most serious incidents/accidents with possible RAS release to the environment:

✓ Fire in the BPC – incinerator	3A
✓ Fire in the BL	3A
✓ Earthquake of over 8° MSK, plane crash, explosion – release to the atmosphere	3A
✓ Earthquake of over 8° MSK, plane crash, explosion – release to the hydrosphere	3A
✓ Flood – release to the hydrosphere	3B

The consequences of other postulated incidents can be removed by technical means in the RAWPTT buildings without affecting the environment. As far as the exposure of the personnel is concerned, the conclusions concerning operational incidents caused by internal factors apply.

The initiation events shown in the tables below were selected as the representative – most serious – initiation events from the point of view of discharges to the atmosphere and hydrosphere for the calculation of the impacts of exposure (conservative approach - considering the maximum capacity of the equipment or of the building from the point of view of the stored or processed amounts of RAW and its actual radionuclide composition):

Table C.III.19./01a

Representative accidents for RAWPTT – leakages to the atmosphere

Emergency	**Leakage to the atmosphere [Bq]**
Earthquake of over 8° MS, plane crash, explosion	3.45×10^{6}
Outage of operation media supply	4.50×10^{5}
Fire	$\mathbf{6.60 \times 10^{10}}$

Table C.III.19./01b

Representative accidents for RAWPTT – leakages to the hydrosphere

Emergency	**Leakage to the hydrosphere [Bq]**
Earthquake of over 8° MS, plane crash, explosion	$\mathbf{3.00 \times 10^{12}}$
Flood	3.00×10^{08}

The tables above suggest that RAW fire can be considered as an overlapping incident for leakages to the atmosphere with a total discharge of 6.6×10^{10} Bq. Radioactivity of leakages to the hydrosphere occur with emergency events, such as earthquakes of over 8º MSK, plane crash or explosion with total expected leakage of 3.0×10^{12} Bq.

A computing programme was used to calculate the radiation impacts in the event of leakages to the atmosphere. This programme is designed to assess the radiation situation mainly in the early phase of an accident, i.e. in the period between the moment of recognising potential exposure of individuals and leakage of a substantial part of radioactivity to the environment, but also at later phases (e.g. Real Time Accident Release Consequence Programme /RTARC/). The determinist RDEBO programme (Annual doses in the EBO environment) was used to calculate the leakages to the hydrosphere.

According to the criterion under Art. 15 of Government Regulation No. 345/2006 Coll., the limits for exposure of the population for expected events of **1mSV per year** may not be exceeded in the surroundings of a nuclear source, i.e. at the border of the protection zone (area without permanent settlements – approx. 3km for EBO).

The conclusions of the assessment of radiation consequences for selected (representative) initiation events are as follows:

- ✓ *<u>Fire</u>*

The highest values of predicted effective doses (RTARC programme) were calculated for the category of F stability (air stability) for all age groups. From the point of view of effective doses, the critical age group is the group of 12–17 years old, and with regard to equivalent organ doses, it is the age group of 2–7 years old.

Table C.III.19./02

The worst values of possible individual doses at the border of the hygienic protection zone in the case of a reference accident – fire in the BPC

Acceptability criterion	Calculated RTARC values (3km)	Age category (years)
Effective dose < 1 mSv/year	2.30×10^{-3} mSv/ year	12–17
Equivalent thyroid dose < 1 mSv/year	2.44×10^{-3} mSv/ year	2–7
Equivalent bone marrow dose < 1 mSv/year	2.79×10^{-3} mSv/ year	2–7
Equivalent skin dose < 50 mSv/year	1.46×10^{-2} mSv/ year	2–7

The calculated values of annual individual doses at the border of the protection zone are <u>~3 orders of magnitude lower</u> than the set acceptability criteria under current legislation.

- ✓ <u>*Earthquake of over 8° MSK (plane crash, explosion)*</u>

The highest value of the individual effective dose per 1 day in the case of discharge to the hydrosphere – Váh river – was calculated for babies from drinking water ingestion in zone 92 = 4.67×10^{-10} Sv, and with regard to discharge to the hydrosphere – Dudváh river – the calculated value is = 7.00×10^{-8} Sv in zone 89.

The highest annual individual effective dose in the case of RAS discharge to the hydrosphere – Váh river – was calculated for the age group of children under 1 year = 1.99×10^{-06} Sv, in zone 92, i.e. in south-south-east direction at a distance of 15–20km at the waters outlet from the SOCOMAN pipe collector to the Váh river.

The highest annual individual effective dose in the case of RAS discharge to the hydrosphere – Dudváh river – was calculated for the age group of children under 1 year = 2.98×10^{-04} Sv, in zone 89, i.e. in south-south-east direction at a distance of 5–7km at the waters outlet from the Manivier channel to the Váh river.

Radionuclides ^{3}H, ^{90}Sr and ^{60}Cr would contribute most to the one-day effective individual dose, and radionuclide ^{60}Co to the annual effective individual dose. The main route of exposure in the case of the one-day dose would be drinking water ingestion, and in the case of the annual dose it is stay on sediments. The contribution of other routes of exposure is negligible. No ingestion of fish and food contaminated by irrigation is considered in the case of this accident.

✓ *Parallel occurrence of both initiation events*

In the case of parallel occurrence of both accidents, i.e. earthquake of over 8°MSK (plane crash, explosion) and fire in the BRAWPC, the impacts of RAS release to the hydrosphere are crucial. The highest doses at the border of the protection zone are provided in the table below.

Table C.III.19./03

The worst values of annual ID values at the border of the hygienic protection zone in the case of a reference accident – earthquake of over 8° MSK (plane crash, explosion) in the RAWPTT NF and fire in the BPC

Acceptability criterion	*Calculated ID values [mSv/year[1]]*			*Age category (years)*
	RDEBO - Váh, Zone 92 (children up to 1 year)	*RDEBO – Dudváh, Zone 89 (children up to 1 year)*	*Calculated RTARC values (3km)*	
Effective dose < 1 mSv/year	1.99×10^{-3}	**0.298**	2.30×10^{-3}	12-17
Equivalent thyroid dose < 1 mSv/year	2.36×10^{-3}	0.354	2.44×10^{-3}	2-7
Equivalent bone marrow dose < 1 mSv/year	2.12×10^{-3}	0.317	2.79×10^{-3}	2-7
Equivalent skin dose < 50 mSv/year	2.73×10^{-3}	0.410	1.46×10^{-2}	2-7

The values of annual individual doses at the border of the protection zone calculated by the RTARC programme for a reference accident of "BPC fire" type are ~3 orders of magnitude lower than the set acceptability criteria under the current legislation, i.e. 1mSv. The values of annual individual doses at the point of liquid waste discharge to surface waters calculated by the RDEBO are ~3 orders of magnitude lower than the set acceptability criteria under the current legislation for discharges to the Váh river, and are close to the limit value of 1mSv for discharges to the Dudváh river.

For conclusion, these results suggest that the acceptability criteria have been met with regard to the analysed accidents.

It should be mentioned in this regard that the hazard area of the RAWPTT was defined jointly for the A1 and ISSF by Decision of the NRA SR No. 97/2006 as an area bounded by the border of the V1 NPP site corresponding to the barrier of the NF guarded area where no presence of people living in this area is assumed. It was concluded on the basis of the safety analysis and relevant legislation that it was not necessary to prepare a Population Protection Plan (PPP) since the hazard area is within the NF fencing and no ties to the Population Protection Plan have been defined. The measures in this hazard area only concern employees and people present in within the JAVYS site in Jaslovské Bohunice.

IV. PROPOSED MEASURES TO PREVENT, ELIMINATE, MINIMISE AND COMPENSATE FOR THE ENVIRONMENTAL AND HEALTH IMPACTS OF THE PROPOSED ACTIVITY

IV.1. LAND-PLANNING MEASURES AND MEASURES FOR THE PERIOD OF THE PROPOSED ACTIVITY DESIGN

Since the given activity is already present in the affected area and is in operation, it is not necessary to deal with measures minimising adverse impacts during its preparation and construction.

The measures aimed to innovate and modernise the LCDL unit and metallic RAW fragmentation unit were implemented under a separate assessment process which was completed by a final approving opinion No. /2013-3.4/hp of 28 February 2013.

The measures concerning other small technical modifications of the activity by extending the equipment for the fragmentation of large-sized metallic RAW in the MPB for its further treatment in the RAWPTT do not require any specific measure to be taken during the period of their preparation; in general, however, the planning of these measures, like in any investment, must take into consideration compliance with all related legislation and protection of the environment and people´s health, as well as protection of the health of employees and compliance with all specific limits for the operation of the given activity (e.g. discharge activity, etc.).

IV.2. TECHNICAL AND TECHNOLOGICAL MEASURES

All required safety and operating documentation has been prepared for the operation of the respective activity, all approvals and decisions have been issued, and the monitoring proved the facility´s ability to meet the set limits.

Given the specific situation, it is recommended, in connection with the expected impacts and potential risks related to the operation of the activity, to further comply with all the conditions of issued decisions and consents, as well as consistent adherence to all internal regulations (operating regulation, emergency plan, etc.).

For any minor future changes in the technology (substantial changes will have to undergo the process of environmental impacts assessment), the affected work processes described in the operating rules will have to be modified accordingly and approved by the approving body (NRA SR).

It will always be necessary to implement technical or technological measures ensuring compliance with the personal dose limits for employees and the discharge limits of the assessed facilities.

IV.3. MEASURES IN THE CASE OF ACCIDENTS

As mentioned above, a safety analysis has been conducted for the assessed operation facility due to the specific situation, and its conclusions were incorporated in the work procedures applying to common and also extraordinary operating conditions. The work procedures as part of the mandatory operating documentation of equipment were approved by all competent authorities (NRA SR, PHA SR); it is therefore recommended to continue complying with all the requirements of issued decisions and approvals, and of all internal regulations.

IV.4. ORGANISATIONAL AND OPERATIONAL MEASURES

See comments above.

IV.5. OTHER MEASURES

- In order to eliminate the fears of the population of affected municipalities, it is necessary to choose a suitable form of providing regular information on the results of the monitoring of assessed activity and on the purpose of the operation and activities performed.

IV.6. OPINION ON THE TECHNICAL AND ECONOMIC FEASIBILITY OF MEASURES

All implemented measures have shown to be organisationally, technically and economically feasible.

V. COMPARISON OF THE PROPOSED ACTIVITY OPTIONS AND PROPOSAL FOR AN OPTIMAL OPTION (INCLUDING COMPARISON WITH THE ZERO OPTION)

V.1. DEFINITION OF THE SET OF CRITERIA AND DETERMINATION OF THEIR IMPORTANCE FOR THE SELECTION OF THE OPTIMAL OPTION

The definition of the assessment criteria has been based on the prediction that any activity within the given area can have an impact on the condition of any part of the environment, and on the ecological landscape features and socio-economic features of the given area.

V.2. SELECTION OF THE OPTIMAL OPTION OR DETERMINATION OF THE ORDER OF APPROPRIATENESS FOR THE ASSESSED OPTIONS

The proposed activity was presented for assessment as a single variant ***(option 1),*** which includes operation of technologies for the treatment and processing of RAW and technologies used in the A1 NPP decommissioning. The list, the purpose, and the processing capacity of the technologies are described in Chapter A.II.8.

The MoE SR abandoned the requirement to assess an alternative option of the activity on the basis of the Proponent´s justified request by letter no. 7243/2012-3.4/hp of 02 October 2012, with the condition of presenting another realistic option of the activity in case such request arises from the comments to the submitted Plan.

Further to the received opinions on the submitted Plan, no such request has arisen, as a result of which, pursuant to the law and the Assessment Scope No. 2671/2013-3.4/hp of 11 April 2013, another option assessed is the ***zero option,*** i.e. the state where the respective activity is not implemented within the area. Since the package of technologies forms part of the existing area of the Jaslovské Bohunice nuclear facility site (it underwent two EIA processes /in the given form/ in the past), such option cannot be assessed in detail with full certainty. In general, however, such option can be considered as a state with no direct (positive or negative) impacts directly induced by the operation of the given activity.

To make the results of assessment more transparent, the assessment was based on the method of assigning relative values within the score scale from -5 to +5 by which the qualitative properties/impacts shortly described by words are quantified.

Scale for the assessment of impacts:

+ 5 very significant positive long-term impact, usually with regional reach and beyond;
+ 4 positive, significant impact, long-term, usually with a local reach or with regional importance;
+ 3 positive impact of medium significance, usually of local importance;
+ 2 positive impact of little significance or with a small territorial reach;
+ 1 positive impact of very little significance, usually within a very limited territory;

0 without impacts, or irrelevant impact as to its significance;

- 1 negative impact of very little significance, usually within a very limited territory;
- 2 negative impact of little significance or with a small territorial reach;
- 3 negative impact of medium significance, usually of local importance;
- 4 negative, significant long-term impact, usually with a local reach or with regional importance;
- 5 very significant negative long-term impact, usually with a regional reach and beyond.

Table C.V.2./01

Comparison of the suitability of the assessed activity options

Area	***Criterion***	***Scoring***	
		Option 1	***Option 0***
Geological environment	Contamination of the geological environment	0 (The implementation of emergency measures prevents the release of hazardous substances to the geological environment)	0
Air	Emissions of common pollutants	-1 (Emissions from waste incineration, related power equipment and transport)	0
	RAS emissions	-2 (Limited RAS emissions from the air-conditioning outlet far below the set limits)	-1 (Small amounts of discharged RAS in the air extracted from storage areas, limited by cleaning)
Waters	Deterioration of water quality caused by common pollutants	-1 (Proportional volumes of common sewage and rain waste waters)	0
	Deterioration of water quality caused by RAS	-2 (Limited volumes of active waste waters discharged to Váh river; with activity far below the set limits)	-1 (Persistence of an impropriate condition – limited efficiency of barriers of the decommissioned A1 NPP – solved by recovery pumping of ground waters)
	Impacts on the draining and flow conditions	-1 (Proportional volumes of waters discharged to the Dudváh and Váh rivers, and draining of rainwaters from the surface outlet pipeline to the Dudváh recipient)	0
Soil	Land occupation	0 (Part of the existing site, use of former A1 NPP buildings)	0
	Soil contamination	-1 (Deposition from air-conditioning discharges produced by emissions far below the set limits)	0

Biota	Direct impacts on biotopes, fauna and flora	0 (Without occupation or direct contact with biotopes, fauna and flora of major importance)	0
	Indirect impacts on biotopes, fauna and flora	-1 (Radiation burden close to the background level)	0
Land	Landscape use	+4 (Inevitable “node” for the treatment of RAW produced by the NPP operation and decommissioning)	0
	Landscape scenery and landscape image	0 (Part of the existing site, use of former A1 NPP buildings)	0
	Protected areas	0 (Part of the existing site, indirect impacts close to the background level)	0
	TSES	0 (Part of the existing site, indirect impacts close to the background level)	0
	Ecological stability	0 (Part of the existing site, indirect impacts close to the background level)	0
Urban complex and landscape use	Settlements	0 (Part of the Jaslovské Bohunice NPP compound)	0
	Agriculture	0 (Part of the Jaslovské Bohunice NPP compound, radiation load close to the background level)	0
	Forest management	0 (Part of the Jaslovské Bohunice NPP compound, radiation load close to the background level)	0
	Transport infrastructure	-1 (Minimum share in the area´s traffic load)	0
	Technical infrastructure	0 (Minimum load for the A1 NPP technical infrastructure)	0
Waste	Waste volumes produced	-1 (Acceptable volumes of predominantly recyclable inactive waste, and	0

		minimum volumes of RAW)	
	Waste treatment	+4 (Inevitable “node” for the treatment of LRAW produced by operation and NPP decommissioning)	-4 (Absence of technologies for RAW processing and treatment leading to their purposeless collection and accumulation of related risks)
Technical and technological design	Level of the technical and technological design and emergency planning for the activity	+4 (Technical, technological and emergency design in line with the requirements for the protection of the environment and people´s health)	0
Population	Job opportunities – socio-economic factor	+3 (Existence of stable jobs within the affected region)	0
Health risks and well-being	Noise	-1 (Noise emissions from related transit; the noise emissions are limited by the placement of equipment and activities within enclosed premises at a big distance from residential areas)	0
	Air pollution	-2 (Emissions related to the induced transport load; RAS emissions from air-conditioning outlet far below the set limits; and emissions of pollutants from waste incineration and related energy equipment emitted under the requirements of the relevant legislation)	-1 (Small amounts of discharged RAS in the air extracted from storage areas, limited by treatment)
	Transit	-1 (Less life comfort of the affected population due to the contribution to the traffic load)	
	Water contamination	-1 (Contribution of seepage waters and waters from the surface discharge to water contamination by common pollutants in line with the conditions of the relevant decision; active waste waters with activity far below the set limits)	-1 (Persistence of an impropriate condition – limited efficiency of barriers of the decommissioned A1 NPP – solved by recovery pumping of ground waters)
	Radiation burden + related psychical discomfort	-2 (Minimum contribution to the radiation burden, far below the set limit, perceived sensitively by the public)	-4 (Inappropriate situation related to RAW (existing and new RAW) = absence of technologies for RAW processing and treatment leading to purposeless collection and accumulation of related risks)

Final scores:

Option 1 -2 points
Option 0 -12 points

Order of suitability of the given activity´s option:

Option 1
Option 0

This suggests that not even a more detailed assessment of the given activity, supported by an expert analysis of health risks for the purposes of the Assessment Report and by a study on the dispersion of common pollutants from the RAW incinerator, has not had any impact on the order of suitability of the individual assessed options defined by the Plan, nor on the originally assumed extent/significance of expected impacts.

The overall summary assessment of the different induced impacts and effects of the assessed activity, ***its existence (option 1) seems to be the most optimal option, compared to the zero option, for solving the situation related to the production of low and medium activity RAW from the A1 NPP decommissioning and from other nuclear equipment or human activities (research, medicine, etc.).***

V.3. JUSTIFICATION OF THE PROPOSAL FOR OPTIMAL OPTION

The most important reason for our proposal for an optimal option is the fact that the respective activity creates a space for comprehensive and safe disposal of low and medium activity RAW produced during NF operation and decommissioning (currently ensured by RAW technology in the process of A1 and V1 NPPs decommissioning).

Another important reason is the fact that the technologies (with the exception of adjustments of technical nature) are optimised to meet the current needs and are interconnected in such way that the final outputs are materials (soil, concrete, metals) that can be discharged to the environment with regard to the level of their activity (reduced by the applied processes), and RAW fixed in fibre-concrete containers with a cement mixture meeting the limit values and conditions for their storage, transport and deposition at the NRAWR in Mochovce. At the same time, the technologies can handle all the RAW produced during waste processing and treatment.

The RAW which cannot be treated by the given technologies so as to be deposited at the NRAWR represent a minor part and will be stored in suitable Proponent´s premises until a deep repository or RAW IS is created.

The selection of the optimal option is also supported by the fact that the given activity (as the above-mentioned detailed assessment of its radiation impacts suggests) with the related technical and technological design can meet the set limits with a large margin, and the individual effective dose to an individual from the critical group, generated by all

operation units of the Proponent within the area, has been continuously lower than the effective dose limit set by the PHA SR for the given technology (including ISFS).
With regard to radiation burden from RAW transport, it can be concluded that all legal requirements for the protection of the population have been met, whereas the RAW transportation outside of the NF site is mainly constituted by the transportation of FCCs with treated and fixed RAW to the NRAWR.

The other reason for selecting the recommended option of the assessed activity are the following facts on its negative impacts which are mainly given by the nature of the activity, its distance from and relation to the closest non-industrial area, its location within the nuclear facilities site, etc.:

- Under a conservative approach (i.e. assessment of maximum traffic frequency), the related freight transport, including generated noise and emissions of common pollutants within the given activity, would to contribute to the traffic load of the monitored section of the affected area as a result of the traffic connection of the Jaslovské Bohunice NF site by only 3.7% of freight transport and 0.5% of overall transport in the year of the last count;
- With regard to noise emissions from installed technological equipment, their location and significance do not suggest any relevant impacts on the noise situation in the residential areas of the affected municipalities;
- According to the immission and transmission assessment performed by a qualified person, the emissions of common pollutants from RAW incineration do not have a significant impact on the long-term and short-term regime of air pollution within the affected area;
- The emissions of common pollutants from other technologies, given their assumed amounts, treatment of emitted waste air, way of its discharge to the municipal air (the major part of the waste air is released to the air through venting chimneys of a min. of 40m), distance from the residential area, etc., are not expected to have a relevant impact on the immission situation in the residential areas of affected municipalities;
- The emissions of common pollutants in sewage, storm and technological waste waters meet all limits specified in the relevant decisions on waste water discharges, and their amounts with regard to the given technologies and under the conservative approach only constitute a minimum share in the total amount of waste waters discharged from the Proponent´s nuclear facilities site;
- The relatively small amounts of common operation waste are recyclable to a large degree; the waste produced from the decontamination of materials which meet the conditions of discharge to the environment mainly have the nature of building waste (waste metals, concrete, earth);
- Given the location of RAWPTT buildings within the nuclear facilities site in Jaslovské Bohunice, the impacts of the assessed activity on the landscape use, its scenery, image, stability, etc. are practically irrelevant.

On the other hand, the existence of this complex facility within the NF site in Jaslovské Bohunice as an important place of RAW production and location of the decommissioned A1 NPP, with its design complying with all safety requirements for the operation of such equipment, represents a positive impact on the process of RAW treatment and, hence, indirectly on the impacts induced by the production/existence of such waste.

Non-existence of such technologies, however, would lead to an unsustainable cumulation of new and non-treated RAW from a long-term perspective, and subsequently to the accumulation of its impacts (mainly in the form of increased potential risks in the event of an emergency situation, such as long-term discharge of active air sucked from storage areas). For example, as concerns the A1 NPP which is in the process of decommissioning after the accident in the 1970s and the monitoring of which shows improper condition of the protection barriers for RAS discharge, this option would represent persistence of the adverse conditions in terms of radiation.

Generally, it can be concluded that the proposed activity, from the point of view of all assessed aspects – environmental, technical & technological, as well as socio-economic – provided that the set limits and operation conditions are respected, seems to be the optimal solution for the processing and treatment of low and medium activity RAW from NF facilities and from A1 and V1 NPPs decommissioning and from other human activities (research, medicine, etc.).

VI. PROPOSAL FOR MONITORING AND FOLLOW-UP ANALYSIS

VI.1. PROPOSAL FOR MONITORING FROM THE START OF CONSTRUCTION, DURING CONSTRUCTION AND OPERATION, AND AFTER THE COMPLETION OF OPERATION OF THE PROPOSED ACTIVITY

Given the fact that the activity has already been implemented and operated, the periods of construction, approval and launch of permanent operation have already ended.
With regard to monitoring, all documents required for this activity have already been prepared and approved (by the NRA SR, PHA SR, etc.), such as the programme of quality assurance during construction, plan of monitoring during operation, etc., and the activity is fully monitored in line with these documents.
The modifications of the assessed activity of technical nature do not have a major impact on the set monitoring system, and will only affect the internal monitoring method of the given worksites, if needed.

The details related to the assessed activity monitoring with regard to radiation burden are specified, for example, in the following documents:

- Internal operating rule “15-INŠ-702 Monitoring plan for processing technologies and decommissioning of the A1 NPP of JAVYS, a.s.”
  This document deals with the “internal” radiation control of the respective technologies/worksites by defining the control points and the time intervals for the control of surface contamination, dose rates and aerosols in operating premises during common operation and in the case of foreseeable deviations from common operation which form the basis for defining the principles of use and handling of

protective tools serving for the protection against internal contamination by inhaling radioactive aerosols during works in the controlled area, for defining the principles of use of personal protective and auxiliary tools for protection against the effects of ionising radiation, and of the principles of movement and stay within the controlled area with ionising radiation and optimisation of activities resulting in the irradiation of persons.

- Internal operating rule "8-INŠ-050 Balancing of discharges from venting chimneys of divisions 2000 and 3000 – JAVYS, a.s."
  This document deals with the radiation control of gas discharges of the given technologies/worksites – division of responsibilities for the balance of discharges from the Proponent´s vent chimneys among its units, and describes the processing of aerosol filters and samples of other media aimed for measurement, the methodology of measurement and calculation resulting in periodical discharge balances.
- Internal operating rule "15-TPP-803 Organised discharge of waters from technological equipment from buildings 30, 808, 44/10, 41 and 809"
  This document deals with the radiation control of liquid discharges of the given technologies/worksites – organisation of the discharge of technological waste waters from all operation units of JAVYS, a.s. in line with the LaP, environment protection rules and rules of classical safety, radiation protection and nuclear safety.
- "Monitoring programme of the radiation control of the EBO NPP surroundings" as Annex A of the document owned by SE, a. s., type of document – special rule marked as 6-SP/007 "Laboratories for the radiation control of the environment"
  This document deals with the monitoring of the radiation burden in the vicinity of the nuclear facilities in Jaslovské Bohunice, e.g. monitoring of the activity of aerosols, surface waters, ground waters and drinking waters, soils, sediments, etc. the results of which are regularly compiled in quarterly reports and once a year in annual reports on radioactivity control.
  The monitoring data of 2011 were used in the text above to present the radiation burden of the individual parts of the environment within the affected area.

On the basis of other characteristics of the assessed activity, the monitoring activities also include:

- control and continuous and discontinuous monitoring of discharged waste waters in relation to contamination by common pollutants (sewage waters, storm waters and technological waste waters);
- control and continuous and discontinuous monitoring of flue gases discharged from RAW incineration in relation to contamination by common pollutants;
- recording of produced waste and of the way of waste treatment; and
- other measurement of the conditions at worksites with regard to the protection of employees´ health (e.g. noise measurement, etc.).

VIII. DEFICIENCIES AND UNCERTAINTIES IN THE INFORMATION OBTAINED DURING THE PREPARATION OF THE ASSESSMENT REPORT

With regard to the description of the individual parts of the environment and of the affected population, no substantial deficiencies and uncertainties have arisen. They have only occurred in cases and in the form that had no impact on the objectivity of the complex assessment of the proposed activity´s impacts within the affected area.

With regard to the deficiencies and uncertainties concerning the set of information on the characteristics of the given activity and its outputs, a specific situation has arisen with respect to this process due to the fact that the assessed facility is already in operation, and all data on its design and on the actual requirements and outputs are available, as a result of which any uncertainties are excluded or restricted to uncertainties in certain measurements.

IX. ANNEXES TO THE ASSESSMENT REPORT (GRAPHS, MAPS, TABLES AND PHOTO-DOCUMENTATION)

Annex 1	Map of wider surroundings
Annex 2	Designation of the affected area
Annex 3	Map of the technology building within the JAVYS site
Annex 4	Expert opinion on the assessment of health risks and health impacts
Annex 5	Dispersion study
Annex 6	Evaluation of the incorporation of comments from delivered opinions
Annex 7	Evaluation of the incorporation of specific requirements for the scope of assessment

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BRATISLAVA, 13 DECEMBER 2013