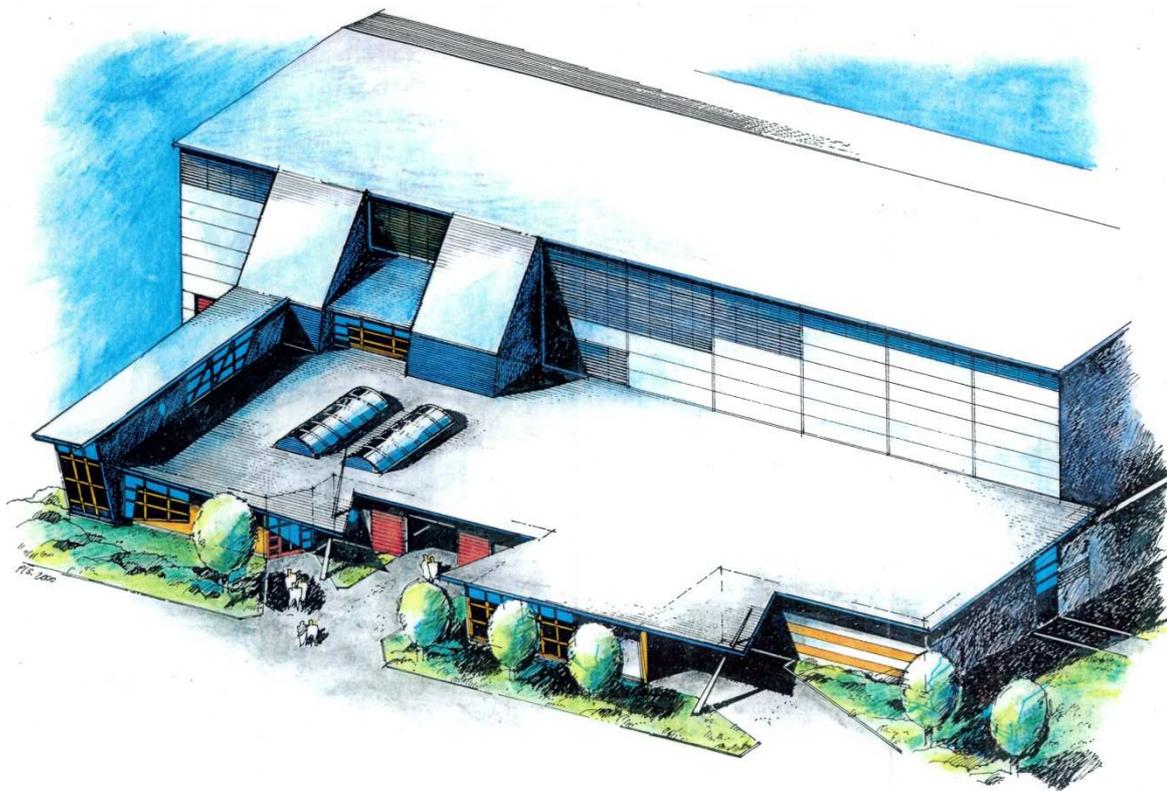




Jadrová a vyraďovacia spoločnosť, a.s., Tomášikova 22, 821 02 Bratislava



BIDSF C8

Interim Storage of Radioactive Waste (IS RAW)

Brief summary from the Report prepared pursuant
to the Environmental Impacts Assessment
Act N°24/2006 Coll., as amended

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INTRODUCTION

This document comprises information from the Environmental Impacts Assessment Report for the proposed activity (*entitled*) „Interim storage of radioactive waste “ in Jaslovské Bohunice nuclear facilities site belonging to JAVYS, a.s.¹ , prepared in compliance with the Annex N°15 of the Act N° 24/2006 Coll.². adequately to the character of the proposed activity.

Within the scope of the assessment N°5651/2011 – 3.4/hp of August 1st 2011 issued in Bratislava, under N°1 were besides the Zero Option also the below options required for further assessment :

Option 1 – IS RAW to be located inside JAVYS, a.s., Jaslovské Bohunice site, and also

Option 2 – IS RAW to be located in close contact with JAVYS, a.s., Jaslovské Bohunice site

The Assessment Report is not discussing **further Option 3 – IS RAW to be located in Mochovce, which was the subject of the intention.**

Interim storage of radioactive waste will be facility–civil structure, stated exclusively for storing of solid radioactive waste, which is specified in part A.II.8.5. of the Report. In Interim Storage will be temporarily stored solid RAW coming from nuclear facility decommissioning at Jaslovské Bohunice site. This waste will consist of waste releasable to environment, radioactive waste meant for further processing which can be stored in NRR Mochovce and waste requiring long-term and safe storing.

Built-up area of Interim Storage will be approximately 7600m², from which the storing capacity of Interim storage presents the area of approximately 6050m² (4 storing modules) and premises for annex of the common operations forms the area of 895 m².

Storing capacity can be defined as the maximum amount of stored RAW, of which overall activity is estimated on the value of 1x10¹⁸ Bq.

In the storage will be stored RAW in the various types of packaged forms (A.II.8.2) in various combinations. As an illustration in IS RAW can be stored:

- aprox. 2500 pc of concrete containers with the dimensions 1,7 x 1,7 x 1,7 m
- or 680 shielding containers of type CASTOR,
- or eventually 900 pieces of ISO containers 20' stored in 2 layers
 - 45000 pc of MEVA drums with RAW

Responses to comments presented by the stakeholders were incorporated to the respective parts of the Report, and these also form part of the document.

The description of how the submitted report deals with the specific comments of participants is set forth in the content of the appendix no. 14.

Should you have any questions regarding the Interim storage strategy, please don't hesitate to contact our PR department at: dobak.dobroslav@javys.sk

¹ Transl. note: joint stock company

² Transl. note: Collection of Slovak Laws

1. GENERAL DATA ON THE PROPOSED ACTIVITY – DESCRIPTION AND GOALS

1.1. The Proponent

Name

Jadrová a vyradovacia spoločnosť, a.s.

Identification N°

Company Identification N° 35 946 024

The Registered Office

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1.2 General data on the proposed activity - Goals

Name

Interim Storage Radioactive Waste (IS RAW)

Purpose

The purpose of the proposed construction is exclusively the storage of:

- a) solid radioactive waste prior their further processing in processing facilities located in JAVYS, a.s. site
- b) solidified radioactive waste modified by various technologies generated in decommissioning of nuclear facilities until the time these are transported to a permanent deposition site;
- c) solid radioactive waste to be released to the environment once their activity is lower than the approved limits

Another purpose is to enable concentrating these materials in a single site to protect the environment, and centrally register and control these.

The storage method, maximum volumes and activity of the storage radioactive waste will be defined for the Interim storage of radioactive waste.

Interim storage of radioactive waste will be designed and operated so that it protects radioactive waste from further degradation and avoid leakage of ionizing radiation and radioactive substances to the environment and allow adequate handling and removal of stored radioactive waste, ensuring also the radioactive waste remains its characteristics determining their storage.

Interim storage of RAW is exclusively a storage facility for storing packaging units containing solid or solidified radioactive waste with equivalent dose rate lower than 10 mSv/hour at the unit surface or its shielding.

Interim storage of RAW functions within the nuclear facilities decommissioning chain:

Dying – RAW that will be stored in the IS RAW require to be separated from other RAW, and these are the so called temporary waste that can be released to the environment once their defined storage time lapsed and their activity reached the approved limits

Storing – safe long-term storage of RAW in highly shielded packaging units

Balancing – RAW meeting the packaging form requirements approved for storage in NR RAW Mochovce, metal bulky RAW required later to be fragmented and sorted in compliance with the proposed technology

Location :

Option 1: Trnava Region, District of Trnava, municipality of Jaslovské Bohunice, Option 1 – JAVYS, a.s. site

Option 2: Trnava Region, District of Piešťany, municipality of Veľké Kostoľany, immediate neighbourhood of JAVYS, a.s. site

Detailed layout of the sites for Options 1 and 2 is given in the respective Annexes N°1 and 2, geographic location is provided in Annex 3, the building – cross section view is given in Annex N° 4/1, 4/2.

The grounds for the location

The primary reason for locating the storage within nuclear facilities site in Jaslovské Bohunice is the generally good practice approach according to which radioactive waste are stored where generated or processed and treated, prior their further disposal. IAEA also proposes to establish temporary storage facilities for radioactive waste within nuclear facility sites.

Another fact supporting the location of Interim storage of radioactive waste in Jaslovské Bohunice is that besides NPP V2 operation there are NPP A1 and NPP V1 being decommissioned and the most of radioactive waste is generated there and thus, waste is generated irregularly prior and after their processing, which requires temporary storage. Jaslovské Bohunice is the best site for such a temporary storage location, since also the RAW treatment and processing facilities are located there, as well (solid and liquid radioactive waste and materials).

The below reasons supporting the IS RAW location in Jaslovské Bohunice:

- Access to the storage without RAW leaving Jaslovské Bohunice nuclear facility site (minimising RAW transportation)
- Treatment and processing lines located nearby at JAVYS, a.s . site (e.g. Bohunice RAW Processing and Treatment Centre)
- Personnel and experts in radioactive materials and waste processing and analysis, including laboratories for radiochemical analysis of materials
- Fully equipped health care centre
- The lowest operating costs for interim storage of radioactive waste preparation and construction (no agricultural land required, no purchase of land required, no new infrastructure network needs to be built or a protection fence, etc.)
- Adequate EIA monitoring system
- The Final opinion of the Slovak Ministry of Environment N°8935/06-3.5/hp from the impacts assessment of the proposed activity „NPP VI Decommissioning“ recommended to implement the Option 1 „Immediate Decommissioning of NPP V1“ subject to establishing the „Interim storage of RAW“ for wastes that cannot be stored in NR RAW Mochovce

The municipalities of concern, the Region

The respective villages of Jaslovské Bohunice, Pečeňady, Radošovce, Ratkovce, Nižná, Žlkovce, Veľké Kostolány, Malženice

Trnava Self-Governing Region

Relevant Authorities

Nuclear Regulatory Authority of the Slovak Republic

Public Health Authority of the Slovak Republic

National Labour Safety Authority of the Slovak Republic – National Labour Inspectorate Intra

District Environmental Office, Trnava

District Environmental Office, Piešťany

District Environmental Office, Hlohovec

Regional Environmental Office, Trnava

District Directorate of Fire and Rescue Brigade, Trnava

District Directorate of Fire and Rescue Brigade, Piešťany

Civil Protection and Crisis Management Department, District Office Trnava

District Office for Road Transport and Roads, Trnava

Railway Transport Regulatory Authority, Bratislava

Permits Issuing Authorities

Regional Construction Authority, Trnava - Zoning and Planning Permit for the construction location
Nuclear Regulatory Authority of the Slovak Republic, Trnava – Building Permit

Supervising Department

Ministry of Economy of the Slovak Republic

Proposed Activity Transboundary Impacts Reports

Environmental impacts (atmosphere and hydrosphere) as well as direct radiation of inhabitants in neighbouring countries (Czech Republic, Hungary, Austria, Poland, Ukraine) resulting from the construction and operation of the interim storage of RAW lies below the monitoring equipment detection limits. Also, this conclusion is supported by the above specified technical solution (See Part A Chap II.8) that is to be defined in the Interim storage design and further terms and conditions to be approved by the respective state supervising authority, i.e. it results from the below:

1. There are no balance values for radioactive waste released to atmosphere and hydrosphere defined by the state supervision authority for the Interim storage of RAW by virtue of legislation (Regulation of the Slovak Government N° 345/2006 Coll.)

- During standard operation, no air ventilation system with filtration is required in storage halls – surface contamination on the surface of external packages of stored materials is below 0,3 Bq/cm² for beta sources or 0,03 Bq/cm² for alfa sources, i.e. the Interim storage of RAW is not considered a workplace with open radiation sources. Free air circulation through blinds is ensuring for the storage ventilation. Air ventilation system with filters will be used in non-standard situations and shall only be operated when higher concentration of air aerosols is measured
- No activity is described for standard operation where radioactive liquid waste could be generated and thus any potential liquid discharges to the hydrosphere. Sewage water from sanitary hygiene facilities is connected directly to the site sewer system. Retention tank with special sewer system was build for non-standard situations (the presence of radioactive substances will be measured in water from retention tank should it be full and only then it will be pumped to sewer or to transportation container for further processing in TSÚ RAO – BSC (RWTC Bohunice)

2. Approved dose rates at the boundary line of the site meet the radiation limits defined in the Slovak legislation for population (Regulation of the Slovak Government N° 345/2006 Coll.) and cannot anyhow impact the radiation of inhabitants living in neighbouring countries

1.3 Description of the proposed activity – Brief description of the technology and technical solution

The construction comprises two phases, with Modules 1 and 2 and the common annex are to be built

during the first phase. Final inspection (to issue the approval for utilisation) of these parts of the IS RAW shall be made separately. Then, works will follow the needs of NPP V1 and NPP A1 decommissioning and RAW disposal within Jaslovské Bohunice site, with Module 3 and 4 to be built in the second phase. Final inspection (to issue approval for utilisation) for the modules built during the second phase will complete the overall construction.

1.3.1 Technical solution for IS RAW as an independent nuclear facility

Interim storage of radioactive waste is planned to be a free standing structure of hall type with a modular structure enabling extension and simple connection to road infrastructure. Its design represents a system of single-aisle one-floor halls with a bridge crane and a common annex. The annex for services is mainly one floor construction containing entrance premises for personnel and visitors, sanitary premises, decontamination rooms, changing rooms (clean and potentially contaminated), emergency shower, premises for clothes, reception and registration offices, training facility, central control room and technical premises. A room with openings to the storage hall will be located on the first floor for visual monitoring the RAW storage premises.

Technical rooms in the annex will comprise decontamination room with solutions storage space, active workshop with a warehouse, contaminated water management (a room with a collection tank, sump area), ventilation machine rooms (clean and potentially contaminated) and electrical switch rooms (6 kV switch room, LV switch room, transformer stations).

Corridor will be used for communication between the premises. In the entrance parts of the premises, the so called sanitary node will be established as the crossing between potentially contaminated premises (storage halls, technical premises in the annex, emergency shower, etc.) and clean premises in the entrance premises.

No daily light is required for the operation of the premises except for administrative rooms. Operating personnel will only be present when handling the stored materials.

Built-up area of Interim Storage will be approximately 7600m², from which the storing capacity of Interim storage presents the area of approximately 6050m² (4 storing modules) and premises for annex of the common operations forms the area of 895 m².

Storage part will comprise four-module single-floor hall (axial size 3x25,150mx 61,425m, 25,150m x 50,225m). Height of the halls is designed to reach 16,2 m, the longest storage dimension in 122,8m and the storage width is 61,425 m. Storage halls will be split with a shielding wall to form the premises for actual storage and the receiving and controlling parts through which a trailer will be delivering the stored containers. Halls will be equipped with lifting devices.

IS RAW object will be seismically resistant against earthquakes. The territory proposed for the IR is found in seismic area with intensity 8° of the MSK-64 scale. Maximum horizontal acceleration on the Earth surface is 0,344 g, maximum vertical acceleration on the Earth surface is 0,214 g, the building object is classified as category SC1 object.

The probability of a seismic event occurring in the area is 1x10 000 years with 10s impact time of the most important movements.

As an illustration, maximum of 660 concrete containers (of size) 1,7 x 1,7 x 1,7 m may be stored in one IS RAW module (220 FCC x 3 layers), whereas the project is designed for 627 FCC to be stored in the storage rooms and the premises will be divided to two parts by a ~ 2,2 m wide aisle. The first part contains regularly positioned 330 FCC (11 FCCs broad wise, 10 FCCs lengthwise in three layers one

above each other), the second part containing 297 FCC (11 FCCs broad wise, 9 FCC lengthwise in three layers one above each other). We assume that in IS RAW will be stored various combinations of the package forms as mentioned at the beginning of the report (p.3)

The design and construction

From construction point of view, IS RAW building object will be designed with two different construction systems:

- Storage part will be designed as prefabricated skeleton of hall type with a bridge crane;
- Annex for supporting technologies will be designed as insulated monolithic reinforced concrete system with cross arms, partially two floors, with reinforced concrete walls and the ceiling. Non-supporting partition walls will be made from bricks.

The hall part structure is designed of fixed reinforced concrete columns with a console for the crane rails. Individual storage halls will be separated by reinforced concrete monolithic wall for shielding reasons. Perimeter walls of storage halls and internal partition wall between storage halls and the entry hall will be constructed as 6 m high monolithic 60 cm thick reinforced concrete wall. Outer walls will be covered with light 100 mm thick sandwich panels.

Steel truss girders on supporting beams will form the roof construction. The folding roof cover will be made of VSŽ metal sheets, thermal insulation and water proof insulation.

The annex will be constructed as insulated monolithic supported system, partially two floors, combined with monolithic and brick walls. Ceiling structure will be made of monolithic reinforced concrete slabs. Roof construction will be made of steel roof truss covered by bitumen roof.

Shielding constructions

The wall between storage hall and the annex, the wall between storage and entry halls and the perimeter walls up to 6,0 m height will be constructed as 500 mm or 600 mm thick special monolithic concrete for shielding reasons. Further shielding concrete blocks will be constructed in IS RAW facility if required by radiation protection, which can be moved and handled by cranes as needed (upon the radiation engineer requirements).

Special requirements

Floor in each room in the controlled zone will be smooth and washable. Smooth and washable walls will be also in the premises where radioactive substances may potentially spread, namely in the so called emergency shower, active workshops, decontamination and management, or contaminated water.

Other selected constructions

Special internal sewer system will also be designed in the facility, to be used in non-standard situations, i.e. to drain potentially contaminated water from the controlled zone, namely from the emergency shower, decontamination tank and also from external sump area. This water will be collected in a stainless steel tank located below the floor level in the contaminated water management room. Prior discharging, representative sample will be tested in laboratories and depending on the results, the water will be released to sewer or pumped to a transportation vessel. Wastewater pipelines will be made of stainless steel.

Besides the above specified constructions needed for safety reasons and environmental protection, IS RAW facility will also contain :

- Sanitary and hygiene facilities
- Lights and heavy current installations and a lightning rod
- Hot water heating system
- Air ventilation
- Light current distribution network
- Electric fire alarm signal system
- Emergency fire water pipeline
- Control and management system

1.3.2 The technology

IS RAW technology comprise transport, machine and technology, and electric equipment, energy sources, distribution lines and accessories, instrumentation and control and other specialised equipment and appliances, such as laboratories, physical and radiation protection, dosimetry, special sewer, air ventilation, etc.

The planned technology and equipment may be split to the below operating units:

Entry and storage of packaging units

Packaging units

Workshops

Decontamination

Air ventilation

Radiation and dosimetric control

Contaminated water management

Electrical equipment

Technology processes (I&C)

SKR – Industrial TV

I&C - Special monitoring

Entry and storage of packaging units

The key technology equipment will include hoisting equipment and its handling arms and stands for control of packaging units arriving for storage.

Bridge cranes to store containers will be equipped with automated positioning system for placing containers to a pre-defined position according to the storage plan. Crane will be operated from central control room with on-site operation option. TV cameras will control the storage.

Packaging units

Characteristic features and parameters:

- FCC: Made of fibre reinforced concrete
 - Size: 1,7 x 1,7 x 1,7 m
 - Weight: 4 200 kg
 - Maximum loaded container weight: 12 500 kg

- 200 l MEVA barrel: Made of zinc coated sheets
 - Size: Ø600x800 mm
 - Weight with waste: 450 kg
- container 2 EM-01:
 - Size: 1,1 x 1,1 x 1,7 m
 - Weight with waste: 1 500 kg
- ISO container : ISO 20' series 1, See STN 26 9341, STN 26 9343 a ISO 1496-1+Amdl
 - Made of steel
 - Outer dimensions: 2 438 x 2 438 x 6 058 mm
 - Weight: 3 000 kg
- Free deposited components, segments or ingots: materials without surface contamination that are activated, refused or contaminated only on inaccessible surfaces (inside); may be shielded
- Metal containers for very low activity waste : solid metal packages of 1m³ volume for storing and depositing solid VLLW (metals, glass, etc)
- highly shielded containers :
Containers available at the market are made of forged cast iron (cast as one piece), equipped with double lid. Usual weight of empty container available at the market – app. 100 tons. The size :
 - length: 4 – 5 m
 - diameter 1,5 – 2, 5 m
 - wall thickness: 0,25 – 0,45 m
- any other packaging unit (tailored design as a prototype or a sole piece of the kind) respecting the relevant legislative and internal requirements for radiological protection.

Packaging units – See Annex N°5/1 -5/4.

Decontamination

The general purpose of decontamination system is to ensure the below specified activities during non-standard situations:

- decontamination of persons in the so called emergency shower
- decontamination of movable parts of equipment
- decontamination of premises

Standard operation – no contamination of people, equipment or premises is assumed in IS RAW premises during standard operation. Packaging units may be decontaminated at sender's premises, if needed.

Non-standard operation – the following is considered non-standard situation regarding contamination:

- contamination of people, premises and objects resulting from compromised packaging units integrity during their handling; operating rules define procedure to be followed when removing the consequences of this event and these are defined specifically for each situation
- contamination of people, premises and equipment resulting from contaminated water spillage during its pumping to a collection tank on a liquid radioactive waste transportation vehicle
- contamination of people measured during contamination control in a control node
- contamination of objects transported from the controlled zone

Air ventilation

When storing waste in relevant packaging units with surface contamination below 0,3 Bq/cm² for beta sources or 0,03 Bq/cm² for alfa sources at external surface of the unit (a precondition for storing packaging units in IS RAW), **ventilation will not be used and ventilators will be used to circulate air in the storage premises.** Controlled zone established in IS RAW will not be classified as a workplace with open radiation sources, and air ventilation is not considered a necessary mean to ensure dose rates below limits with regards to the personnel protection.

Air ventilation system will be installed in halls in IS RAW for ventilation, mainly to direct the air as required during non-standard situations in order to pump the air out from storage facility and clean it at filters. IS RAW radiation safety engineer will give the instructions to start air ventilation system operation (e.g. when higher air volume activity is measured in the storage). Air ventilation system failure will have no adverse environmental impacts. In the contrary, the fact that the air from the storage is not pumped out means that contaminated air spread will be stopped temporarily.

For non-standard events, the air ventilation system will be operated in the mode for category III of a workplace with open radiation sources as follows:

- when air ventilation system operation starts, it will ensure air exchange five times per hour with pressures preventing radioactive contamination spreading
- the storage premises air ventilation system comprises two units; one operational and one back-up unit. Exhaust ventilation unit will consist of pre-filter, exhaust radial ventilator with a diffuser, filters and highly efficient filter for radioactive aerosols collection and exhaust air shutter. Air exhausted from the ventilation unit will be connected to a pipeline leading above the storage roof with an outlet opening with blinds
- air will be exhausted through outlets in the top parts of the storage mounted directly on exhaust pipes. Both exhaust lines will be equipped with manual regulation shutters
- the exhaust pipe will lead up to the roof of the storage and will be designed with a by-pass for measuring the air flow and aerosols radioactivity
- the volume of exhausted air will be regulated in order to maintain moderate vacuum in the storage
- filtration quality will be determined by operating conditions defined by the producer and filter efficiency will be checked in accordance with the Quality Programme (the requirement defined in the Slovak Ministry of Health Decree N°545/2007 Coll.)

Radiation and dosimetric control

The term „radiation and dosimetric control“ shall mean systematic measurements with the ultimate goal to prove that there is not and nor there will be any undesirable exposure of IS RAW staff, public or the environment.

The following will be measured within the „radiation and dosimetric control“ set of measurements:

- a. exposure of IS RAW staff
- b. exposure of people present (single-time presence) in the controlled zone once (maintenance and service, visitors, supervisory bodies representatives, JAVYS management, etc.)
- c. surface contamination of hands, soles and work clothes of IS RAW staff exiting the controlled zone
- d. surface contamination of hands, soles and work clothes of visitors to the controlled zone

- e. surface contamination of RAW packaging units will be checked upon their arrival
- f. contamination of objects removed from controlled zone
- g. contamination and dose rate on the surface of empty vehicles prior their departure
- h. equivalent dose rate in the controlled zone, in particular in the storage halls
- i. radioactivity of aerosols and tritium in the storage
- j. exhausted gas radioactivity

Contaminated water management

Contaminated water management dealing with collection of waters generated during non-standard situations will comprise special sewer system and its collection in a stainless steel tank. The tank itself is the key element, located centrally in 5,5 m³ stainless steel bond. It will be equipped with an ultrasound level gauge signalling two threshold levels; for the volume of 3,1 m³, when the tank needs to be emptied and for the volume of 3,3 m³, when the inlet will be closed until the tank is emptied. The signals will be monitored from the central control room. Water will be pumped out by immersion pump (one in operation, one back-up). Radioactivity of a representative sample will be measured prior the pumping. For that, the tank will be equipped with a stirrer. The sample to measure the respective values in JAVYS laboratories will be taken manually. Depending on the measurement results, the tank content will be pumped to sewer or to the liquid radioactive waste transportation vehicle used by JAVYS for these purposes. The procedures to be followed during these activities, as well as the terms of work (water sampling, connecting to the cistern etc) will guarantee that no contamination will occur in standard situation (e.g. by using special trays)

Electrical equipment

Electrical equipment will comprise 6kV switch room with a standardized switch box, cables, two three- phased transformer stations to transform 6kV voltage to 0,4/0,241 kV. Joint exterior grounding system is designed for the switch gear, transformers and LV switchgear.

Control system and technology processes control system

Automated technology processes control system directly related to the stored packaging units (PU) will be designed as decentralised control and information system with local independent control units and a central control and information system.

SKR – Industrial TV

Camera system to see to selected premises is planned to be installed. Camera system with central control room, joystick control desks, monitors and cameras monitoring certain premises of objects will be designed to monitor certain selected premises or technologies in the facility. From technological point of view, IS RAW camera system will monitor the respective processes: transportation, package units handling and inspection.

SKR – Special monitoring

Special monitoring is designed to monitor mechanic properties of the structure (in particular measuring the position or shift of the base slab by the method of hydrostatic levelling (HYNI), i.e. structural defects caused for example by seismic activity, geologic disturbances etc. HYNI system comprises sensors, connection hoses with liquid and air hoses, connection cables and

the communication unit. Further processing of the measured values will be made in the central control and information system located in the central control room.

1.3.3 Operation description

Packaging units income and leaving is planned mainly as manual regime. Crane will be allowed to be operated by operators on the site by radio control. Once the transportation vehicle arrives, individual containers are captured and transported to the control location in the entry hall to verify information provided in the radioactive waste accompanying letter, i.e. visual control, measuring the surface dose rate and taking surface sample.

The crane for containers storage will be equipped with automated positioning system for placing containers to a pre-defined position according to the storage plan. Crane will be operated from central control room, with on-site operation option. TV cameras will control the storage. The pre-defined storage position, type and characteristics of the package form will determine the place for the transportation vehicle to drive and the crane from a storage hall that is to be used.

The storage position will be defined by the storage system that will define the storage area for the packaged radioactive waste based on isotopic composition, expected storage time, required shielding and the terms for regular control of the package form. The storage system will allow continuous balancing function to be performed by concentrating the package forms with RAW that is to be further processed in a short period of time. A separate module will be used to store activated parts from decommissioning.

Radioactive waste storage position will be determined according to the classification stipulated in the Act N°541/2004 Coll. and the Nuclear Supervision Authority Decree N°53/2006 Coll.

Radioactive waste is classified as below according to activity:

a) temporary radioactive waste with activity decreasing during the storage period below the release limit

b) low activity radioactive waste and medium activity radioactive waste with activity above the release limit with residual heat below 2 kW/m^3 :

1. short-term radioactive waste, which after processing meet the limits and terms of safe operation for surface radioactive waste repository with average volume activity of alfa nuclides below 400 Bq/g ,
2. long-term radioactive waste, which after processing don't meet the limits and terms of safe operation for surface radioactive waste repository with average volume activity of alfa nuclides equal or higher than 400 Bq/g .

Any information about the stored material generation and content (radioactive waste), its volume, storage position and history of movements will be monitored by central operational registration system with software and hardware compatible with the existing technology information system. Transportation packages and vessels need to allow placing a code label for registration system sensors located at workplaces. Central desk will make the information available in information files allowing these to be sorted by special applications and their presentation in the required output format.

Complementary records will monitor and evaluate information about the neighbouring micro-climate and those in the storage premises, as well as monitoring the status of supporting technologies (air ventilation, EPS). The respective information will be archived for further processing

when evaluating the standard operation of crisis situations.

1.3.4 Description of radioactive waste and planned volumes to be stored in IS RAW

Interim storage of radioactive waste will store waste generated in NPP V-1 Jaslovské Bohunice. NPP A-1 Jaslovské Bohunice and NPP V-2 Jaslovské Bohunice. These are radioactive waste with various activity levels.

The planned types of stored waste are based on the Radioactive Waste Volume Analysis from NPP A-1, V-1, V-2, Mochovce power plant that cannot be stored in RAW NR Mochovce, and on the NPP V-1 Radiological Inventory Report, which contains the results of inventory and describes the contamination in individual buildings, structures, equipment parts in the location and in the affected media.

1.3.4.1 Radioactive waste from NPP V-1

IS RAW will be used to store all solid RAW generated during NPP V-1 decommissioning. All planned functions of the storage will be used in V-1 decommissioning process, which means that certain waste will be stored there temporarily prior their transportation to a certain RAW processing lines, other waste will be released to the environment after certain period of storage and once being processed accordingly, and a group of RAW that cannot be stored for various reasons will be safely stored in IS RAW for its overall planned life-time

Besides very low level (radioactive) waste (VLLW) that is supposed to be transferred from Interim storage once the VLLW repository is completed within NR RAW in Mochovce, activated and contaminated components from NPP V-1 decommissioning will be stored in the Interim storage. Supposing that all radioactive waste generated during NPP V-1 decommissioning will go through the Interim storage, the characteristics of the materials may be based on the NPP V-1 Radiological Inventory Report prepared from NPP V-1 measurements in 2010.

The summary of radiological inventory:

Total radiological inventory of V1 NPP recorded in DDB is given in Table 1, where total activity inventory contained in individual civil buildings is summarized. In this table, total activities of civil structures and equipment for all considered civil buildings with related masses are presented. More detail radiological inventory of V1 NPP recorded in DDB is presented in Appendix 23. There is the radiological inventory and mass of civil structures and equipment based on material composition, radiological classes and type of contamination or respectively activation evaluated for each SO.

Tab.1 Total radiological inventory of V1 NPP, activity [Bq], ref. date 1.1.2010

SO		Activated components	Contaminated civil structures	Contaminated equipment	Total
401:V1 (PK35, PK41)	activity [Bq]	0	2,757E+07	6,379E+07	9,136E+07
	mass [kg]	0	934934	4811	939745
460:V1	activity [Bq]	0	8,680E+06	2,514E+06	1,119E+07
	mass [kg]	0	3955550	11250	3966800
800:V1	activity [Bq]	2,027E+17	3,788E+10	1,173E+13	2,027E+17
	mass [kg]	1391763	138790971	9449970	149632704
801:V1	activity [Bq]	0	1,251E+09	6,547E+09	7,798E+09
	mass [kg]	0	74027153	1815651	75842805
802:V1	activity [Bq]	0	9,348E+05	1,433E+08	1,442E+08
	mass [kg]	0	508730	50812	559542
803:V1 (KP part)	activity [Bq]	0	2,388E+07	6,676E+07	9,063E+07
	mass [kg]	0	677989	158788	836777
804:V1	activity [Bq]	0	1,169E+08	1,643E+07	1,334E+08
	mass [kg]	0	6295882	8281	6304163
C809:V1 (C350, C804)	activity [Bq]	0	1,168E+08	5,124E+07	1,680E+08
	mass [kg]	0	4472157	73265	4545422
800a,b:V1	activity [Bq]	0	4,773E+09	0,000E+00	4,773E+09
	mass [kg]	0	176184	0	176184
Total	activity [Bq]	2,027E+17	4,420E+10	1,173E+13	2,027E+17
	mass [kg]	1391763	229839550	11572830	242804143

From Tab.1 follows, that total activity recorded in DDB represents the value of 2,027E+17 Bq with respected 2,428E+08 kg total mass of equipment. Given mass represents only the radiological inventory of V1 NPP recorded in DDB. This value does not include civil buildings without occurrence of contamination or buildings, where only local contamination spots were identified above the natural background level (e.g.: 490:V1). For the sake of better clarity, the following figures Fig.1 thru Fig.3 are included as the graphical representation of percentage contribution of given total activity and mass according to:

- material composition,
- radiological classes,
- type of contamination or respectively activation.

As it is possible to see from the diagram at Figure 1, percentage activity contribution is in accordance with the material composition. Stainless steel machine equipment, which is mostly placed in core represents majority share - 99,77% of total NPP V-1 activity. The other equipment in the following

sequence: carbon steel and other materials (mostly non iron metals) machine equipment and steel and reinforced concrete civil structures represent the rest of activity - 0,23%. The contribution of electrical and SKR equipment being mostly contaminated only on the surface to the total activity value is the lowest. Reinforced concrete and concrete civil structures represents on the other hand 84,8 % of the equipment NPP V-1 mass, as it can be seen from Figure 2 - percentage of mass according to material composition. These materials represent only 10^{-6} % of NPP V-1 total radiological inventory. In contrary, stainless steel machine equipment containing nearly all activity represent from the point of the view of mass only 2,14% of NPP V-1 inventory.

Figure 5 presents diagram of percentage activity division in accordance with activity kind (activated technological parts, equipment with contaminated inner surface, equipment and civil structures with contaminated outer surface and civil structures with volume contamination). From this figure is evident, that 99,993% of total activity rely to activated materials; on the other hand surface/volume contamination represents only 0,007% of total activity value. It was not possible to present graphical diagram for mass contribution in DDB according this criterion, as different equipment rely to several kind of contamination (for example contamination of both- inner as well as outer surfaces). Mass of this equipment would be assigned to both kind of contamination in DDB and total mass would reach value over the 100% of total radiological inventory.

The last Figures 4 and 5 show NPP V-1 diagrams of radionuclide percentage contribution to total activity for reactor materials activation as well as for materials contamination in controlled area and out of controlled area. In both cases, corrosion products Fe-55, Ni-63, Co-60 are the dominant radionuclides, which represent more than 95% of total activity. Fission products Cs-137 and Sr-90 represent only 0,13% and 0,09% of total activity of contaminated materials.

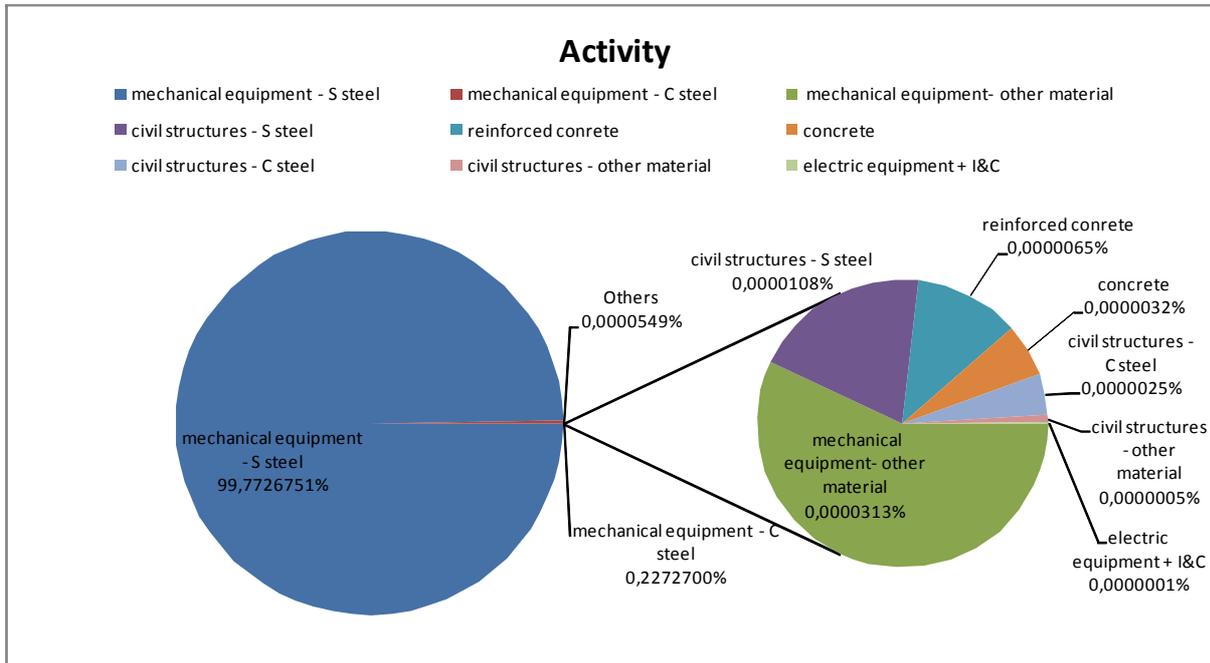


Fig.1 Percentage contribution to the total activity according material composition

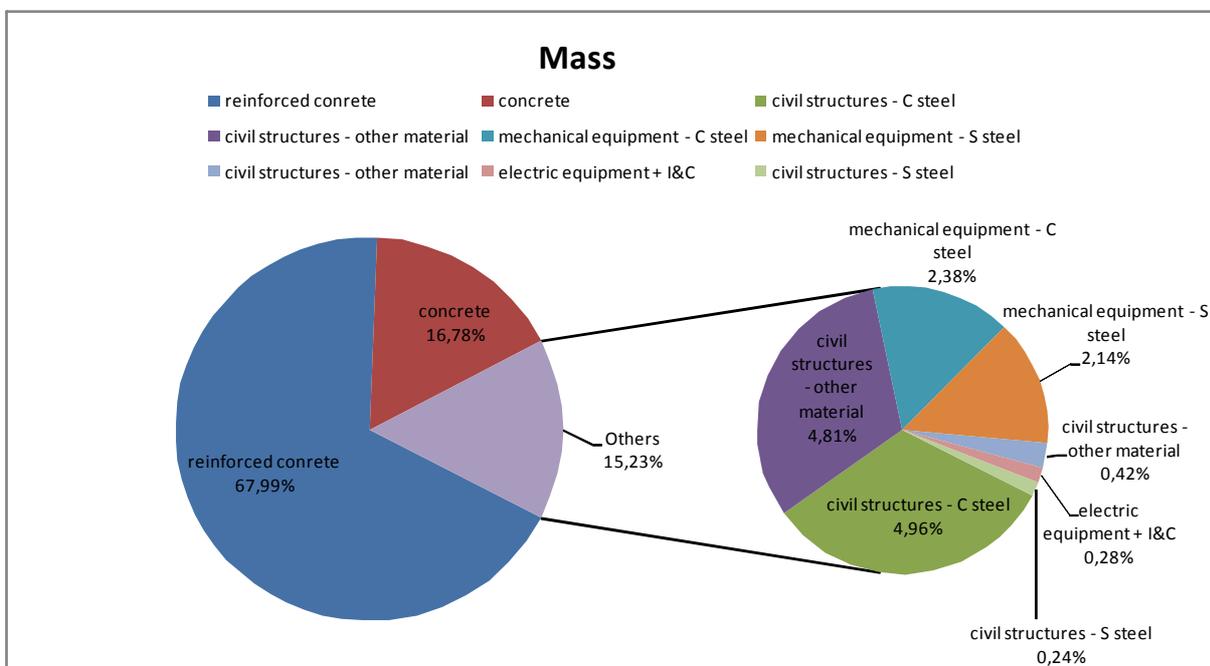


Fig.2 Percentage contribution to the mass according material composition

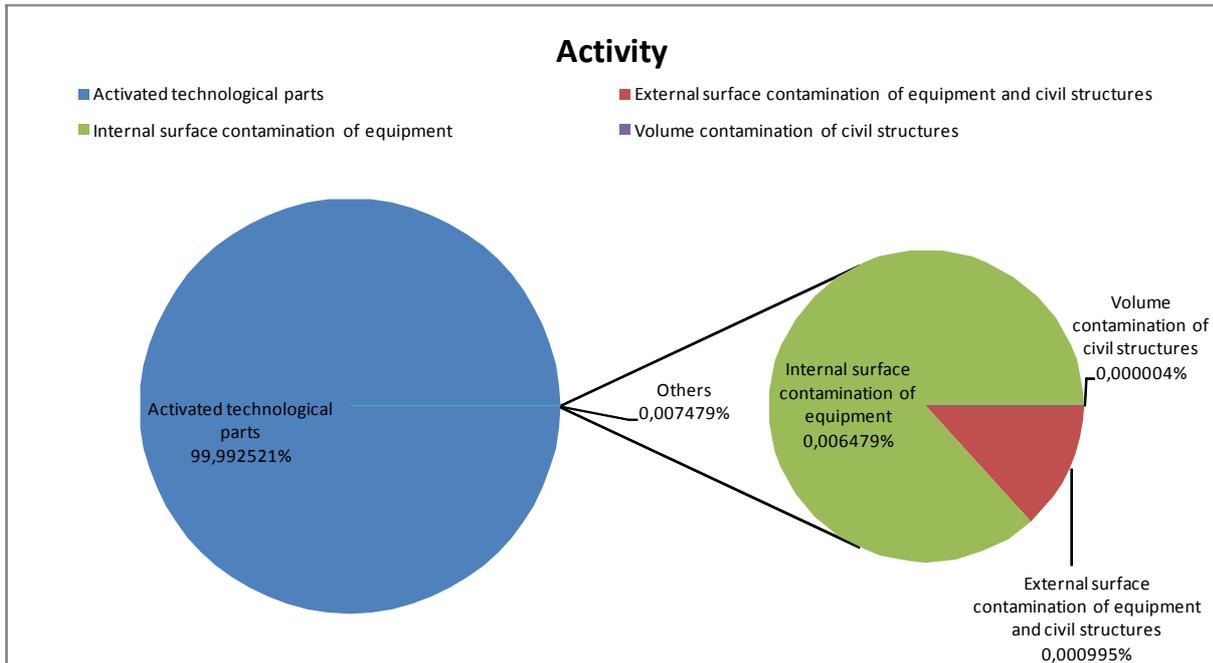


Fig.3 Percentage contribution to the total activity according the kind of contamination/activation

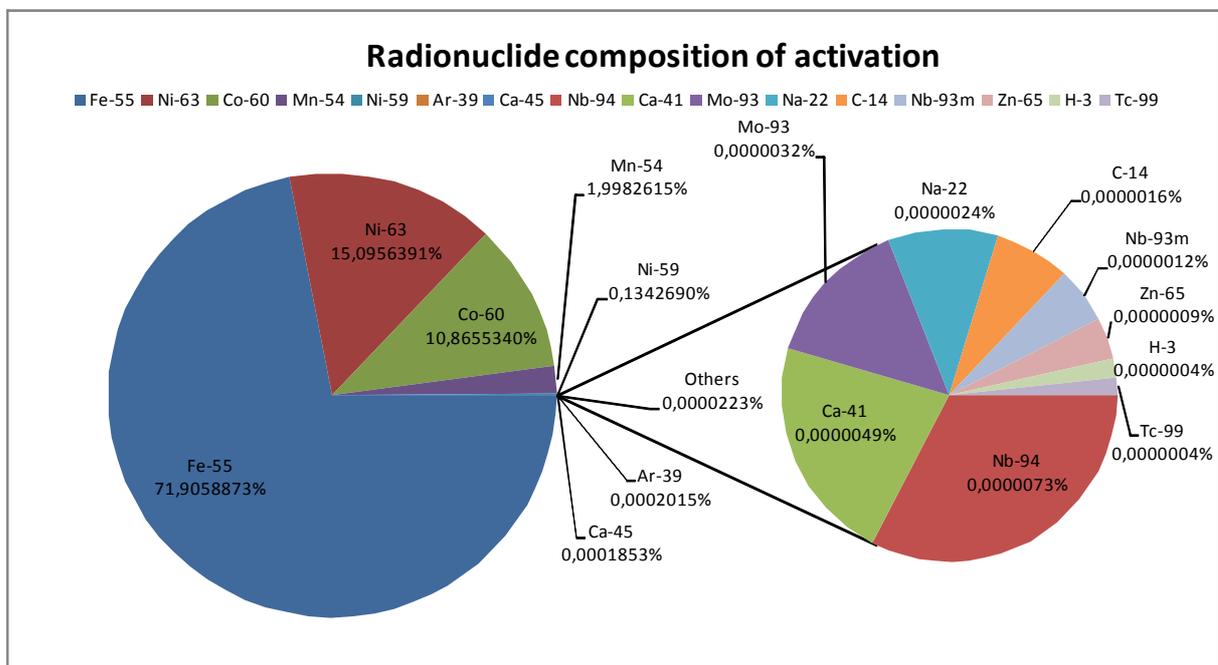


Fig.4 Percentage contribution of individual radionuclides to the NPP V-1 activation

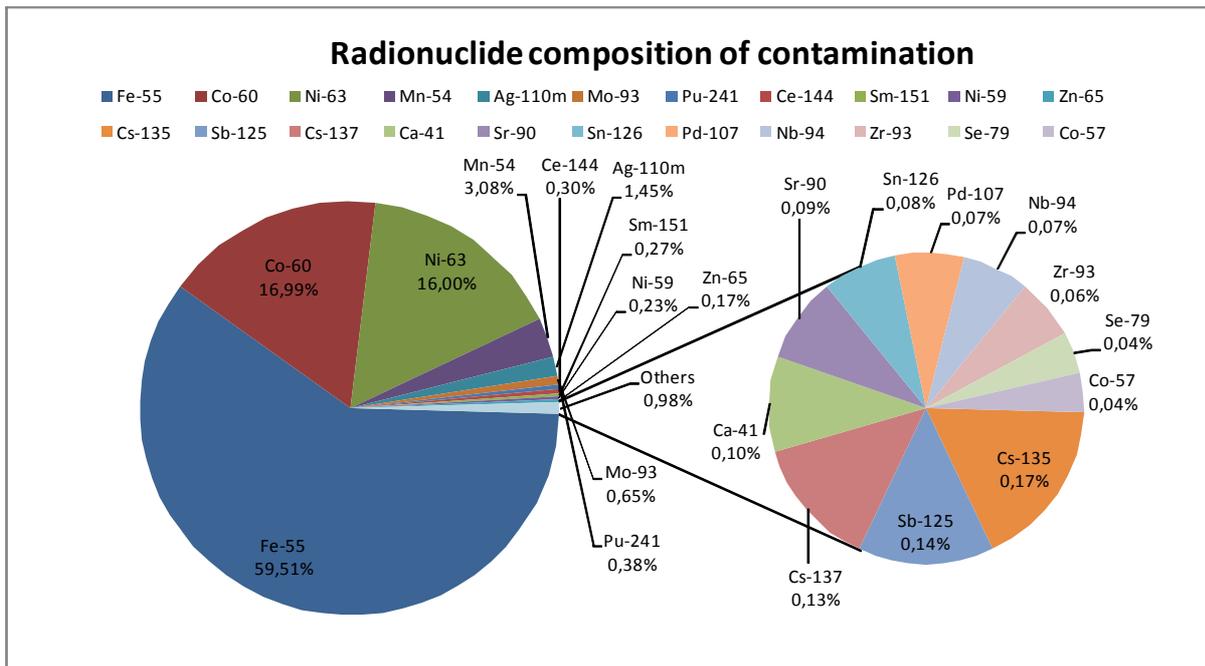


Fig.5 Percentage contribution of individual radionuclides to the NPP V-1 contamination

For illustration, an example of dominant radionuclides dying times:

Half-Live :

$^{55}\text{Fe} = 2,7$ years

$^{60}\text{Co} = 5,27$ years

$^{63}\text{Ni} = 100,1$ years

$^{137}\text{Cs} = 30,07$ years

$^{34}\text{Mn} = 313$ days

$^{110}\text{Ag} = 249.9$ days

1.3.4.2 Radioactive waste from NPP A-1

Interim storage will provide long-term storage capacities for processed and treated RAW from NPP A-1 decommissioning that cannot be stored in NR RAW Močovce (Table 8.2). Presently, the unsorted RAW - vitrification cartridges with solidified chrompik I is stored in NPP A-1 HVB (main production unit). In the next phases of NPP A-1 decommissioning, RAW will be stored in Interim storage as specified in Tab. 2, or other RAW generated mainly from the NPP A-1 primary circle, which cannot be stored for various reasons

Tab. 2 is an overview of individual types of RAW, specific activity, total activity, packaging unit and its storage system.

Tab. 2 Overview of RAW from NPP A-1 expected to be stored in IS RAW

Packaging unit	Packaging storage unit	Type of solidified RAW	Specific activity $\sum\beta\gamma$ (Bq.m ⁻³)	Total activity $\sum\beta\gamma$ (Bq)
20 hermetic casing (70 vitrification cartridges)	Castor for RAW storage, or equivalent	chrompik II. and III. sludge that may be pumped from MSN	Not measured, estimate $10^{15} - 10^{16}$	Not measured, estimate $10^{15} - 10^{16}$
20 hermetic casing (30 vitrification cartridges)	Castor for RAW storage, or equivalent	chrompik II. and III. sludge that cannot be pumped from MSN	Not measured, estimate $10^{15} - 10^{16}$	Not measured, estimate $10^{15} - 10^{16}$
75 hermetic casing	Non-storables will be stored in hermetic casing or equivalent	chrompik sludge fixed at the bottom of PDS	$1,1 \times 10^{14}$	$2,4 \times 10^{13}$
43 hermetic casing (213 vitrification cartridges)	Storage in TOS, or equivalent	Vitrificate chrompik I.	$1,2 \times 10^{12}$	1×10^{13}
50 hermetic casing (250 vitrification cartridges)	Castor for RAW storage, or equivalent	Chrompik II-III. from MSN	$1,2 \times 10^{14}$	$1,2 \times 10^{15}$
200 MEVA barrels in shielded packaging unit (container for barrels)	Storage in TOS, or equivalent	Spent (saturated) inorganic sorbent and filter from VBO cleaning	6×10^{13}	$2,5 \times 10^{13}$
1 hermetic casing	Storage in TOS, or equivalent	Sorbents from DS pool water cleaning	3×10^{14}	6×10^{13}

Tab. 3 Example of NPP A-1 waste radionuclide composition :

Chrompik III. from MSN	
Radionuclide	Volume activity (Bq/L)
¹⁴ C	6,18.10 ⁴
⁴¹ Ca	< 5,50.10 ³
⁵⁹ Ni	< 2,65.10 ⁴
⁶³ Ni	2,71.10 ⁵
⁷⁹ Se	< 500
⁹⁰ Sr	2,44.10 ⁶
⁹³ Zr	< 600
⁹³ Mo	< 600
⁹⁴ Nb	< 2,25.10 ⁴
⁹⁹ Tc	3,12.10 ⁴
¹⁰⁷ Pd	< 420
¹²⁶ Sn	< 2,36.10 ⁴
¹²⁹ I	4,67.10 ⁴
¹³⁵ Cs	< 1,42.10 ⁵
¹⁵¹ Sm	1,30.10 ³
^{239,240} Pu	< 1,16.10 ³
²³⁸ Pu	< 1,10.10 ³
²⁴¹ Am	< 1,10.10 ³
⁶⁰ Co	< 4,82.10 ⁷
¹³⁷ Cs	9,50.10 ¹⁰
<i>Reference date: 02.12.2007</i>	

Sludge chrompik III. from MSN	
Radionuclide	Volume activity (Bq/L)
¹⁴ C	2,55.10 ⁵
⁴¹ Ca	< 6,00.10 ³
⁵⁹ Ni	< 6,36.10 ⁴
⁶³ Ni	5,20.10 ⁴
⁷⁹ Se	< 970
⁹⁰ Sr	1,45.10 ⁸
⁹³ Zr	< 1,20.10 ³
⁹³ Mo	< 737
⁹⁴ Nb	< 4,46.10 ⁴
⁹⁹ Tc	3,46.10 ⁴
¹⁰⁷ Pd	< 540
¹²⁶ Sn	< 5,80.10 ⁴
¹²⁹ I	1,40.10 ⁵
¹³⁵ Cs	< 2,78.10 ⁵
¹⁵¹ Sm	1,26.10 ⁵
^{239,240} Pu	7,03.10 ⁵
²³⁸ Pu	8,83.10 ⁴
²⁴¹ Am	8,21.10 ⁵
⁶⁰ Co	< 2,28.10 ⁷
¹³⁷ Cs	1,87.10 ¹¹
<i>Reference date: 27.01.2008</i>	

1.3.5 RAW disposal process after IS RAW planned life-span expiry

Interim storage operation is planned for 70 years. After 50 years of storage, only RAW are expected to remain in the storage that cannot be released or from which radioactive or contaminated parts cannot be separated.

Proposed further RAW storage :

- Prolongation of the integrated storage life-time period by its reconstruction
- Building a new storage for RAW storage with new technologies and barriers
- Depositing RAW to an deep storage

1.3.6 Technical and organisational means for RAW storage fire protection and physical protection

1.3.6.1 Physical protection of Interim RAW storage

Protection against theft and other projected threats will be solved by physical protection that is governed by the Act N°541/2004 Coll. The holder of the permit is responsible for physical protection within the scope of the activity.

By fulfilling the requirements stipulated in the Nuclear Supervision Authority Decree N°51/2006 Coll,

the permit holder (JAVYS, a.s.) guarantees to have ensured for effective protection based on the nuclear material classification, RAW, the building objects and technologies. The key goal of this protection is to limit the risk of misusing nuclear facilities and nuclear materials for endangering lives and health of individuals and the environment.

The issues of physical protection will be subject to a separate document entitled „ Preliminary Plan for Physical Protection“ that is part of classified documents by virtue of the respective laws N°215/2004 and 241/2001 Coll. The „Preliminary Plan for Physical Protection“ will define the scope of physical protection, production method and location of physical protection technical means, requirements for these during emergency, and regime measures as part of physical protection system for NPP V-1 guarded area.

Interim storage will be classified to category III according to the Decree N°51/2006 Coll. The construction of Interim RAW storage will take place in JAVYS, a.s. site (Option 1), or in connection to JAVYS, a.s. (Variant 2) within the already operating physical protection system of the permit holder, i.e. the storage building will be located in JAVYS, a.s guarded zone. The entrance to the premises will be controlled and secured with mechanical and electronic systems. Entrance will only be granted to certain staff with a permit. Access (entry and exit) for vehicles (road and railroad vehicles) will be governed by the principles of controlled entry to premises and the regulations.

1.3.6.2 IS RAW fire protection

IS RAW fire protection will be a part of JAVYS, a.s. Fire Protection Plan that is based on fire risks analysis in compliance with the requirements defined in the valid legislation of the Slovak Republic.

IS RAW fire protection will be secured with the below technical and organisational means:

- Electric fire alarm

All premises with fire risk will be equipped with automatic EPS alarm. EPS alarm buttons will be installed in the exit routes. EPS central control room will be located at the reception premises. EPS will be used to enlarge the approved PÚ area. Cable canals will be equipped with automatic EPS alarm.

EPS will be directed to joint fire call centre located in SO 653:V1 – Fire station building.

- Fire gates (doors, shutters)

Individual fire sections will be separated with fire gates – fire doors or windows. Automatic fire shutters will be installed as fire resistant separating structures where air ventilation pipelines cross with diameter above 0,04 m², ensuring for min. 30A fire resistance.

- Fire water system

Water consumption for fire fighting will be calculated for all fire sections by virtue of the Decree N°699/2004 Coll and STN 92 0400.

Operational and sanitary annex will be equipped with internal hose winches with a permanent shape hose.

Exterior fire fighting water supply will be provided from new external surface hydrants that will be

situated outside of fire danger area, at least 5 m but not more than 80 m away from the building, with the longest distance 160 m from each other - STN 92 0400.

- Portable fire extinguishing devices

The number of portable fire extinguisher for each fire section will follow STN 92 0202-1; carbon dioxide and powder fire extinguisher will be used.

- Access roads

These will use the existing public and site communication leading directly to the building. The minimum 80 kN load capacity per vehicle axle and min. 6 m width need to comply with §82 of the Slovak Ministry of Interior Decree N° 94/2004 Coll.

- Entering the site

Hardened area with water drainage system will be located in front of the building at least on two sides, which may be used as entering area to the site for fire fighting equipment pursuant to the Slovak Ministry of Interior Decree N°94/2004 Coll., though it is not required for a building with 9 m fire height.

- External intervention routes

Fire escape ladders at the building facades will be used as external intervention route by virtue of the Slovak Ministry of Interior Decree N°94/2004 Coll.

- Internal fire fighting unit (ZHÚ)

EBO V2, the founder of ZHÚ SE a.s., is providing services to JAVYS, a.s. based on a contract.

ZHÚ is located in the building N° 653:V1 in JAVYS a.s. premises.

The minimal number of internal fire fighting unit staff was defined in the Decision N° KRHZ-1241/OPT-2002 issued by the Regional HaZZ Directorate in Trnava, based on the assessment of the fire risk analysis in the nuclear facility.

ZHÚ comprise 4 shifts, with the respective number of 17, 16, 16 and 17 fire-fighters (i.e. 1 shift commander, 2 squad commanders and 12 or 13 fire-fighters). Work shift means 12 hours (12 hours of a daily shift, 12 hours of a night shift / 48 hours off.

The internal fire fighting unit has available the below:

- Fire fighting vehicles: 2x T 815 CAS 32, 1x T 815 CAS 25, 1x SCANIA CAS K 27, 1x KHA T 815 MIXMATIK, 1x T 815 RFC 11 – vehicle for ambulance – technical accidents, 1x IVECO EUROCARGO – anti-gas vehicle
- Other mobile equipment (vehicles): 1x FORD TRANSIT AMBULANCE, 1x IFA W 50 DL 30, 1x AVIA 31 PPL, 1x FORD TRANSIT – vehicle for ambulance - technical accidents, 1x Š 135 PRAKTIK, 1x Škoda Octavia, 2x PPS 12, 1x Š 1500 NA
- anti-gas service: autonomous air pressure breathing devices, body surface protection tools – anti-chemical overalls, fire resistant overalls, radioactive fallout resistant overalls, multi-purpose gas detectors
- communication – radio stations
- fire extinguishing and sorption substances
- dosimetric devices

In cases when ZHÚ SE a.s., EBO V2 plant would not have sufficient means to manage the accident, the intervention of fire-fighters from villages is secured pursuant to the Fire fighting Act N° 314/2001 Coll. as amended, : „In fire emergency, Regional Directorate, Fire fighting and Rescue Corps of the Slovak Capital City of Bratislava and District Directorates are entitled to concentrate and deploy fire fighting units within their territory regardless to whom these report and to whom these belong to“.

1.3.7 Financing the operation and decommissioning of Interim storage of RAW

IS RAW construction will be co-financed from the BIDSF (established by the EU) and National Nuclear Fund. Interim storage will be owned by JAVYS, a.s. having the state of the sole shareholder represented by the Ministry of Economy of the Slovak Republic. Pursuant to the Act N°541/2004 Coll. (the Atomic Act), the sole shareholder is responsible for ensuring sufficient funds for Interim storage operation and decommissioning. Funds to cover the operation expenses – RAW storage in IS RAW will be acquired through the National Nuclear Fund in compliance with the Act N°238/2006 Coll, as amended. The National Nuclear Fund is split to 8 sub-accounts, and will use the first sub-account assigned for nuclear facilities decommissioning in Jaslovské Bohunice site , including RAW disposal, namely the analytical accounts NPP A-1 and NPP V-1.

IS RAW decommissioning will be covered from funds to be accumulated during its operation, by virtue of the valid Slovak legislation.

2. DESCRIPTION OF THE PROPOSED ACTIVITY – OPTIONS OF THE PROPOSED ACTIVITY

2.1 Option 1

Option 1 - IS RAW is planned as a single building object of hall type inside JAVYS, a.s site . The respective buildings SO 760-II6:V1, SO 760-II.9,14:V1, SO 760-II,7:V1, SO 722 a SO 760-II.10:V1 are presently located at the selected location and will be removed. Also, hardened areas are located there and part of the site is covered with grass. Hardened areas will also be removed.

The size was an important condition for selecting the location for Option 1; after demolitions it is sufficiently large site for gradual construction of storage premises as required by RAW generation, and in particular the possibility to link the building to railroad system. Other decisive condition was the infrastructure accessibility.

2.2 Option 2

Option 2 – is also proposed to be located within the existing nuclear facilities in Jaslovské Bohunice and based on the principle that radioactive waste are stored where generated prior their further disposal.

Option 2 assumes the location outside JAVYS site . It is located in the immediate neighbourhood within the area limited and defined by the trailers coming out from JAVYS, a.s.. This location belongs to the cadastral area of the village Veľké Kostoľany, District of Piešťany.

Construction design and the technology are the same as in the Option 1. For this Option, the proponent would need to build the required infrastructure, namely access roads, protective fencing and infrastructure, which will require 8 242 m² of agricultural land.

Construction design and the technical solutions are the same for both the above Options and described in Chapter 1.3.1.

2.3 Zero Option

This is defined as situation that is a consequence of not implementing the activity. This Option cannot be considered due to the mutual link of all steps related to RAW disposal and NPP A-1 and NPP V-1 decommissioning in Jaslovské Bohunice. The reason would be reverse influence (slow down) on NPP A-1 and NPP V-1 decommissioning. Thus, decommissioning of these nuclear facilities would be suspended until the decommissioning waste that cannot be stored in NR RAW are safely deposited (e.g. a deep repository). The current experience proves that the impossibility to store also other types of RAW for a limited period of time could result in the overall decrease in RAW disposal system nuclear safety.

The principal activity within nuclear facilities decommissioning is dismantling of radioactive parts that will require safe storage. Temporarily, radioactive and contaminated parts may be stored in the main production unit that is a controlled zone equipped with all required measures (barriers, hygiene loops...). This alternative would only be feasible subject to fragmenting radioactive bulky components, which is very doubtful based on the Greifswald nuclear facility experience (Annex 6/1, 6/2).

Zero option would not solve this issue as NPP A-1 and NPP V-1 will be decommissioned at brown field, i.e. the building objects of the production unit will also be liquidated. This means, that a problem with radioactive parts storage would occur sometimes around the year 2025. Difficult handling after storing in certain premises within the main production unit is another reason for not storing radioactive parts in the main production unit controlled zone for longer time.

Building the Interim storage was one of the conditions in the selected NPP V-1 decommissioning options assessed in 2007. Potential absence of storage capacities in the Interim storage is disturbing the selected strategy of immediate decommissioning and would mean to completely review the overall NPP V-1 decommissioning and a principal change in NPP A-1 decommissioning strategy.

3. DESCRIPTION OF POTENTIALLY AFFECTED ELEMENTS OF THE ENVIRONMENT

Implementation of the proposed activities will have no significant adverse effects on the environment, and the only individual outcomes from IS RAW operation would be air effluents and radioactive water generated during non-standard situation that are not to be released directly to the environment. Option 2 will require land presently used for agricultural purposes – app. 8 242 m². Only local impacts on the air are expected during the construction – dust generated during construction and demolition works, emissions from transportation and construction machines and vehicles. Non-active waste generation will be more important during construction (waste from demolition of buildings to make space available for IS RAW construction) than during the operation (minimum volumes of municipal waste generated by the operation staff, maintenance waste).

3.1. Air – air pollution situation

3.1.2 Non-radioactive air pollution

From air pollution point of view, the area of interest belongs to the least exposed territories. Within Trnava Region, the respective cities of Trnava and Senica were identified in 2010 as air quality management areas for PM₁₀ substance. Other pollutants didn't exceed the thresholds or limits or target values. The territory is aired thank to favourable orthographic and climate conditions, and the pollutants are thus spread.

The existing JAVYS, a.s. operation impacts the air by generating emissions of pollutants (no radioactivity) depending on the respective sources operation within JAVYS, a.s.. site. Having regarded the data on the volumes of individual pollutants, this impact may be evaluated as of low importance. Interim storage operation will not represent an air pollution source and thus will not influence the air quality.

JAVYS, a.s. operates the below air pollution sources:

Auxiliary boiler plant (NaRK) - Building N° 441 – large air pollution source

Medium air pollution sources

- **Radioactive waste incineration plant – Building N° 808 – Bohunice Radwaste Processing and Treatment Centre (BSC RAO /BR WTC)**

Tab. 4: Overview of air pollution emissions from BSC RAO Incineration Plant

Pollutant	1 st half 2011 (t)	The Year 2010 (t)	The Year 2009 (t)	The Year 2008 (t)	The Year 2007 (t)
HCl	0,00031	0,00105	0,002	0,001	0,002
HF	0,000052	0,00896	0,011	0,006	0,002
Hg+Tl+Cd	0,000012	0,000035	0,00002	0,0009	0,003
As+Ni+Cr+Co	0,00017	0,00043	0,0003	0,004	0,012
Pb+Cu+Mn	0,000091	0,000157	0,00008	0,0006	0,002
SO ₂	0,00282	0,00611	0,005	0,011	0,347
NO _x	0,43905	0,85275	1,17	0,989	3,593
CO	0,04214	0,07838	0,093	0,168	0,726
TZL	0,00320	0,00523	0,004	0,02	0,036
C _{org}	0,00837	0,01446	0,018	0,029	0,045
Operating hours	2 873	5 342	6 143	7 574	6 037

- **Boiler LOOS** – Building N° 441 – steam generation for bitumenisation line
- **Gas boiler plant** – Building N° 740-IX.1 – heating of part of the site
- **Diesel generators** – Building N° 530 - emergency power supply source for cases when own electricity consumption fails

Small air pollution sources :

- **diesel generator at MSVP (Interim spent fuel storage facility – ISFS)- Building N° 840** – not permanently in operation, operating ability is being tested, pollution generation is negligible.

Tab. 5: Operation of sources and the volume of emissions in 2010

SOURCE	Fuel	Pollutants (t)				
		TZL	SO ₂	NO _x	CO	C _{org}
	Natural gas (m ³)					
Auxiliary boiler plant (NaRK)	156 736	0,011911	0,001429	0,262061	0,08785	0,01116
Boiler LOOS	24 993	0,001899	0,000228	0,037039	0,014958	0,002493
Gas boiler room	100 817	0,007662	0,000919	0,14941	0,060338	0,010056
	Nafta (t)					
Diesel generators (V1) with input power 1,680MW	9,686	0,01375	0,000193	0,04843	0,00775	0,001104
Diesel generators (V1) with input power 3,37 MW	7,597	0,01078	0,00015	0,03798	0,00607	0,00054
Diesel generators MSVP	1,344	0,001908	0,000026	0,00672	0,001075	0,000153

3.1.3 Air pollution through radionuclides

Ventilation smokestacks from JAVYS, a.s operated buildings are the main spot air pollution sources; namely the below ones are located in JAVYS, a.s site :

- the main ventilation smokestack (Building N° 460) with air ventilation from the respective buildings N° 800, 801, 803, 804 through 461
- air ventilation smokestack NPP A1
- air ventilation smokestack BSC RAO
- air ventilation smokestack MSVP

Air ventilation systems in buildings with controlled zone mode of operation is so that air pumped from rooms in the buildings runs from the premises with lower potential contamination of surfaces (corridors and staircases) to those with higher potential surface contamination (cells) in order to avoid contamination to be spread with air. The pumped air runs through highly efficient air/aerosol filters (filtration lowers the volume of effluent radioactive aerosols up to 10 000 times) to ventilation smoke stack with non-stop monitoring (alfa, beta and gamma activity of aerosols is controlled) and released to higher atmosphere layers in an organised manner.

The limit principle is applied to minimise environmental impacts of gas effluents, i.e. when authorised gas effluent limits are observed, radiation limits for individuals from critical groups of inhabitants will

not be exceeded. Limit values setting is based on calculated assessment of individual dose rate when all probable radiation methods are applied.

Based on the gas effluent balances given in the Annual Reports on radiation protection and environmental impacts of JAVYS, a.s. site it may be stated that the values reached in the respective years fall significantly below the defined limits.

Annual limits for gas effluents from individual pollution sources are stipulated in the respective decisions issued by the Public Health Authority of the Slovak Republic.

Tab. 6: Gas effluent limits for JAVYS, a.s. valid for the year 2010

ANNUAL LIMITS	SITE NPP A-1 and TSÚ RAO	MSVP
aerosols alfa [Bq]	$8,8 \cdot 10^6$	--
aerosols beta, gamma [Bq]	$9,4 \cdot 10^8$	$3 \cdot 10^8$
strontium [Bq]	$2,8 \cdot 10^7$	--
ANNUAL LIMITS	MAIN VENTILATION NPP V1	SMOKESTACK
Inert gases [Bq]	$2 \cdot 10^{15}$	
Iodine ¹³¹ I [Bq]	$6,5 \cdot 10^{10}$	
aerosols [Bq]	$8 \cdot 10^{10}$	
⁹⁰ Sr[Bq]	$1,4 \cdot 10^8$	
aerosols alfa [Bq]	$2,0 \cdot 10^7$	

Gas effluents in 2010

	Effluent activity	Annual limit	% of the annual limit
Aerosols A-1	3 368,762 kBq	$9,4 \cdot 10^5$ kBq	0,358 %
Aerosols MSVP	812,093 kBq	$3,0 \cdot 10^5$ kBq	0,271 %

V1 Power Plant	effluent Year 2010	Annual limit for V1	Annual limit portion [%]
Gas effluents			
Inert gases	5,577 TBq	2000 TBq	0,179
Aerosols	6,264 MBq	80000 MBq	0,008
Iodine	0,765 MBq	65000 MBq	0,001

3.2 Surface and underground water

3.2.1 Surface watercourses

The affected area belongs to the Váh River basin. The River Váh flows east of the affected area. The river was included to the assessment of hydrologic conditions because most of wastewater generated in Jaslovské Bohunice nuclear facility is drained directly to the River Váh by pipeline collector SOCOMAN through Drahovský Canal and only a smaller part thereof is discharged through Manivier Canal to Dudváh River. Both rivers Váh and Dudváh flow from north to south.

Following the „2010 Water Monitoring Programme“, qualitative surface water indicators were monitored in Slovakia during the year 2010 pursuant to the Annex °1 to the Government Regulation N°269/2010 Coll. 98 samples were taken in River Váh partial river basin, 87 thereof didn't meet the requirements in one or more indicators. Discrepancies with the surface water quality requirements were mainly found in monitoring points located in particular underneath significant pollution sources, tributaries and also in monitoring points where several unfavourable factors impact, with the unfavourable ratio of water flow rate in the recipient to the volume (and pollution) of the discharged wastewater likely being the most significant one. In the part D - **radioactivity indicators: total alfa and beta volume activity, tritium, strontium, caesium, all samples met the limits.**

3.2.2 Water pollution through radionuclides

Pollution of discharged water that is the consequence of nuclear facilities operation in JAVYS, a.s. and SE, a.s. EBO V2 plant, is strictly controlled and limited. Limits are based on potential impacts on the environment and inhabitants and are fixed for the approved activity within a nuclear facility. Public Health Authority is setting annual limits for liquid discharges, monitored indicators, monitoring methods and reporting, for each operator.

Wastewater contaminated with radionuclides are generated during nuclear facility operation, and depending on their type these are further processed in TSÚ RAO (Radioactive Waste Processing and Treatment Technology RAW PTT) technologies as liquid radioactive waste or pre-treated in special facilities until these can be discharged to surface waters.

Multiple control mechanisms are applied to ensure that the limits defined by the Public Health Authority Decision are observed and monitored (control of the tank prior discharge, discharge approval process, continuous monitoring of discharged wastewater in two measuring buildings).

The River Váh is used as recipient for all technology, municipal (once treated in WWTP) and low radiation wastewater generated in JAVYS, a.s site . These are drained by SOCOMAN pipe collector through the Building N°368 (measuring building to measure the volume and quality of discharged wastewater). Wastewater from JAVYS, a.s site (pipeline capacity 354 l/s) are mixed before the Building N°614 with wastewater generated by SE, a.s. -EBO V-2 running to the pipeline collector through the other line (pipeline capacity 143 l/s) from V-2 power plant and water from both these entities are drained to the Váh River recipient. Socoman, the final pipeline collector for other than rain water drains the wastewater through Drahovský Canal (0,4 rkm) located in Madunice (village) cadastre area to the River Váh (6,4 rkm). For 10,8 km, the collector follows the right bank of Manivier Canal until it reaches the limits of Žilkovce village and there, it is turning to its left bank. It is crossing the Dudváh River and flows to the final discharge point equipped with back shutter located at the

right bank in Madunice location; the pipeline capacity from the Building N°614 is 497 l/s.

Water mainly from surface flows in JAVYS, a.s. site without any limits and certain water from buildings not connected to Socoman are drained through the open Manivier Canal to **Dudvák River recipient**. Building N°614 is one control sampling point (physical and chemical indicators) and the Building N°880 is the other one (monitoring activity).

Tab. 7: Liquid discharge limits valid for the year 2010

ANNUAL LIMITS – V1	RECIPIENT DUDVÁH	RECIPIENT VÁH
Corrosive and fission products [Bq]	$1,3 \cdot 10^8$	$1,3 \cdot 10^{10}$
tritium [Bq]	$2,0 \cdot 10^{11}$	$2,0 \cdot 10^{13}$
ANNUAL LIMITS – A1, TSÚ RAO	RECIPIENT DUDVÁH	RECIPIENT VÁH
Corrosive and fission products [Bq]	$1,2 \cdot 10^8$	$1,2 \cdot 10^{10}$
tritium [Bq]	$3,7 \cdot 10^{10}$	$1,0 \cdot 10^{13}$

Table 8: Recipient Váh – low radiation water discharge

The year 2010	Radionuclides activity in wastewater discharged to Váh recipient							
	site V1				site A1			
	KŠP (MBq)	tritium (GBq)	% KŠP limit*	% of 3H*limit	KŠP (MBq)	tritium (GBq)	% KŠP**limit	% of 3H**limit
Total	19,211	298	0,148	1,49	105,272	225,719	0,877	2,257

* corrosive and fission products (KŠP) limit -13000 MBq ; limit tritium - 20000 GBq

**corrosive and fission products (KŠP) limit -12000 MBq ; limit tritium - 10000 GBq

No water was discharged to the Dudvák River in 2010 from A1 site; condensation water from auxiliary boiler plant (NaRK) were released to rain water pipeline (volume - 160 m³, with summary tritium activity of 0,024 GBq, i.e. 0,012 % of the approved limit).

Based on the analysis of radioactive substances discharged from JAVYS, a.s., evaluated in annual reports it may be stated that volumes of radioactive substances discharged to hydrosphere didn't anyhow exceed the respective approved annual limits issued by supervisory bodies.

3.2.3 Hydrogeologic conditions – underground water

Hydrogeologic conditions in the area of interest are determined by its geological and tectonic structure, morphological and climate conditions. The 1st watered layer collector consists of gravel, sandy gravel and sands, which may be considered to be the equivalent to the Kolárovo formation and the flat sediments of Dudvák wetlands. These are located on retentive plastic neogene clays with sands and gravel forming the 2nd watered layer.

According to hydro-geological division of Slovakia, the wider area of interest belongs to the following hydro-geological regions: Nižna - N 049, Veľke Kostolány - QN 050 and Q 048.

Chemical composition of underground water in the fluvial sediments is formed rather by the mixing of water with varied mineralisation, composition and origin than by mineralisation processes taking place at the interface between the rock and underground water phase. Intensity of these processes depends mainly on the flow rate, granulometric composition of fluvial gravel-sands and chemical activity of the underlying rock material. These genetic conditions result in extensive special variability of mineralisation and chemical composition of these waters. An important factor participating in the formation of these variability is also inorganic or organic pollution of varying origin transported into the circulation environment through the infiltration of surface water and rainwater, or direct intrusion.

The quality of underground water is more often affected by the local area when higher content of nutrients (ammonium ions, nitrites), organic substances (dichlorobenzene) and trace elements (Fe, Mn, Ni, Hg) was monitored in (other than water utilities) SHMU buildings.

The average speed of underground water flow in Jaslovské Bohunice nuclear facility site reaches $94.10^{-7} \text{ m}\cdot\text{s}^{-1}$. Underground water level lies in gravel sand sediment complex 20 m below the terrain. Underground water in the collector have free level and strong Ca-Mg-HCO₃ type, mid-mineralised, hard with slight alkali reaction.

Underground water of the area of interest belong to the underground water formation in pre-Quaternary rocks (SK2001000P Inter-grain underground water of Danube basin and its ridges within Váh River basin) that is evaluated as having high soil protection potential. (Annex N° 8)

Following the request of the Hungarian stakeholders, information is also provided on underground water monitoring in transboundary underground water formation. Underground water is monitored due to Gabčíkovo water dam – monitored are underground water levels and quality, which is followed by solid humidity monitoring. Underground water levels are measured within the joint Slovak-Hungarian monitoring process and also within the national and purpose-built network of monitoring wells (Annex N°7). Data from the basic network objects are also part of the mutual exchange of information with Hungarian counterpart by virtue of Inter-Governmental Treaty of 1995. Majority of these objects is monitored within the basic monitoring of underground water level in Slovakia carried out by SHMU (Slovak Meteorological Institute). Annex N°7 shows the location of objects.

The regime of flow rates and water level in the Danube River and in Gabčíkovo water dam retention basin, regulation of water level and flow rates in soak and irrigation canals, water level and flow rates in the river network and its branches, Mošon branch of the River Danube as well as those Little Danube River has the principal and the largest impact on the regime of underground water . The Danube River affects the intensity of reserves fill up, rate and direction of underground water flow and its chemical composition. Danube River water level and quality are of key importance for underground water volume and quality (www.gabcikovo.gov.sk).

Regarding the information provided on the River Danube impact on the quality of underground water in transboundary water formation (SK1000300P) in the layer of quaternary underground water formation and taking into account the underground water direction and flow rate in the neighbourhood of the location where the activity is proposed, it may be stated that underground

water of the respective Hungarian counterpart cannot be influenced by Jaslovské Bohunice underground water quality, and taking into account the contaminated water management and operation method as well as the fact that these are generated only in non-standard situations and having regarded the discharged water monitoring, no impact of the Interim storage operation may be assumed on underground water quality (Annex N°8 and 9).

4. DESCRIPTION OF POTENTIAL ENVIRONMENTAL IMPACTS INCLUDING HEALTH PROTECTION AND THEIR ESTIMATED IMPORTANCE

Environmental impacts depend on outputs from IS RAW construction and operation that are evaluated as those with low importance and acceptable for the proposed area.

4.1 Input data

4.1.1 Air

In the Interim storage of radioactive waste, only solid and solidified waste will be stored in fibre-concrete containers or barrels, and large metal pieces after pre-dismantling decontamination with no surface contamination activated. These waste is not a source of radioactive gases or aerosols. Regarding the Air Act N°137/2010 Coll. and its implementing regulations, IS RAW building nor any of its facilities are classified as air pollution source (for heating, hot water will be used through heat-exchange station, connected to the existing hot water distribution network on the site).

Depending on the solution proposed in the design documentation, natural ventilation or exhaust ventilation equipment may be used to work in the the mode for category III workplace with open radiation sources (See Chap. II.8.2) in non-standard situations.

Air ventilation system, once in operation (**non-standard situation**), will ensure for ventilation and in particular air flow in appropriate direction so that potentially generated aerosols are exhausted and caught on filters. As no technologies releasing gaseous RAW to the air are planned to be operated in IS RAW, air ventilation is not required to limit gas effluents with regards to the protection of inhabitants living in the nuclear facility neighbourhood. Regarding the personnel protection, the estimated dose rates from the potentially generated aerosols when the packaging units are damaged (non-standard situation) are lower by several orders than radiation limits for personnel and thus, air ventilation is not a necessary mean to ensure for dose rates below the threshold limits and thus, it may not be a classified equipment.

Build-in ventilation will exhaust the controlled zone premises, in particular those for RAW handling and storage of packaging units. Air ventilation equipment exhausting the storage and handling premises is supposed to ensure under pressure in the storage sufficient for avoiding any radioactive aerosols leakage through the entrance hall door. Similarly, air ventilation exhausting the air from other controlled zone premises should ensure under pressure sufficient for avoiding any radioactive aerosols leakage through other openings than the air ventilation filtration equipment.

Monitoring of radioactive aerosols concentration in the storage premises, air ventilation gas effluents

monitoring and air samples for laboratory testing will be done by pumping the air through filtration material. The air will flow through aerosol filters when packaged forms of waste is being handled in the storage premises, also in case of an accident. In order to reach the correct results, also the volume of air flowing through the air ventilation system needs to be measured and aerosol filters spent (saturation) level must be verified.

Gas effluent limits for the site are governed by the decisions issued by the Public Health Authority of the Slovak Republic and IS RAW operation will not require any changes (See Chap. 3.1.3).

4.1.2 Wastewater

During the construction, municipal wastewater will be generated in the volume corresponding with drinking water consumption used for sanitary purposes, as well as rain wastewater from the construction site. During the construction, municipal wastewater may be collected in a sanitary container that will form a part of the construction site, until new sanitary premises are completed. Nevertheless, the final shape will only be specified in the design documentation..

The below wastewater will be discharged to the environment from the Interim storage operation:

- **Municipal wastewater** from sanitary facilities are not contaminated and will be drained through the municipal sewer to wastewater treatment plant. The total volume of municipal wastewater will be negligible also regarding the operating regime and will depend on the number of operating staff.
- **Surface water (rain water** from roofs and hardened areas); max. volume of 253,13 l/s will be drained through retention tanks to Manivier recipient. These are rain water from the roof of IS RAW hall and the roof of the supporting technologies annex, representing 6 748m²; the first phase thereof means 3 468m² and the second one represents the roof size of 3 280m². The annex roof represents size of 830,9m².
- Water from retention tank may be either municipal type of water (not contaminated), or contaminated water (exceptional cases) when these will be processed in TSÚ RAO

Collection tank will be used for collection of wastewater in standard IS RAW operation, and in non-standard situations i.e. exceptional cases it will also be used for contaminated water collection (liquid RAW). No radioactive water or decontamination solutions are expected to be generated in standard IS RAW operation. Waters from three sources will flow to the retention tank – from decontamination of persons, equipment and the premises. During standard IS RAW operation, app. 6,0 m³ of water /year is estimated to be generated that will be drained to the contaminated water retention tank. Based on the volume activity data, water from retention tank will be pumped either to municipal sewer or to transportation container used for liquid RAW transport.

Non-standard situations will result in increase of all components of wastewaters. When a non-standard situation occurs, water from retention tank will be measured and (depending on their activity) pumped to municipal sewer prior decontamination activity. Thus, the retention tank will be made available for water from decontamination and then, only radioactive water from decontamination activity will be pumped to the transportation vehicle. Contaminated water will be transported to TSÚ RAO for further processing.

Generation of wastewater during the construction or interim storage operation will not require changes in limits or conditions defined in the valid decisions governing wastewater discharge to the Váh and Dudváh River recipients (Decision issued by Regional Environmental Authority in Trnava), nor liquid discharge limits defined by the Public Health Authority of the Slovak Republic (See Chap. C II 15.2.2).

4.1.3 Waste

Waste generated during construction phase

Waste characteristic for construction activities are expected to be generated during the construction phase. The excavated soil and waste from removal of the existing constructions to make space for the Option 1, will form the major part of the volume of waste generated during this phase (7250 t). The soil will be reused to fill up the excavation holes, landscaping and recultivation.

Waste from demolition of road network and pavements – 620 t

Expected volume of other waste to be generated – app. 17 059,8 t

Waste generated during operation

Regarding the characteristics of the activity, by virtue of the Waste Act N°223/2001 Coll. and the Slovak Ministry of Environment Decree N°284/2001 Coll. introducing the Waste Catalogue, the operation of the proposed facility will generate solely standard operational waste, such as mixed municipal waste, fluorescent tubes, hydraulic, engine, lubricating waste oils from hoisting devices, spent (saturated) filters from ventilation, etc. Implementing different alternatives have no impact on the volume or type of waste to be generated, in this phase.

Waste will be disposed in compliance with the Waste Act and its Implementing Regulations; waste recovery will be preferred.

Radioactive waste

Specific waste that may be generated during the proposed activity (in non-standard situations) are radioactive waste or materials contaminated with radioactive substances, such as used decontamination solutions, exhausted air cleaning filters, contaminated personal protection tools, aerosol filters from air ventilation systems, sampling materials for activated surface contamination testing, aerosols caught to monitor their volume concentration, decontamination tools and devices, etc. Estimated annual volume of these waste is 3 – 5 m³.

Radioactive waste will be disposed according to internal documents governing RAW disposal, waste will be classified according to their potential processing method available in the facilities for RAW treatment and processing on the site. Output RAW may be stored in NR RAW (FCC with RAW fixed in cement bed.)

4.1.4 Radiation and other physical fields

Storage premises will be ionising radiation source. The overall activity of waste present in solidified form in IS RAW is estimated to be 1.10^{18} Bq at the most, and this is activity that is only moved from other nuclear facilities within the location, not increasing thus the overall activity within the site.

Activity is represented by dominant ^{137}Cs radionuclide. Its radiation will be shielded by packaging form and by the building perimeter wall. Besides, outer concrete shielding wall will be build around the building. Shielding walls parameters will be designed so that only background values of dose rates will be reached at the outer shielding wall surface, and therefore IS RAW impact on the inhabitants and personnel around IS RAW will be negligible in regard to external radiation. As the dose rate in immediate neighbourhood of the Interim storage will only reach levels of the natural background deviation, it may be stated that radiation exposure of inhabitants through direct radiation from fully stocked Interim storage will be zero.

4.1.5 Assessment of the expected development of the location should the proposed activity not be implemented

Should the proposed activity not be implemented, the area of interest for Option 1 would further be used for its present purposes, i.e. buildings used as workshops, warehouses, offices and cloakrooms, build-in areas. For Option 2, the site would remain to belong to agricultural fund. There are no other intentions presented regarding the potential utilisation of the area of interest inside the site or in its close neighbourhood. With regards to the specific utilisation of JAVYS, a.s. premises, no other future potential use of these area is expected than those related to nuclear facilities decommissioning activities, radioactive waste treatment and processing and storage of spent nuclear fuel in JAVYS, a.s. site.

Should the submitted proposal not be implemented, transport load of the area of interest would not increase to a certain level due to transport of construction waste and construction materials from and to the proposed location, transportation of staff, suppliers, which will generate adequate volume of pollution and noise. RAW would not be transported inside the site, waste would be deposited in buildings assigned for gradual decommissioning, which would significantly slow down the decommissioning schedules for NPP V-1, NPP A-1 and leading thus to a principal re-considerations of the overall nuclear facilities decommissioning strategy in Slovakia, which would result in shifting the planned deadline for releasing certain construction sites and finally, also the overall location from institutional supervision. The existing facilities in the decommissioned power plant are not adjusted to storage purposes and their potential utilisation for storing will affect the complexity of their operation, and higher the risk for the operating staff.

4.2 Impacts of the proposed activity

4.2.1 Impacts to the population

The available studies proved that it is not possible to statistically link the existence of nuclear facilities

in Jaslovské Bohunice with the development of population health in the affected territory.

In terms of radiological protection, the Principal Hygiene Officer of the Slovak Republic issued a decision on the hygiene protection zone around nuclear facility JAVYS, a. site in Jaslovské Bohunice with no permanent settlement. This zone is of irregular shape between the fencing of the site and the closest municipalities, ranging from 2,5 to 3 km from the centre of the site. The inhabited areas of the closest municipalities are included in the affected areas. There are no specific conditions set as to the use of this zone for farming, except for monitoring of radiological situation. Besides the hygiene protection zone, there is a radiation control zone with 3 and 5 km radius, and a monitored zone with radius of 25 km established around the nuclear facility. Radiation situation is monitored in all three above zones.

Regarding environmental pollution, Jaslovské Bohunice site is characterised as a site with nuclear – energy facilities which operation causes and, also, potentially may cause environmental pollution, namely as a result of radioactive substances discharges and release of residual heat (operated by the nuclear facility).

Radioactive substances are released from the individual nuclear facilities into the atmosphere or hydrosphere. Radionuclide activity in gaseous effluents and liquid waste is limited - the so called authorised limits. Compliance (not exceeding) with these is a precondition for obtaining the operation licence. Compliance with annual activity limits is monitored and measurement results are reported to the relevant state hygiene supervision authorities.

The experiences and knowledge so far show that the impact of gaseous radioactive effluents is so small, that it reaches the level of monitored background values, which are not measurable in any of the elements of the environment. The existing radiological situation around JAVYS site causing exposure of the population within the reach of gaseous discharges is virtually identical to that of the so-called radioactive background created by the existence of cosmic radiation and natural radionuclides in the environment. The real impact of the nuclear facility operation in regional scale is that of an element increasing the radiation background. In wider surroundings of JAVYS site, the radiological situation is not specific in any way, when compared with the situation in any location with similar geo-chemical composition of the sub-base. The Interim dose rate of gamma radiation created by radionuclides in the sub-base and cosmic radiation, reaches 95 mGy.hour⁻¹.

Supervisory hygiene authorities defined pursuant to Annex 3 of Government Regulation N°. 345/2006 Coll., the exposure limit for individuals from the critical group of population at 250 µSv/year for the sites of JAVYS and SE, a.s., -EBO V2 plant

Experience from Jaslovské Bohunice nuclear facility operation up to date shows (except for some extremes) that the actual values of radionuclide activity in gas discharges are lower than 1 % of the authorised limits; discharges into the hydrosphere reach up to 10% of the authorised limits. The above suggests that population exposure, expressed as effective dose equivalent for individuals from the critical group of population will be below 0.25m mSv.year⁻¹, which is the exposure limit for individuals around a nuclear facility site.

A facility, to which existing RAW will be relocated for safer storage, will have no adverse impact on The population health.

The proposed solution and the character of operation represent no further direct risk for the affected inhabitants, be it from point of view of air or water pollution caused by emissions of pollutants or from noise and vibration generation.

The Regulation of the Slovak Government N°345/2006 Coll. recommends the effective dose 1

mSv.year⁻¹ as the limit for population radiation. Since the Slovak Nuclear Supervision Authority in its Decision N°97/2006 approved the NPP V-1 site borders as the emergency zone for IS RAW, from emergency planning point of view it is not necessary to assess radiological consequences in relation to the intervention levels for introducing public protection measures pursuant to Annex 10 of the Slovak Government Regulation N° 345/2006 Coll.

Dose load analysis of inhabitants are carried out in order to assess the impacts of SE, a.s. site – EBO V2 plant and JAVYS, a.s. site to the inhabitants, based on actual meteorological measurements and the actual radioactive substances effluents to atmosphere and hydrosphere, in the respective year.

Following the radioactive substances discharge analysis from SE, a.s. site – EBO V2 plant and JAVYS, a.s. site in the respective years it may be stated that the volumes of radioactive substances discharged to the atmosphere and hydrosphere in previous years **didn't anyhow exceed the authorised annual radioactive substances discharge limits issued by the supervising authorities.**

The personnel

Pursuant to the Slovak Government Regulation N° 345/2006, the effective dose limit per one person working with ionising radiation sources is defined as follows:

Effective dose of 100 mSv during five subsequent calendar years, when effective dose shall not exceed 50 mSv in any calendar year.

In order to optimise radiation protection, the effective dose per one person working with ionising radiation sources of 1 mSv in a calendar year is the set guide value to prove the actually reached level of radiation protection in activities leading to radiation.

The construction parts of IS RAW storage halls are also used for radiation sources shielding and thus, creating conditions enabling to minimise and optimise the doses the operating personnel is receiving during work activities in the building, and to minimise the operation impacts on radiation situation around the building.

Model calculation of effective dose for the personnel

(627) FCC, (1800) stainless steel MEVA barrels and ISO containers (overall volume 2 150 cm x 1 500 cm x 731 cm) were used as model packaging units for effective dose calculation from RAW .

Regarding the dose calculations IS RAW personnel is receiving when handling RAW packaging units, the activity of these external radiation sources is in particular caused by ¹³⁷Cs radionuclide. Other radionuclides may also be present in RAW, such as ¹⁴C, ⁴¹Ca, ⁵⁹Ni, ⁶³Ni, ⁷⁹Se, ⁹⁰Sr, ⁹³Mo, ⁹³Zr, ⁹⁴Nb, ⁹⁹Tc, ¹⁰⁷Pd, ¹²⁶Sn, ¹²⁹I, ¹⁵¹Sm, ²³⁸Pu, ²³⁹Pu, and ²⁴¹Am, and their share on the overall activity is negligible and therefore their contribution to the overall dose may be assessed as negligible also regarding the shielding of these radiation by the package unit material.

The following may be concluded from model calculation of effective dose rate within Interim storage premises and in its surroundings :

- When the storage halls are fully stocked with RAW packaging units (all packaging units with surface effective dose rate 10 mSv) and assuming 800 hours as the annual time for one person being present at the IR workplace (the project assumes IR operation in two shifts in a week), the annual effective dose from external radiation sources would reach 0,6 mSv at the place with

maximum effective dose rate in IR annex.

- When the storage halls are fully stocked with RAW packaging units and assuming 2 000 hours as the annual time per one person being in 2 m distance from IS RAW building surface, the received effective dose from external radiation would reach 0,05 mSv.

For the construction design, realistic calculations will need to be carried out and stay scenarios should be defined in order to meet the conditions for protection of the staff working with ionising radiation in IS RAW premises and to exclude unjustified and unlimited exposure of the staff by virtue of valid legislation.

4.2.2 Impacts on individual parts of the environment

Based on the character of the activity as described in the EIA Report, no adverse effects of the proposed activity (IS RAW) are expected on:

- Rock sub-base, mineral deposits, geodynamic and geomorphologic conditions
- Climate and the ambient air (Interim storage will generate no discharges in standard operation and thus, it will not influence the volume or concentration of radioactive emissions within the affected area)
- Water conditions (Interim storage will only store solid RAW, water from hygiene loop emergency shower will be collected in a collection tank)
- Soil
- Fauna, flora and their biotopes

Impacts on the climate and the air

Regarding the selected heating methods, no combustion process will be involved in the proposed activity that could generate carbon dioxide and carbon monoxide as the so called greenhouse gas, nor will any other technology generate other greenhouse gas emissions.

During IS RAW construction phase, mainly pollution emissions will be generated by lorries and construction mechanisms, and secondary dust conditions will be generated from construction activities and the demolition of certain existing buildings. Generally, these are only temporary sources with different intensity within individual implementation phases, which will exist for the overall period of 15 months time with maximum generation during the first months of construction. This territorially limited air pollution source will be located app. 4 km from the nearest complex residential zone. From air pollution point of view, transportation routes will be affecting the nearest residential zones. The expected increased transportation load in this regard is nevertheless considered to be within the scope that is usual for construction activity of such scale.

Regarding the character of the proposed activity, no emissions of generally known pollutants will be generated from the technology itself during the operation – no new air pollution source is established. Neither emissions of pollutants will be generated from heating during the proposed activities as the existing hot water distribution network is planned to be used for heating of the premises.

Depending on the ventilation method, impacts of radionuclides discharged to the air will be evaluated. No air contamination with radionuclides is expected to be generated in standard

operation, and partial leakages of radionuclides to the air in storage premises may be expected during emergency situations. In these cases, the air will be exhausted from premises where a risk of contaminated radionuclides leakages to the air exist and prior final release to the ambient air it will be cleaned using appropriate filtration equipment and following the safety analysis requirements. The efficiency of such filtration equipment is more than 99% and already the primary emissions are significantly reduced by the low frequency of emergency situation occurrence when aerosols may be generated – released.

Outputs from air ventilation systems exhausting these premises will lead to ventilation smokestack equipped with the required radioactive effluents monitoring.

Standard operation or operation failures or accidents in IS RAW will have no provable radiation impact on the surrounding or population.

Impacts on the water conditions

During construction phase, the risk of surface and underground water contamination will only relate to cases of failures or accidents of construction mechanisms when leakages of crude oil may occur. Such a situation will be addressed in compliance with the Construction Site Emergency Plan. The scope of this risk may be significantly lowered when the mechanisms used for construction will be well maintained, safety regulations and the operation measures for the construction phase are observed.

Underground water courses cannot be affected by the construction due to the underground water level being at -20 m.

Only municipal wastewater will be generated – as a result of construction company staff activities, and surface water will be drained from the construction site to the existing rain water sewer. Drinking water consumption increase will not be of importance, drinking water is only used for drinking and sanitary purposes.

No technology wastewater will be generated during standard operation. Thus, the proposed activity will only generate municipal wastewater and rain water. Surface rain water from hardened areas and roofs of the building object of the proposed facility will be drained to the existing rain water sewer that is leading to the open Manivier Canal through retention tanks, which flows to Dudvák River. Water contaminated with radionuclides may only be generated in emergency situations when decontamination of transportation, packaging units or packaging premises will need to be carried out, including the personnel. Water from decontamination and emergency shower will be drained to a collection tank and drained to municipal sewer (subject to meeting the release limits), or these will be pumped to transportation container to be processed as liquid RAW in certain RAW processing lines. The expected production of these water amounts max. 6 m³ annually and generally, it cannot be proved at the background of JAVYS nuclear facility operation and NPP V-1 and NPP A-1 decommissioning. Potential gaseous and liquid discharges generated in processing of liquid RAW generated in IS RAW will be included to the limits and conditions defined for individual processing facilities, i.e. no limits for liquid discharges will be needed for IS RAW as liquid discharges from this facility will not be discharged to surface or underground water.

Due to the control when emptying the collection tank and taking into account technical conditions of the storage facility (impermeable floors), the potential water contamination risk only relates to emergency situations during RAW transportation. Therefore, only leakage of fuel and lubricants from transportation vehicles may be considered due to the fact that only solid and solidified RAW will be

transported to the storage. These events would be addressed according to JAVYS, a.s. Emergency Plan for Surface and Underground Water Protection. The level of such risk will be decreased by observing the ADR terms and the relevant legislation requirements in transportation, and applying the relevant mode measures during RAW transportation.

Summary: Neither the construction nor the operation will have any direct impacts on surface and underground water quality. Surface water from the roof and build-in areas are no pollution sources for surface water, municipal water generated by the personnel will be drained to the existing municipal sewer connected to mechanical and biological wastewater treatment plant and thus, regarding the character of the operation their volume will not affect the existing WWTP treatment capacities.

Water contaminated with radionuclides is expected to be generated only in emergency situations and their volume will have no impact on JAVYS, a.s. processing technologies capacity. Wastewater discharge from these facilities is governed by operation regulations and limits and conditions, thus no requirement would arise to adjust the existing limits and conditions for liquid discharges.

Impacts on the soil

Option 1 requires no new land, the construction would be carried out on a build-up area within JAVYS, a.s site. Agricultural land fund will be affected in case of the Option 2, as new land will be required being part of the land registered in the land cadastre records as agricultural land.

Impacts on the protected areas

The proposed activity will have no impacts on protected areas nor protected zones.

The proposed activity is located within the area belonging to the first - the lowest level of territorial protection pursuant to the Act N°543/2002 on the nature and landscape protection, as amended. Thus, the implementation will not directly affect any small or large protected areas or protected zones.

The proposed activity is not located nearby any drinking water source protection zone used as drinking water supply for inhabitants.

Regarding the location and the character of the proposed activity, no adverse transboundary effects are expected.

4.2.3 The selection of optimal option and the assessed options suitability ranking

The Proposed Activity Report submits two options plus a zero option. Method of allocating quantifiers to individual impacts was used for the assessment (from -3 to +3).

Impacts evaluation scale:

- + 3 Significant positive impact, long-term, mostly with regional and supra-regional significance
- + 2 Positive impact of medium importance, mostly with local to regional significance
- + 1 Positive impact of little importance, mostly with local or lower significance
- 0 No impact
- 1 Negative impact of less importance, mostly with local or lower significance
- 2 Negative impact of medium importance, mostly with local to regional significance
- 3 Significant negative impact, long-term, mostly with regional and supra-regional significance

Tab.9: Comparison of the suitability of the proposed options

	Option 0	Option 1	Option 2
Ground environment	0	0	0
Soil	0	0	- 1
Surface water	0	0	0
Underground water	0	0	0
Air	0	0	0
Flora	0	0	-1
Fauna	0	0	-1
Biotopes	0	0	0
Landscape	0	0	0
Urban sites	0	0	0
Population	-1	+ 1	+ 1
Waste and technologies	-1	+ 3	+ 3
Transportation	0	0	-1
Total	-2	+4	+0

Ranking of the respective options suitability:

1. Option 1
2. Option 2
3. Option 0

Overall, it may be stated that the best solution for implementation is the Option 1.

Justification of the optimal option

Zero Option is defined as a situation when the proposed activity is not implemented. As a result of the links between RAW management and nuclear power plants decommissioning, this option is not feasible. The reason is the reverse impact on NPP A-1 and NPP V-1 decommissioning. NPP A-1 and NPP V-1 decommissioning would be suspended until the decommissioning waste currently disqualified for storage in RAW NR would become suitable for storage (in a deep repository). The latest experience show that the overall nuclear safety of RAW management system would decrease if it is not possible to store also other types of radioactive waste for a limited period of time. The proposed activity is an inevitable consequence of the already approved activities related to the decommissioning of NPP A-1, NPP V-1, which are already being carried out and that of the current RAW management system. For the above reasons, the Zero Option was not analysed further.

Having assessed the options, the Option 1 seems to be the best one, i.e. the proposed facility to be located within the existing JAVYS, a.s site after removing the selected buildings owned by the Proponent and registered as build-up areas and courtyards with the land cadastre records. This Option would not require any new land from the agricultural land fund (PPF), i.e. nor it will affect the biotopes of grass formations at the boundaries, no new access road is needed or any other connections to the existing infrastructure as would be the case should the Option 2 be selected.

Having regarded the above, **Option 1 is recommend** to be selected for the proposed activity „Interim storage of RAW“, subject to fulfilling all legislative requirements and conditions set following the future safety analysis.

4.2.4 Operating risks and their potential impact on the territory (accidents)

Operating risks

New pre-design preparation is going on for the IS RAW investment project, when the designs for Zoning and Planning Permit and Building Permit proceedings were prepared. Pursuant to the valid Slovak legislation (in particular the Act N°541/2004 Coll.), Pre-operation Safety Report was prepared for individual levels of the proceedings. All the below events are taken from the Pre-operation Safety Report. Operation events will be analysed again and re-considered when drafting safety and design documentation in order the IS RAW construction meets all nuclear and radiation safety requirements for operating personnel and also for inhabitants living nearby the new nuclear facility, including the environment.

The events potentially to occur in IS RAW are classified in compliance with the valid legislation (the Act N°541/2004 Coll., and the Decree of the Nuclear Supervision Authority N°55/2006 Coll.)

The frequency of the consequence occurrence during operation is defined as high, medium and low.

- Large with probability 1 means that the consequence occurs at least once in a year. Special personnel drill and sustainably well maintained technical conditions of the facility prevent the consequence
- Medium with probability 0,1 means that the consequence occurs once in 10 years. Technical measures implemented pursuant to the valid operating regulations may prevent the consequence
- Low frequency has 0,01 probability, its occurrence means once in 100 years. Engineering measures and safety construction may prevent the consequence.

Small, medium or large consequences are defined by the value of doses received by operating personnel, or those critical for an individual, the time needed for the operation facility to stop, or the material damages caused on facilities or the environment. Tab. 10 represents an overview of the value of the danger and risk due to consequences of critical aspects in IS RAW operation

Tab. 10: The list of events, evaluation of the danger and risk

N°	The accident	Category*	Level	Risk
1	Contaminated water leakage due to broken tank (large leakage) or due to leaking pipeline and equipment (small leakage)	Failure	2C	1×10^{-7}
2	RAW packaging unit fall	Failure	2B	1×10^{-6}
3	Failure on exhaust air ventilation	Failure	2C	1×10^{-7}
4	External impacts: earthquake, airplane crash, explosion – pressure waves, fire and flood	Accident	3B	1×10^{-7}
5	Radioactive substances leakage from packaging unit, when the leakage is localised in IS RAW	Accident	2C	1×10^{-7}
6	Damaged packaging unit not accompanied with radioactive substances leakage	Accident	2C	1×10^{-7}
7	Failures of equipment or constructions removal of which is associated with personnel receiving a dose load	Accident	2C	1×10^{-7}

Note 1: * the category defined according to the Act N° 541/2004 Coll.

Note 2: activity or situation socially acceptable if the resulting risk doesn't exceed 10^{-4} . The events belonging to 2C or 3B categories represent the hazard of the least importance and may be generally neglected in the analysis. The events belonging to 2B category are considered to represent the most significant danger with regard to the increased personnel exposure during their liquidation

4.2.4.1 Operating accidents caused by internal factors

Equipment failures or the personnel may initiate these operating accidents. With regards to the structure of the building or facilities, and/or the personnel qualification and training, the operating accidents will only be of a scope limited to the given operating unit and these will be classified as failures.

Contaminated wastewater leakage

No radioactive water or decontamination solutions are expected to be generated in a standard operation. Water from three sources may flow into the collection tank – from decontamination of personnel (hygiene loop), facilities and the premises. In standard IS RAW operation, app. $6,0 \text{ m}^3/\text{year}$ may be generated that will be drained to the collection tank. As the max. operating volume of water in the collection tank is $3,4 \text{ m}^3$ (pumping is planned when the volume of $3,1 \text{ m}^3$ is reached), the tank is planned to be pumped two times in a year. Based on their volume activity, water from collection tank will be pumped to municipal sewer or to special outlet sewer, using immersion pump. The special outlet sewer will be drained to transportation tank through special a connection shutter.

In case of a non-standard situation, the water pumped out from collection tank is drained to municipal sewer prior decontamination activity (supposing their volume activity is lower than 30 Bq/L) even if there is less than $3,0 \text{ m}^3$ of water in the tank. The tank will be emptied in order to be used for water from decontamination (higher contamination). Then, contaminated water from decontamination activity will be pumped to the transportation vehicle (container PC 55) and transported to BSC for further processing.

Emergency scenarios with the most conservative assumptions were analysed in order to assess the potential impact of a single leakage of contaminated water from the tank (emergency leakage of

liquid RAW of the overall tank volume), though the calculated doses for population reached 2.10^{-12} Sv also for this unrealistic assumption, i.e. value lower by almost nine orders than the population radiation limit in nuclear facility neighbourhood under standard operation.

Contaminated water may leak from IS RAW as a consequence of leaking pipelines and equipment (small leakage), or due to the tank being broken (large leakage).

Taking the most conservative assumption that the tank will be full and all contaminated water will spill over and gets to surface water ($3,3 \text{ m}^3$ of water with activity conservatively increased up to $40 \text{ Bq/l} = 1,32.10^5 \text{ Bq}$), and assuming that mostly 80 % ^{137}Cs and 20 % ^{90}Sr will contribute to the activity, i.e. $1,056.10^5 + 2,64.10^4 = 1,32.10^5 \text{ Bq}$, the doses the population will be exposed to would be negligible based on calculations carried out by RDEBO software.

Tab. 11: Individual effective doses for contaminated water leakage from the tank, alt. 1.

Swimming [Sv]	Sediments [Sv]	Irrigated soil [Sv]	Drinking water [Sv]	Fish [Sv]	Irrigated food ingestion [Sv]	The amount [Sv]
$4,58.10^{-16}$	$5,13.10^{-13}$	$1,39.10^{-20}$	$5,04.10^{-14}$	$1,35.10^{-12}$	$8,75.10^{-15}$	$1,92.10^{-12}$

Similarly negligible is also if 40 % ^{137}Cs , 40 % ^{60}Co and 20 % ^{90}Sr contributed to the activity, i.e. $5,28.10^4 + 5,28.10^4 + 2,64.10^4 = 1,32.10^5 \text{ Bq}$, the results of RDEBO calculations are shown in tab. 12.

Tab. 12: Individual effective doses for contaminated water leakage from the tank, alt. 2.

Swimming [Sv]	Sediments [Sv]	Irrigated soil [Sv]	Drinking water [Sv]	Fish [Sv]	Irrigated food ingestion [Sv]	The amount [Sv]
$1,23.10^{-15}$	$1,21.10^{-12}$	$3,25.10^{-20}$	$4,58.10^{-14}$	$6,82.10^{-13}$	$7,93.10^{-15}$	$1,94.10^{-12}$

Should part of this radioactivity be released to the atmosphere, conservative assumption may be made that 0,1% of the overall radioactivity will be released in form of aerosols. RTARC doses are calculated for the atmosphere spreading conditions – weather stability category A to F; times - 2 hours, 1 day, 7 and 15 days and 1 year. The release amount – 1 hour ground release is estimated. The calculation results of individual effective doses with conservative assumptions that an individual is outside for the overall period of time and underneath the radioactive cloud axis, the worst atmosphere stability category for spreading –F, the above time period, for adults and 3 km distance, are given in Tab 13 for alt. 1 and Tab 14 for alt. 2.

Tab. 13: Effective ID for adults, weather stability category F; distance 3 km, alt. 1

Cat.	Time	Radiation route				
		Cloud	Deposit	Inhalation		The amount
				Cloud	resuspension	
F	2 hours	4.22E-24	6.22E-20	9.34E-14	2.07E-17	9.35E-14
	1 day	4.22E-24	1.84E-18	9.34E-14	6.09E-16	9.40E-14
	2 days	4.22E-24	3.78E-18	9.34E-14	1.24E-15	9.47E-14
	7 days	4.22E-24	1.35E-17	9.34E-14	4.30E-15	9.77E-14
	15 days	4.22E-24	2.89E-17	9.34E-14	8.79E-15	1.02E-13
	1 year	4.22E-24	6.82E-16	9.34E-14	5.00E-14	1.44E-13

Tab. 14: Effective ID for adults, weather stability category A to F distance 3 km, alt. 2

Cat.	Time	Radiation route				
		Cloud	Deposit	Inhalation		The amount
				Cloud	resuspension	
F	2 hours	6.13E-16	2.07E-16	1.21E-13	2.68E-17	1.22E-13
	1 day	6.13E-16	6.11E-15	1.21E-13	7.89E-16	1.29E-13
	2 days	6.13E-16	1.26E-14	1.21E-13	1.61E-15	1.36E-13
	7 days	6.13E-16	4.47E-14	1.21E-13	5.56E-15	1.72E-13
	15 days	6.13E-16	9.61E-14	1.21E-13	1.14E-14	2.29E-13
	1 year	6.13E-16	2.20E-12	1.21E-13	6.45E-14	2.39E-12

Packaging unit with RAW falling down

A palette falls down from a transportation vehicle and barrels are damaged

Palette with barrels may fall down from the vehicle during transportation and barrel may suffer damage due to the crash. Barrel may also be damaged when palette is not handled with care. If the package is deformed but not broken, the barrel is stored as undamaged. When the package is broken, its content is moved to an intact package, or the damaged barrel with RAW will be sealed in an untypical barrel (larger size). The new barrel labelling must be the same as the original and operating regulations will be followed for its disposal.

Should radioactivity leak from the damaged barrel, the affected area will be decontaminated. Activities related to the accident liquidation will be supervised by dosimetry and optimised in order not to exceed the approved personnel dose rate limits. The largest accident due to a fall of a palette is expected to be its release from the 5 m height during transportation in IS RAW storage hall. During the accident, the structure of concrete or bitumen unit is expected to be disturbed, package damaged and partial leakage of the product outside of the package from 4 damaged barrels is

expected to occur. Dose rate at the barrel surface is 10 mSv/hour at the most, 20 kg RAW will leak with the overall activity $\sum \beta$ a γ : $2 \cdot 10^{10}$ Bq [1].

Liquidation of the consequences of the fall :

1. fixing the damaged barrels with a rope to the crane and putting these to large packaging unit (OS)
2. the spilled product to be collected and put to a packaging unit (200 dm³ MEVA barrel)
3. packaging units to be sealed, labelled and controlled
4. packaging units to be transported to storage premises or BSC
5. the space to be decontaminated

FCC with RAW falling down

Sealed container containing processed RAW is not very likely to fall down though it cannot be excluded. It may happen in particular when the container is moved by a crane and not being handled with due care.

Container with a product damaged as a consequence of a fall needs to be temporarily stored as non-standard waste. No radioactivity leakage threat is present regarding short falling distance (height) in this potential damage, and therefore no contamination nor generation of higher volume of secondary RAW is considered. Handling the damaged container may cause higher dose rate exposures for the operating personnel. The below operations are assumed for estimated dose rate during liquidation of the consequences of such an accident:

1. loading the damaged container to a transportation vehicle
2. transporting the damaged container to its temporary storage place prior repair (in TSÚ RAO)
3. unloading the container

Micro Shield (X) was used to calculate dose rate when liquidating the consequences of this accident. The assumptions for the calculation:

- radionuclide composition and activities of the respective radionuclides in the container – the same as when calculating the walls width
- container fastening time – 10 min
- loading the container to a transportation vehicle– 10 min
- transporting the damaged container to its temporary storage – 15 min
- fastening the container prior unloading from the transportation vehicle – 10 min
- unloading the container from transportation vehicle to its temporary storage place – 10 min

The results of calculation analysis are given in Tab 15.

Tab. 15: Results of dose rate calculation when liquidating an accidents caused by FCC container falling down

The activity	Number of personnel	Time [min]	Distance [m]	Dose rate [mSv/h]	IDE [mSv]	KDE [mSv]
Loading FCC to a transportation vehicle	Person fastening the container – 1	10	0	10,0	1,7	1,7
	Crane operator – 1	10	3,5	0,73	0,12	0,12
FCC transportation to its temporary storage place	Driver – 1	15	2,1	1,75	0,44	0,44
Fastening and unloading FCC to its temporary storage place	Person fastening the container – 1	10	0	10,0	1,7	1,7
	Crane operator – 1	10	3,5	0,73	0,12	0,12

The collective dose rate received by the personnel when liquidating this accident is 4,08 mSv[1]. Another option is to temporarily store in IS RAW after putting it to ISO container.

Air ventilation equipment failure

Air ventilation system ensures ventilation of the premises in non-standard situations, namely directing the air to flow in the right direction in order it is exhausted from storage premises and cleaned at sucking filters.

Should air ventilation system fail at the very moment when FCC falls down, the potentially received dose is described below in the text. Air ventilation system failure will have no adverse environmental impacts.

The conclusions from the assessment of operation accidents caused by internal factors

It results from operating accidents analysis that no adverse impacts on the environment are to be caused by any of the accidents. It is obvious that the probability for the personnel receiving increased dose rates due to the presented accidents is very low (e.g. presence of personnel close to the place of container fall down at the time of the accident). It is more likely that the personnel will be warned of the accident by the alarm system and increased dose rates may only be received during the accident liquidation and repair of the equipment. No stress will be put on the personnel during the liquidation, the personnel will have available the dose rate data and those of air contamination, and the overall activity may be planned in compliance with ALARA principles in order the limit dose rates for personnel are not exceeded.

All the above accidents have no impacts on the inhabitants living in the surroundings and their liquidation method will be addressed in the respective operating regulations.

Regarding the approved annual dose rates for population – calculated effective dose rate values for adults from external and internal radiation from potential radioactive substances leakages will not exceed the annual dose rate limit for an individual from population (1×10^{-3} Sv), there is a reserve 5 to

9 times .

⁶⁰Co contribution from NPP V-1 decommissioning has only minimum impact on the final dose.

4.2.4.2 Operating accidents caused by external factors

Disturbed physical protection of nuclear facility

A situation may occur in IS RAW operation that a protected facility intruder willingly commits a crime against the nuclear facility that may directly or indirectly endanger lives, health or the environment. This crime may be committed by spreading a scaremongering information about a threat in a guarded premises, threat in the premises where the systems are located that are important for the safety, or the intruder may break into the nuclear facility premises with the aim to disturb its security.

Terrorist attack

This may be air attack, airborne or helicopter borne troops, up to a sabotage activity of a small group of perpetrators. All nuclear facilities (including IS RAW in Bohunice site have defence forces available to response to attacks of that scope – BS (Security Services) and PJ PZ SR (Slovak Police Corps Swat unit).

JAVYS BS methodology management ensures that only individuals who were granted permit by JAVYS are present at the nuclear facility site (including IS RAW) and these observe physical protection requirements.

PJ PZ SR (Slovak Police Corps Swat unit) is permanently available to the company to response to any unauthorised entry to the nuclear facility, or potential unauthorised activities performed on its facilities, as well as when terrorist attack threat occur.

Fire – explosion

Fire is a specific external initiation source. In IS RAW, fire may be initiated by operating personnel negligence (e.g. during repair and maintenance of equipment in welding), or as a deliberate act. Regarding the potential danger a fire or explosion may cause to IS RAW operation, damage followed by an explosion need to be considered, as well as the damage followed by a fire of packaged forms.

After a fire occurs, contaminated aerosols may leak to the environment, though this is very unlikely for IS RAW. Non-flammable RAW will be stored in the building in packaging units that are also non-flammable. In a fire, in particular IS RAW systems may burn (e.g. electrical devices) but not non-flammable packaging units (e.g. MEVA barrels) or packaged forms (FCC, ISO containers, highly shielded containers). IS RAW building will have internal intervention routes equipped with technical equipment enabling fire fighting intervention without radioactive aerosols leakage. EPS system will be installed in the building, with a central control room located in central fire fighting station (in Bohunice site, there is SE, a.s. fire fighting unit available non-stop, and JAVYS signed a contract for these services).

The required fire resistance of the structure for the defined 1st level of fire safety of fire sections will be 30 minutes. Supporting steel constructions – beams, roof truss girders in the storage part (with

certified fire resistant coating) will have the required 30 min resistance. Intervention will be carried out by the fire fighting unit of the facility, BS coordination and, if needed, should the ZHÚ not be able to manage the fire with their own forces – other fire fighting units will be called through HaZZ Trnava operating centre.

Natural and other disasters:

Earthquake

The Interim storage is designed to meet the functional requirements for RAW storage, seismic resistance requirements for a construction and the estimated lifespan of 70 years. IS RAW nuclear facility will not be located immediately on the critical zone.

Summary assessment of existing geological and geophysical data from wider surrounding of Bohunice (25 km radius) shows that the location is situated nearby Dobrovodská depression, a seismically active area in the past situated between Small and Brezovské Carpathians. Maximum calculated earthquake - 8° MSK-64 (Medvedev, Sponheuer, Kárník Scale), max. acceleration on the Earth surface - 0,344 g horizontally and 0,214 g vertically.

Earthquake occurrence is considered 1×10^4 years. The building object (namely its storage part) must be resistant against seismic event of 8° intensity on MSK-64 scale; regarding the nuclear facility character IS RAW technology don't require seismic resistance strengthening from nuclear safety point of view and in compliance with IAEA 50-SG-D15 Guidelines. During the design phase, engineering and geological survey will be required, and new static calculations based on these will be carried out.

The likelihood of a seismic event occurrence in the given location with 10s time of impact of the most important movements is very small - 10^{-4} .

Nevertheless, even if taking the most conservative view to such an accident it cannot be expected that activity will be released – in particular aerosols – to the environment as all activity will be fixed in packaging units or packaged forms. This accident is expected to end with the end of the earthquake. In case of stronger earthquake, the respective regulations will be followed, and these will be prepared following the detailed safety analysis prepared in further phases of IS RAW construction.

Flood caused by a wave flowing from a dam

Bohunice is located on the lower flow of the River Váh, underneath the Váh cascade dam system. Dam accidents (earthquake, purposefully caused damages) may be considered a potential threat to the buildings. If no regulatory measures are carried out in water dams of the Váh cascade system and assuming that water dams on the upper flow of River Váh are disturbed (Liptovská Mara, Orava dam), other water dams located on the watercourse may be subsequently disturbed.

It results from the analysis that wave culmination in any of the cases cannot endanger the IS RAW facility safety within JAVYS, a.s. site.

The flood wave will not reach Bohunice nuclear facility site.

Impact of excess local rainfall

So far, no floods are recorded for the affected territory. Flooding of the stored material is no threat even in case of an excess rainfall since the floors of storage halls doesn't lie underneath the terrain level.

The capacity of rainfall sewer to drain the so called 100-years (centennial) rain fall was assessed. It results from the analysis that during a the 100-years (centennial) rain fall ($65 \text{ l.s}^{-1} \cdot \text{ha}^{-1}$), $1,18 \text{ m}^3 \cdot \text{s}^{-1}$ will fall to JAVYS, a.s. site, and thus the rain water sewer with $2,36 \text{ m}^3 \cdot \text{s}^{-1}$ capacity will not be overloaded. Should it locally fail (certain drain inlet is blocked), water from adjacent roofs and areas may run down.

Flooding and excess rain fall analysis

Nevertheless, should a flooding occur, at the most $\pm 0,00$ floor will be partially flooded in IS RAW premises and radioactivity release would gradually occur from flooded packaging units due to the contact of the water with radioactive material. Contaminated wastewater is stored in a sealed tank and no activity would leak from the tank to the surrounding environment during this accident.

Intensive floods in IS RAW sire are very rare to occur, nevertheless simplified analysis of potential radiologic consequences to the surrounding environment was calculated by RDEBO (X) that is also suitable for assessing radiologic consequences of radioactive substances (RAL) leakages to hydrosphere. Long-term full flooding of IS RAW storage premises is not expected as the rooms are not hermetically sealed and it can be assumed that the flood wave will leave the site in a short time. Assuming maximally conservative model assumptions of fully stocked storage premises:

- the number of stored barrels - 1800
- the number of stored FCC - 660, the number of stored ISO containers with bulky RAW - 80
- surface contamination of packaging units $\sum \beta$ and γ - $3 \cdot 10^3 \text{ Bq/m}^2$, $\sum \alpha$ - $3 \cdot 10^2 \text{ Bq/m}^2$,
- water decontamination efficiency -100 %,

the activity given in Tab. 16 will be washed out from IS RAW storage premises.

Tab. 16: Activity washed out from packaging units in IS RAW in case of a flood

Packaging units	$\sum \beta$ a γ [Bq]	$\sum \alpha$ [Bq]
FCC	$3,43 \cdot 10^7$	$3,43 \cdot 10^6$
Barrels	$1,07 \cdot 10^7$	$1,07 \cdot 10^6$
ISO containers with bulky RAW	$7,66 \cdot 10^6$	$7,66 \cdot 10^5$
2 EM-01 containers	$5,23 \cdot 10^6$	$5,23 \cdot 10^5$
Total	$5,79 \cdot 10^7$	$5,79 \cdot 10^6$

The source element was used for radiation consequences analysis, that was based on the fact that isotope composition of the leakage is for $\sum \beta$ and γ : 80 % ^{137}Cs , 20 % ^{90}Sr , i.e. $4,63 \cdot 10^7 + 1,16 \cdot 10^7 = 5,79 \cdot 10^7 \text{ Bq}$, for $\sum \alpha$: 80% ^{238}Pu , 10% ^{239}Pu a 10% ^{241}Am , i.e. $4,63 \cdot 10^6 + 5,79 \cdot 10^5 + 5,79 \cdot 10^5 = 5,79 \cdot 10^6 \text{ Bq}$ for activity washed out from solid RAW to water during the flooding – alt. 1. Conservative assumption is that no measures are introduced to protect the inhabitants. Tab 17 gives the results of maximum annual individual effective dose calculations from activity leaked to surface water during a

flood.

Tab. 17: Individual effective doses [Sv] for a flood-type accident , alt. 1

Swimming [Sv]	Sediments [Sv]	Irrigated soil [Sv]	Drinking water [Sv]	Fish [Sv]	Irrigated food ingestion [Sv]	Sum [Sv]
$2,01 \cdot 10^{-13}$	$2,25 \cdot 10^{-10}$	$6,08 \cdot 10^{-18}$	$2,21 \cdot 10^{-11}$	$5,91 \cdot 10^{-10}$	$3,84 \cdot 10^{-12}$	$8,42 \cdot 10^{-10}$

Assuming the isotope composition of the leak is for $\sum \beta$ a γ : 40 % ^{137}Cs , 40 % ^{60}Co , 20 % ^{90}Sr , i.e. $2,316 \cdot 10^7 + 2,316 \cdot 10^7 + 1,16 \cdot 10^7 = 5,79 \cdot 10^7$ Bq, for $\sum \alpha$: 80% ^{238}Pu , 10% ^{239}Pu a 10% ^{241}Am , i.e. $4,63 \cdot 10^6 + 5,79 \cdot 10^5 + 5,79 \cdot 10^5 = 5,79 \cdot 10^6$ Bq for activity washed out from solid RAW to water during their flooding – alt 2. Conservative assumption is that no measures are introduced to protect the inhabitants. Tab. 18 gives the results of maximum annual individual effective dose calculations from activity leaked to surface water during a flood.

Tab. 18: Individual effective doses [Sv] for a flood-type accident , alt. 2

Swimming [Sv]	Sediments [Sv]	Irrigated soil [Sv]	Drinking water [Sv]	Fish [Sv]	Irrigated food ingestion [Sv]	Sum [Sv]
$5,41 \cdot 10^{-13}$	$5,29 \cdot 10^{-10}$	$1,43 \cdot 10^{-17}$	$2,01 \cdot 10^{-11}$	$3,00 \cdot 10^{-10}$	$3,48 \cdot 10^{-12}$	$8,53 \cdot 10^{-10}$

Air traffic

Within the range of 25 km from IS RAW location in Bohunice, there is a civil airport in Piešťany, Aero club airport in Boleráz and Trnava airport used for farming purposes. Within the range above 25 km, there is Bratislava international airport. Runways or approaching routes distance is at least 4 km from the nuclear facility and these represent no significant threat for Bohunice site.

All air corridors are spatially separated from protected air zone. After IAAE recommendation, Airplane crash risk report was prepared for Jaslovské Bohunice location.

Airplane crash

To numerically asses the likelihood of an “airplane crash” type accident for individual categories of air traffic, firstly, the safety important elements (building objects) in a nuclear safety need to be identified.

There, HVB (main production unit) building containing the reactor and primary circle are the most important element according to [L2.2-1] . HVB size that was considered (1. Unit): 72,0x57,9x50,6 m. The “effective crash area” $A = 0,014 \text{ km}^2$ was conservatively defined for HVB for airplane crash. IAAE Guidelines [L2.2.1-1] was used to assess the airplane crash risk for Jaslovské Bohunice. Five air traffic categories were assessed:

- civil airplane traffic – all transport flights at defined routes and RNAV (area of navigation) in the affected area are spatially separated from the LZ P29 forbidden zone. The annual frequency of movements in the affected area are 50 000 for this category. Pessimistic assumption was selected for this category of air traffic, assuming that all movements within this category are concentrated to one corridor of 20 km width and that nuclear facility site lies inside this corridor.
- BERVA approaching zone for Piešťany airport
- Sport and recreation flights – 5 000 flights per year with 175 km/hour average airplane speed considered for this event assessment
- Special flights and flights for farming purposes – the annual volume of 13 000 flight hours was assumed
- Military operation – Malacky-Kuchyňa military airport is located 42,5 km from nuclear facility

Conservative value probability of airplane crash to HVB building was defined for each of the above categories. The individual values for each category (and also their summary value) are lower than the limit concentration $1,0 \cdot 10^{-7} \text{ year}^{-1}$ recommended by the Guidelines [L2.2-1].

Analysis carried out for HVB may also be applied the assessed IS RAW building with regards to character of IS RAW and RAW stored there.

That means that the probability of an airplane crashing to JAVYS buildings is very low and no measures for “airplane crash” type of accident need to be formulated for IS RAW.

Building objects wind load

Maximum blast of wind for Jaslovské Bohunice location is $33 \text{ m} \cdot \text{s}^{-1}$ according to long-term measurements. STN 73 0035 – change N° d-9/1982 classifies Jaslovské Bohunice location to the wind category II, with the basic wind pressure $W_0 = 0,45 \text{ kN} \cdot \text{m}^{-2}$.

Tornado occurrence is excluded within Jaslovské Bohunice nuclear facility, following the document entitled “Assessment of Selected Meteorological and Hydro-meteorological Characteristics for Jaslovské Bohunice Location” issued by the Slovak Hydro-meteorological Institute Bratislava. Structures construction calculations will include the maximum winds impacts. For buildings with strengthened seismic resistance, wind resistance is also calculated.

Buildings related to security will be verified for wind resistance considered in the project and their construction will be adjusted so that the structures of selected buildings will withstand the impacts of an extreme wind. Seismic load rather than that of wind is decisive for structure load caused by wind pressure in seismically resistant structures.

5. DESCRIPTION OF MEASURES MITIGATING SIGNIFICANT ENVIRONMENTAL IMPACTS

Certain measures will be adopted to avoid adverse effects of the proposed activity and to mitigate their consequences and to minimise these.

5.1 Measures related to zoning and planning

Already the location of the construction within the site (or immediate contact) with existing nuclear facilities may be considered a measure related to zoning and planning in both proposed Options.

The below specified measures will be adopted when preparing the design documentation both for Zoning and Planning Permit and Building Permit

- The design of newly build objects, including their foundations, to observe the outputs from engineering-geological and hydro-geological survey of the affected location, as well as those from the seismic threat assessment of the area of interest
- To observe all protection zones existing within the area of interest
- Fire Protection Plan will be prepared and submitted for approval
- Safety analysis and radiation load calculations will be prepared and submitted for approval
- The “Organisation” part of the design documentation will take into account the requirements for labour safety and health protection during construction and operation by virtue of §4 Sections 1 and 2 of the Act N° 124/2006 Coll.

5.2 Technical measures

In particular, the design of storage premises – layout of storage zones, shielding width, fire protection project, location of monitoring dosimetric system elements, project elements for incorporation to the physical protection system, are considered to be the technical measures.

Only RAW with no activated surface contamination and packaged RAW are planned to be stored in the Interim storage. The main aim is to store RAW so that it maintains its high integrity even under the most unfavourable conditions. Despite these characteristics of the stored units, the Interim storage structure provides protection, separates radioactive waste from the environment and ensures safe conditions for storage and for other organisational and technical measures.

Also, the proposal to mitigate the impacts of maximum operating accidents through filtration of the air exhausted from Interim storage premises and collection of wastewater to a special sewer tank with radionuclides content control in non-standard situations, are other technical measures.

5.3 Technology related measures

The operation and activity of each operated technology is governed by its operating regulations that include instructions both for standard and non-standard situations. The operating regulations regarding nuclear safety and radiation protection is subject to approval process of supervising state authorities.

The below technologies are to be operated:

- Air ventilation – ventilation
- Contaminated water management
- Automated control system
- Camera system
- Special monitoring

Individual technologies and measures are described in chapter 1.3.2.

5.4 Organisation and operation measures

Interim storage operation system is governed by the Slovak standards, supervision of the Slovak Nuclear Supervision Authority, Slovak Public Health Authority, Slovak National Labour Inspectorate, Fire Protection.

Organisational and operation measures – operating regulations and internal standards define the methods for receiving radioactive waste, entrance control, assigning the storage position according to the RAW sorting system (for details see Chap 1.3.2 – The technology) regular controls during storing, connection to the organisation system of physical protection, fire protection, staff training and education system – training on the valid legislation.

Individual operating regulations describe the steps to be taken in standard and non-standard situation. Regarding the impacts on individuals from population, the given activity is considered to be optimised under ALARA principles. No compensation measures are expected.

Further organisation and operating measures concerning **radiation protection and health protection** will be addressed based on the proposed activity safety analysis .

6.METHODS USED IN THE IMPACT ASSESSMENT PROCESS OF THE PROPOSED ACTIVITY ON THE ENVIRONMENT AND THE METHOD AND DATA SOURCES OF ACTUAL ENVIRONMENTAL SITUATION IN THE AREA WHERE THE PROPOSED ACTIVITY IS TO BE IMPLEMENTED

The principal approach in assessing the impacts of the proposed activity were the data, design documentation and the safety documentation prepared in 2008 for the originally planned IS RAW location.

The available designs were prepared for Building Permit proceedings, therefore all the details on IS RAW construction are provided. Also, documents on NPP V-1 radiological inventory characteristics were used, providing detailed data on composition and characteristics of NPP V-1 materials.

Processes, methods approved for calculations of gaseous and liquid effluents impacts were used to assess the impacts on the inhabitants and the environment. Calculations from the actual load of the location were used to approximate the expected IS RAW impacts.

The information on the actual environmental situation were taken from annual EIA reports of nuclear facilities in Jaslovské Bohunice location , as well as from publications providing information about the quality of individual parts of the environment in Slovakia.

7. INSUFFICIENCIES AND UNCERTAINTIES IN THE KNOWLEDGE THAT OCCURRED IN DRAFTING THE ASSESSMENT REPORT

No principal insufficiencies or uncertainties occurred in the descriptions of the characteristics of individual parts of the environment and the affected population. These occurred within this location only in shape and in cases with no impact on the objectivity of the overall assessment of the proposed activity impacts in the affected area. These were namely the absence of more detailed information about health conditions of inhabitants directly in the affected micro-region, outputs from monitoring emissions of common pollutants in the affected area, information about underground water quality in the affected area (except for radioactivity), etc. Avoiding these insufficiencies and uncertainties would thus mean to collect objective statistical information about health conditions of inhabitants solely in the surrounding villages for several years, for example, (only statistical information on the district level is recorded presently), or to carry out monitoring of the basic pollutants at the affected location that is basically pointless with regards to the proposed activity outputs, etc.

With regard to the pre-project preparation phase for RAW Interim storage construction, several uncertainties occurred in the characteristics of the proposed activity and its outputs. Only the following phases of project preparation will provide answers to specific technical and layout solutions designed for air ventilation, electrical wirings. Once the safety analysis is prepared, that is planned for the next steps of the permit proceedings, design documentation for Building Permit will be then prepared including all characteristics needed to assess how radiation protection of personnel and inhabitants is ensured, as well as the preliminary radioactive waste disposal plan, preliminary fire protection plan, preliminary radiation protection plan during operation, and, last but not least, preliminary limits and conditions for safe operation will be defined and proposal prepared for defining an area of special importance.

Though, neither these uncertainties had no critical impact on the objectivity of the proposed activity impacts assessment since with regards to the character of the RAW storage operation and the conditions for accepting exclusively solid or solidified RAW, the contribution of this type of operation to the radiation load of the location when all radiation protection requirements are observed (without that, the proposed facility couldn't pass the next phases of the permit issuance proceedings) may be neglected in general. In comparison with the impacts and risks of the operated energy producing nuclear facilities or RAW processing and treatment technologies, the impacts of the proposed RAW storage operation are really only minimal.

8. MONITORING AND POST-PROJECT ANALYSIS PROPOSAL

8.1 The existing situation

Presently, the assessment of JAVYS, a.s. a SE, a.s. – plant EBO V2 nuclear facilities impacts is carried out based on the agreed joint “JAVYS and EBO – Neighbourhood Monitoring Programme”, based on which individual parts of the environment are monitored. The programme stipulates the description and scope of sampling, type of analysis, number of analysis for the respective parts:

Monitoring of aerosols – permanent monitoring stations in EBO nuclear facility neighbourhood are located, within three circles. The first one is established by the EBO nuclear facility site, the second one is within 3-6 km distance from EBO nuclear facility and the third one includes the towns and villages with higher concentration of inhabitants located within 15 km distance from EBO nuclear facility.

Permanent monitoring stations are located in: EBO I-V, (the respective villages and towns of) Jaslovce, Bohunice, Radošovce, Kátlovce I-II, Nižná I-II, Veľké Kostolány I-III, Pečeňady I-II, Žlkovce, Malženice I, Trakovice, Krakovany, Piešťany, Šulekovo, Trnava

Fallouts – EBO site, (the respective villages and towns of) Veľké Kostolány, Bohunice, Nižná, Pečeňady, Trnava.

Soil – external stations: EBO A-1, V-1, V-2, (the respective villages and towns of) Krakovany, Veľké Kostolány I, Pečeňady II, Trakovice, Bohunice, Radošovce, Kátlovce II, Nižná II, Piešťany, Šulekovo, Trnava, Žlkovce

Food chain elements

Grass: EBO A1, EBO V1, EBO V2, (the respective villages and towns of) Krakovany, Veľké Kostolány, Pečeňady, Jaslovské Bohunice, Radošovce, Kátlovce, Nižná, Piešťany, Hlohovec, Trnava, Žlkovce, Malženice (15 places in total)

Milk: cow houses in farms of Nižná, Pečeňady, Dolné Dubové, Drahovce

Food – agricultural products

The activity of antropogenous nuclides in vegetable production is measured.

Sampling places: these are not strictly defined regarding the agro-technical conditions. There is at least 32 sampling points – two samples from one sector so that one sample represents the key crop grown in the sector (barley and wheat) – and the second sample is taken in order it to meet the two further specified criteria – to take at least 3 samples of each other grown crops. At least 3 samples of clover to be taken at least 2 x in a year. At the same time, at least 4 samples need to be taken from the distance lower than 5 km from EBO nuclear facility.

Types of crops: controlled are : wheat, barley, maize, sugar beet, oilseed rape, sunflower, potatoes. Certain portion of the capacity is reserved for other, unspecified crops like pie, root vegetables, fruits, fruiting vegetables.

Surrounding hydrosphere

Surface water

The purpose of the control is to prove the EBO nuclear facility contribution to surface water radioactivity.

Sampling places: Dudváh Veľké Kostolány, Dudváh Bučany, Žlkovce Canal, Váh Madunice, Váh Varov Šúr, Horné Zelenice

Drinking water

The purpose of the control is to supervise the contamination of underground water first horizon

Sampling places: wells in Veľké Kostolány, Žlkovce I-II, Trakovice I-II, Kátlovce, Zelenice, Siladice, Malženice PD, Jaslovské Bohunice farm.

Underground water

Radiation control wells are made in EBO nuclear facility site, divided to three groups depending on their depth:

dry - up to 5 m depth

wet - up to 15 m depth, i.e. Ist water horizon

wet - up to 25 m depth, i.e. IInd water horizon

The purpose of the control is to find out whether underground water contamination is not occurring.

Parts of the hydrosphere

Coastal bottom sediment – Manivier Canal, Dudváh Bučany, Dudváh Veľké Kostolány (reference point), Kráľová water dam

The purpose of the control is to gain information about the recipient bottom contamination development trends from discharged water sedimentation.

Water plants (potamogeton) - Žlkovce Canal (by the plants occurrence), Dudváh Bučany, Dudváh Veľké Kostolány

The purpose is to gain information from an independent control of surface water radioactivity.

Radiation measurement from external sources

Dose rates measurements

The purpose of the control is to gain information about dose rates changes and soil surface contamination.

Measurement points: measurements are carried out at the tele-dosimetric station points: EBO A-1, V-1, V-2, Veľké Kostolány, Pečeňady, Malženice, Jaslovské Bohunice, Radošovce, Kátlovce, Nižná, Piešťany, Hlohovec, Trnava, Žlkovce, Krakovany (15 in total)

Doses measurement

The purpose is to gain information about the average dose rate and it's Interim for a time period.

Measurement points: EBO I-V, Jaslovce, Bohunice, Radošovce, Kátlovce I-II, Nižná I-II, Veľké Kostolány I-III, Pečenady I-II, Žlkovce, Malženice I, Trakovice, Krakovany, Piešťany, Šulekovo, Trnava (24 in total).

Tab. 19 The overview of samples taken and analysed in a year

	N° of points	frequency annually	N° of samples annually	gamma	sum beta	sum alfa	H3	Sr90	Pu239/ Pu240	C14
aerosols	24	26	624	624	TDS			24	12	104
fallouts	6	12	72	72				24	12	
soil	15	1	15	15				3	3	
milk	4	12	48	48				16		
sediment	4	1	4	4				4	4	
food	32	1	32	32				4	4	
Water plants	3	1	3	3				3	3	
grass	15	2	30	30				2	2	
clover								2	2	
Surface water	6	12	72	72	72	72	72	24		
Drinking water	11	4	44		44		44	12		
VRK*	17	2	34		34		34			
SUM			900	900	150	72	150	118	42	104

*VRK – radiation control wells

Underground water in JAVYS, a.s. site, SE, a.s. – plant EBO V2 and around the nuclear energy location in Jaslovské Bohunice are a separate part of the environment that is being thoroughly monitored.

As a priority, the subject of the monitoring and protection are underground water in the Ist aquifer, in certain places also underground water in IInd aquifer and underground water in aeration zone (non-saturated overlying rock geological layer) called the underground seepage water. Surface water is monitored at certain points in order to assess the communication between underground and surface water (coastal filtration). Underground water and underground seepage water are monitored in monitoring objects, be it wells, drills and probes, and opened underground water is monitored in a lake nearby the village of Červeník (a gravel pit). Surface water is permanently monitored in the village of Žilkovce – derivation canal, and in Drahovský Canal where water from SOCOMAN SE, a.s is discharged.

Regular underground water monitoring in sites of individual legal entities (JAVYS, a.s. SE, a.s.) follows the Monitoring Programme defining the buildings where the monitoring is carried out, the frequency of monitoring and the parameters that are monitored. Also, it stipulates the volumes of samples by individual monitored parameters and the samples conservation method.

Besides the underground water samples taken in accordance with the Monitoring Programme, rain water is also monitored; it is taken daily from SHMÚ rainfall measurement station Jaslovské Bohunice and put together as a cumulative volume per each month. The required volume is then taken from this overall volume for individual analysis. Tritium volume activity and the selected physic-chemical

characteristics: pH, conductivity, total concentration of soluble matters, salt concentration in water, oxygen concentration in water and overall water hardness are the analysed (monitored) parameters. Also, the surrounding environment is being monitored besides the monitoring within the sites of both companies, when samples of surface and underground water are taken also, following the approved Monitoring Programme (Annexes 10-13).

8.2 Monitoring proposal since the construction commencement, during the construction, during operation and after the proposed activity operation is closed

There is no need to amend or extend the existing Monitoring Programme with regard to the operation character and the expected impacts defined in the report.

The records about waste generation and disposal during construction and also in operation is a must that follows the requirements defined in the relevant waste management legislation.

Individual outputs from IS RAW operation will be monitored depending on their characteristics:

- In air ventilation operation during non-standard situations, effluents will be monitored and evaluated following the processes defined in operating regulations and then, these will be included to the overall location assessment (e.g. *Radiation protection in JAVYS, a.s. and the impact of JAVYS, a.s. site to the surroundings, for XX year*)
- Water generation will be monitored based on the volume of water pumped to the collection tank (contaminated water management) and the existing monitoring method for tanks emptying using the ARSOZ application, where also the approval for emptying of individual tanks is controlled. Should contaminated water be pumped out and transported to RAW processing and treatment facilities, the impacts of this activity will be included to the effluents and limits for the respective facility
- Control of secondary RAW generation that are expected to be generated only in non-standard situations will follow the existing rules stipulated in the "RAW disposal" process documentation. Each producer records the generated RAW in ARSOZ application
- Generation of non-active waste is controlled through records of incoming waste from individual producers in waste collection section, and transferred to the overall records that are maintained in form of "Record Sheets" for individual types of non-active waste
- ARSOZ application and the respective radiation control systems will be used to record the doses received by IS RAW operation staff
- During IS RAW construction, also records about the construction are maintained in compliance with the Construction Act requirements
- As this project is co-financed by EBRD, also the requirements stipulated in the EBRD Environmental and Social Policy needs to be observed

9. NON-TECHNICAL SUMMARY

The Proponent:

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

The Proposed Activity: Interim storage of radioactive waste

General data on the proposed activity:

The purpose of the proposed activity is the construction and operation of a nuclear facility – Interim storage of radioactive waste with the purpose to exclusively store :

- a) solid radioactive waste prior their further processing in processing facilities located in JAVYS, a.s. site
- b) solidified radioactive waste modified by various technologies generated in decommissioning of nuclear facilities until the time these are transported to a permanent deposition site;
- c) solid radioactive waste to be released to the environment once their activity is lower than the approved limits

The storage method, maximum volumes and activity of the stored radioactive waste will be defined for the Interim storage of radioactive waste.

Interim storage of radioactive waste will be designed and operated so that it protects the radioactive waste from further degradation and avoid leakage of ionizing radiation and radioactive substances to the environment and allow adequate handling and removal of stored radioactive waste, ensuring also the radioactive waste remains its characteristics determining their storage.

Interim storage of RAW is exclusively a storage facility for storing packaging units containing solid or solidified radioactive waste with equivalent dose rate lower than 10 mSv/hour at the unit surface or its shielding.

Interim storage of RAW functions within the nuclear facilities decommissioning chain:

- Dying – RAW are to be stored in the IS RAW that require to be separated from other RAW, and these are the so called temporary waste that can be released to the environment once their defined storage time lapsed and their activity reached the approved limits
- Storing – safe long-term storage of RAW in highly shielded packaging units
- Balancing – RAW meeting the packaging form requirements approved for storage in NR RAW Mochovce, metal bulky RAW required later to be fragmented and sorted in compliance with the proposed technology

The investment intention(plan) was submitted for evaluation as one solution with two construction options with different location of the building objects representing the proposed facility within the area of interest. The evaluated facility is proposed to be located within the site of Jadrová a vyraďovacia spoločnosť, a.s., a nuclear facilities operator in Jaslovské Bohunice, situated approximately 3 km from build-up area of Jaslovské Bohunice village (Option 1), or at the site boundary within the area limited and bordered by railway trailers within the cadastre area of Veľké

Kostolany village (Option 2).

IS RAW building will be situated within a fenced JAVYS, a.s. site equipped with a functioning physical protection system .

Waste generated in NPP V-1 Jaslovské Bohunice, NPP A-1 Jaslovské Bohunice and NPP V-2 Jaslovské Bohunice will be stored in the Interim storage of radioactive waste. These are radioactive waste with various activity levels.

General information about the construction and technical solutions of the proposed activity:

Interim storage of radioactive waste is planned as a free standing structure of hall type with a modular structure enabling extension and simple connection to road infrastructure. Its concept represents a system of single-aisle one-floor halls with a bridge crane and a common annex. The annex for services is mainly one floor construction containing entrance premises for personnel and visitors, sanitary premises, decontamination rooms, changing rooms (clean and potentially contaminated), emergency shower, premises for clothes, reception and registration offices, training facility, central control room and technical premises. A room with openings to the storage hall will be located on the first floor for visual monitoring the RAW storage premises.

Technical rooms in the annex will comprise decontamination room with solutions storage space, active workshop with a warehouse, contaminated water management (a room with a collection tank, sump area), ventilation machine rooms (clean and potentially contaminated) and electrical switch rooms (6 kV switch room, LV switch room, transformer stations).

Corridor will be used for communication between the premises. In the entrance parts of the premises, the so called sanitary node will be established as the crossing between potentially contaminated premises (storage halls, technical premises in the annex, emergency shower, etc.) and clean premises in the entrance premises.

No daily light is required for the operation of the premises except for administrative rooms. Operating personnel will only be present when handling the stored materials.

Built-up area of Interim Storage will be approximately 7600m², from which the storing capacity of Interim storage presents the area of approximately 6050m² (4 storing modules) and premises for annex of the common operations forms the area of 895 m².

Storage part will comprise four-module single-floor hall (axial size 3x25,150mx 61,425m, 25,150m x 50,225m). Height of the halls is designed to reach 16,2 m, the longest storage dimension in 122,8m and the storage width is 61,425 m. Storage halls will be split with a shielding wall to form the premises for actual storage and the receiving and controlling parts through which a trailer will be delivering the stored containers. Halls will be equipped with lifting devices.

From construction point of view, IS RAW building object will be designed with two different construction systems:

Storage part will be designed as prefabricated skeleton of hall type with a bridge crane;

Annex for supporting technologies will be designed as insulated monolithic reinforced concrete system with cross arms, partially two floors, with reinforced concrete walls and the ceiling. Non-supporting partition walls will be made from bricks.

The wall between storage hall and the annex, the wall between storage and entry halls and the perimeter walls up to 6,0 m height will be constructed as 500(600) mm thick special monolithic concrete for shielding reasons. Further shielding concrete blocks will be constructed in IS RAW facility

if required by radiation protection, which can be moved and handled by cranes as needed (upon the radiation safety engineer requirements).

Floor in each room in the controlled zone will be smooth and washable.

Special internal sewer system will also be designed in the facility, to be used in non-standard situations, i.e. to drain potentially contaminated water from the controlled zone, namely from the emergency shower, decontamination basin and also from external sump area. This water will be collected in stainless steel tank located below the floor level in the contaminated water management room. Prior discharging, representative sample will be checked in laboratories and depending on the results, the water will be released to sewer or pumped to a transportation vessel. Wastewater pipelines will be made of stainless steel.

The key technology equipment will include hoisting equipment and its handling arms and stands for control of packaging units arriving for storage.

Bridge crane to store containers will be equipped with automated positioning system for placing containers to a pre-defined position according to the storage plan. Crane will be operated from central control room with on-site operation option. TV cameras will control the storage.

Any information about the generation and content of the stored materials (radioactive waste), its volume, storage position and history of movements, will be controlled by central operation record system with hardware and software compatible with the existing technology information system.

The waste will be stored in packaging units, e.g.

- FCC – Made of fibre reinforced concrete
- 200 l MEVA barrel– Made of zinc coated sheets
- container 2 EM-01,
- ISO container - Made of steel
- Metal containers for very low activity waste : solid metal packages of 1m³ volume for storing and depositing solid VLLW (metals, glass, etc)
- any other packaging unit (may be tailored design as prototype or a sole piece of the kind) respecting the relevant legislative and internal requirements for radiological protection
- or, free deposited components, segments or ingots may also be stored: materials without surface contamination activated, refused or contaminated only on inaccessible surfaces (inside); may be shielded

During standard operation, no air ventilation system with filtration is required in storage halls – surface contamination on the surface of external packages of stored materials is below 0,3 Bq/cm² for beta sources or 0,03 Bq/cm² for alfa sources, i.e. the Interim storage is not considered a workplace with open radiation sources. Besides the storage of material, no other activity is expected that could generate radioactive aerosols to the air in storage rooms (the diffusion of radionuclides from the packages surface itself cannot result in a measurable concentration of radioactive substances in the storage halls air at the given surface contamination values). Free air circulation through blinds is ensuring for the storage facility ventilation. Air ventilation system with filters will be used in non-standard situations and shall only be operated when higher concentration

of air aerosols is measured.

Inputs requirements:

- app. 8 242 m² (Option 2) of agricultural land, Option 1 is proposing the location inside JAVYS, a.s. site, at a currently build-up area
- drinking water – not a significant volume, only for sanitary needs of the employees
- heat and electricity necessary for the storage operation

Summary of the environmental impacts assessment of the proposed activity

<i>Impact description</i>	<i>Assessment</i>
Water	
Drinking water consumption/municipal wastewater generation	Interim storage of RAW would only require drinking water consumption for sanitary purposes of the employees executing their working tasks in the proposed facility. This consumption will be covered through the connection to existing drinking water distribution pipeline within JAVYS, a.s. site. Municipal wastewater generation is adequate to drinking water consumption. Municipal wastewater will be drained to existing sewer through a connection and then to JAVYS, a.s. MB ČOV (mechanical and biological waste water treatment plant). This output of the proposed activity will have no relevant impact on the quality or quantity of surface or underground water in the affected area, no limits or conditions for discharged wastewater will need to be amended. Based on the above, this impact is assessed as almost of no significance.
Service water consumption/technology wastewater generation	The proposed activity is not connected to water consumption for technology purposes, i.e. nor technology wastewater is to be generated. No such impact. Radionuclide contaminated water may be generated during emergency situations. The estimated volume of these water represent app. 6 m ³ /year, which is an insignificant volume regarding the present production of these water. Depending on the content of contamination, contaminated water will either be pre-treated to the level these can be released to the environment, or processed as liquid RAW on the existing RAW treatment and processing technologies.
Rainwater/surface outflow	Flow situation in the affected area will not be significantly influenced as rain fall from surface flow will be drained to the existing rainwater sewer, and the size of the removed buildings are almost the same as those to be build. For Option 2, increased volume of water would be drained from surface flow though without any significant impacts on Dudváh River recipient where the rainwater is discharged. Based on the above, this impact is assessed as almost of no significance.
Contamination of water	Potential contamination of water may only occur in emergency leakage of hazardous or radioactive substances (water) during operation, or construction of the proposed facility, or during related transportation. Emergency safety solution for the proposed operation as well as RAW transportation, observance of all safety measures including the process defined for emergency or otherwise non-standard situations, the so called event, the possibility of water

	contamination is limited to minimum. Overall, this impact may be assessed as acceptable.	
Air		
Emissions from construction phase	Air within the community will be mainly loaded with emissions from combustion engines of transportation and construction mechanisms during the construction phase, or higher noise will be produced from construction activity and removal of buildings (Option 1). Though, regarding the location and time and spatial limitation of this impact, it may be assessed as of no significance	
Emissions from operation	The new facility is not an air pollution source (hot water heating). Emissions of substances contaminated with radionuclides may be generated in very limited volumes, and only in emergency or extraordinary events, when the contaminated air will be exhausted through air ventilation system and highly efficient filter system and a monitoring system. No effluent limits will be needed for operation of this nuclear facility; it is not a workplace with open radiation sources. In standard operation (regarding the requirements for taking over the waste to the storage – surface contamination on the surface of external packages of the stored materials is lower than 0,3 Bq/cm ² for beta radiation sources and 0,03 Bq/cm ² for alfa radiation sources), no radioactive aerosols are generated that could contaminate the storage work environment. Based on the above, the impact of the proposed activity on the affected area may only be assessed as less significant and acceptable.	
Soil		
New requirements land	Option 1	Option 2
	The evaluated activity is proposed to be implemented on the already build-up area within JAVYS, a.s. site after removing certain existing buildings. No further requirement for land from agricultural or forest land. Based on the above, this impact is assessed as almost of no significance.	The evaluated activity is proposed to be implemented on the area limited and bordered with railroad trailers leading to JAVYS, a.s. site in close neighbourhood (at the edge of the fenced site) in Veľké Kostolany village cadastre area. This area is registered as agricultural land in the land cadastre. App. 8 242 m ² of land would be required that needs to be exempted from the agricultural land fund. Based on the above, the impact may be assessed as less important, but with larger impact than the Option 1.

Contamination of soil	The soil within the affected area may only potentially be contaminated during emergency leakage of hazardous or radioactive substances during operation (only when liquid RAW is transported from the collection tank), or when the proposed activity is implemented or when related transportation takes place. Emergency safety solution for the proposed operation and RAW transportation, observance of all safety measures including the processes defined for emergency or otherwise non-standard situations, the so called event, the possibility of water contamination is limited to minimum. Overall, this impact may be assessed as of little significance.	
Geologic conditions and relief		
Foundations of buildings, terrain and excavation works	Option 1	Option 2
	During construction phase, the proposed activity will require firstly to remove the existing buildings. Geologic bedrock will only be affected up to the designed foundation height, where the building objects will be located. This impact may be assessed as only of little significance and acceptable for the affected area.	The proposed activity would require removing app. 12.000 m ³ of excavated soil. Geologic bedrock will only be affected up to the designed foundation height, where the building objects will be located. This impact may be assessed as less important, but larger than that of the Option 1.
Biota		
Impacts on flora and fauna	Option 1	Option 2
	The proposed activity is located within the JAVYS, a.s. site at the already build-up area. Therefore, it may be stated that should the proposed activity be implemented, no important biotopes will be consumed nor any important rare or protected fauna and flora representatives will be threatened or liquidated, nor their habitats will be consumed. Based on the above, this impact is assessed as almost of no significance.	The proposed activity will be located at land presently used for farming. Nearby the site fencing, at the border area covered with grass. No important biotopes will be consumed nor any important rare or protected fauna and flora representatives will be threatened or liquidated, nor will their habitats be consumed. Based on the above, the impact may again be assessed as of little significance but larger than that of the Option 1.
Waste		
	Option 1	Option 2

Waste generation	The volumes and types of waste adequate to the scope and character of the construction and demolition of existing building will be generated during implementation of the proposed activity. Thus, the minimum waste generated during operation of the proposed facility will be disposed in compliance with the valid legislation, recovery to be the preferred disposal methods. Based on the above, this impact may be assessed as only of little significance and acceptable for the affected area.	Regarding the larger scope of preparatory works for construction, also adequately larger volume of excavated soil will be generated, though less demolition waste. Thus, this impact may also be assessed as only of little significance and acceptable for the affected area, comparable with that for the Option 1.
Population		
New jobs	Regarding the planned activities (one shift irregular operation, app. 2 shifts a week), the storage equipment will be operated by staff from own resources of the operator, i.e. JAVYS, a.s.. This impact may be assessed as of no significance.	
Noise conditions	Regarding the location of the proposed activity being several kilometres from the residential area of the closest affected villages, which will only be affected by transiting transportation vehicles with construction materials and waste from demolition of existing buildings (time-limited period of the construction), it may be stated that this impact may be assessed as only of little significance and acceptable for the affected area.	
Transportation load	Concerning the proposed activity, the transportation load of the area of interest will only be increased by transiting lorries transporting construction materials and demolition waste (Option 1) to JAVYS, a.s. site during the construction phase. RAW transportation to the storage will only be made within the existing fenced JAVYS, a.s. site. Based on the above, this impact may be assessed as only of little significance and acceptable for the affected area.	
Activity of inhabitants	Regarding the further development of the affected villages and activities of their inhabitants, there are no impacts expected of the proposed activity since it is located outside the municipal residential area and within JAVYS, a.s. site (Option 1) or in close neighbourhood of the existing JAVYS, a.s. site (Option 2).	
Health conditions /radiation load/	The given expected technical solution and project implementation will be analysed in the Safety Report that will further specify the	

detailed radiation protection requirements. With regard to the subject of the proposed activity (exclusively receiving and storing RAW in packaging units or bulky waste subject to the condition that “surface contamination on the surface of external packages of stored materials is lower than 0,3 Bq/cm² for beta radiation sources and 0,03 Bq/cm² for alfa radiation sources “ as well as based on the above facts, this impact is assessed as little importance and acceptable for the affected population.

The Assessment Report provided a comprehensive environmental impacts assessment of the proposed activity in two Options, including the Zero Option. Having assessed all options, the best seems to be the Option 1; i.e. to locate the proposed facility within the existing JAVYS, a.s. site after removing the selected buildings owned by the proponent and registered in the land cadastre as build-up areas and courtyards. In this Option, no further land will be required from the PPF, i.e. no biotopes of surrounding grass cover will be consumed nor will new access road need to be build or any technical infrastructure connections as would be the case for the proposed Option 2.

At the same time, all impacts occurring as a consequence of the proposed activity show the characteristics of adverse effect of less significance to the surrounding environment of the affected area and its population, which can be mitigated by adequately set technical, organisational, operational and protection measures. Though, implementation of the investment plan will have a significant positive impact on disposal of RAW from NPP A-1 and NPP V-1, and potential other nuclear facilities due to creating a space for safe and systematic storage of generated RAW in compliance with the requirements for safe and systematic storage of generated RAW, as well as radiation protection of inhabitants. Building the Interim storage of radioactive waste will ensure smooth process of disposal of RAW from decommissioning of nuclear facilities, enabling thus gradual emptying of premises and building objects in order the location to be released from the Nuclear Supervision Authority supervision.

Based on the above, we herewith **recommend** assessing **Option 1** for the proposed activity “Interim storage of RAW”, subject to observing all legislative requirements and conditions defined based on the safety analysis to be carried out in the future.

10. DATE AND SIGNATURE (STAMP) OF AUTHORISED REPRESENTATIVE OF THE COMPANY PREPARING THE ASSESSMENT REPORT AND THAT OF THE PROPONENT TO CONFIRM THE CORRECTNESS OF INFORMATION

AUTHORISED REPRESENTATIVE
OF THE PROPONENT:

ASSESSMENT REPORT
AUTHOR:

.....

.....

JAVYS, a.s.
Ing. Ján Horváth
Chairman of the Board and Director General

JAVYS, a.s.
Ing. Branislav Mihály
Safety Division Director
– authorised for representation

.....

JAVYS, a.s.
Ing. Miroslav Obert
Vice-Chairman of the Board and Director
of NPP1 Decommissioning and PMU Division

.....

JAVYS, a.s.
Ing. Milan Orešanský
Member of the Board and Director of Economics,
Sales and Investment Division

BRATISLAVA, DECEMBER 1ST 2011

ANNEXES TO THE ASSESSMENT REPORT (FIGURES, MAPS, TABLES AND PHOTOS)

- Annex N° 1: Option 1 location in JAVYS, a. s. site Jaslovské Bohunice cadastre area
 Annex N° 2: Option 2 location nearby JAVYS, a.s. site Veľké Kostoľany cadastre area
 Annex N° 3: Geographic location of nuclear facilities within Jaslovské Bohunice (*scale 1: 50 000*)
 Annex N° 4/1: Interim storage of radioactive waste – cross section views
 Annex N° 4/2: Interim storage of radioactive waste – +0,00 floor plan view
 Annex N° 5/1-4: Examples of packaging units planned to be used for radioactive waste storage in the Interim storage of RAW
 Annex N° 6/1-2: Interim storage Nord – Greifswald Germany
 Annex N° 7: Layout of underground water monitoring buildings within the area influenced by Gabčíkovo water dam, and typical levels map
 Annex N° 8: Transboundary underground water formations picture in the layer of quarterly formations of underground water and quarterly rock formations
 Annex N° 9: Picture of underground water surface iso-lines within the area influenced by Gabčíkovo water dam (prior and after water dam operation)
 Annex N° 10: Regular Underground Water Monitoring Programme for Bohunice Nuclear Facility Site and its Surroundings – valid for the year 2010
 Annex N° 11: Layout of objects for monitoring Bohunice nuclear facility site surroundings
 Annex N° 12: Layout of objects for monitoring Bohunice nuclear facility site surroundings – detailed section of the area with the wastewater discharge
 Annex N° 13: Bohunice nuclear facility site and the surroundings – hydro-geologic survey – underground water surface levels as of August 18th 2010

List of Abbreviations

AKOBOJE	Automated nuclear power plant safety protection complex
BIDSF	Bohunice NPP V-1 International Decommissioning Support Fond
BSC RAO	Bohunice RAW processing and treatment centre
ČMS	Partial monitoring system
ČOV	Wastewater Treatment Plant -WWTP
DS	Long-term storage facility
EPS	Electric fire alarm system
HaZZ	Fire fighting and rescue corps
HYNI	Hydrostatic levelling
IS RAO	Interim storage of radioactive waste - IS RAW
JE	Nuclear power plant - NPP
JE A1	Nuclear power plant A1 Jaslovské Bohunice
JE V1	Nuclear power plant V1 Jaslovské Bohunice
JE V2	Nuclear power plant V2 Jaslovské Bohunice
JZ	nuclear facility
KP	Controlled zone
MAAE	International Atomic Energy Agency IAEA

MDA	Minimal detectable activity
MSK	12 degree seismic intensity scale (Mercalli, Cancini, Sieberg)
MSN	Handling and storage tank
MSVP	Spent fuel temporary storage facility
MŽP SR	Ministry of Environment of the Slovak Republic
NaRK	Auxiliary boiler plant
NN	Low voltage (LV)
OS	Packaging Unit
PDS	Long-term storage facility casing
PPF	Agricultural land fund
PUŽ	Collected sealed radiation sources not used by users anymore
PÚ	Fire section
RAL	Radioactive substances
RAO	Radioactive waste - RAW
RNAV	aRea NAVigation
RNV	radionuclide vector
RÚ RAO	National Repository for Radioactive Waste Mochovce NR RAW
SC1	Seismic resistance category
SE	Slovenské elektrárne / Slovak Electricity Utilities
SKR	Control and management system
SO	Building object
SR	Slovak Republic
TNR	Reactor pressure vessel
TOS	transportation packaging unit
TRB	Radiation Safety Engineer
TSÚ RAO	RAW processing and treatment technologies
TV	Television
ÚJD	Nuclear Supervision Authority
ÚPD	Zoning and Planning documentation
ÚVZ	Public Health Authority
VBK	Fibre-concrete container
VBO	Fibre-concrete container
VLLW	Very low level waste
VOB	Water biological protection
VVER	Pressurised water reactor
VZT	Air ventilation
ZHÚ	Internal fire fighting unit