SUMMARY OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROGRAMME (SCOPING DOCUMENT)

DECOMMISIONING OF THE IGNALINA NUCLEAR POWER PLANT

Organiser of the proposed economic activity	**State Enterprise Ignalina Nuclear Power Plant**
Developer of the Environmental Impact Assessment Programme	**State Enterprise Ignalina Nuclear Power Plant**

2023

Abbreviations

NF	Nuclear Facility
Decommissioning	Decommissioning of the INPP
FDP	Final Decommissioning Plan
INPP	Ignalina Nuclear Power Plant
D&D	Dismantling and Decontamination
SRW	Solid Radioactive Waste
SSC	Structures, Systems, and Components
VLLW Repository	Very Low-Level Radioactive Waste Repository
LR	Republic of Lithuania
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
SNF	Spent Nuclear Fuel
PEA	Proposed Economic Activity
RW	Radioactive Waste
SAR	Safety Analysis Report
SPZ	Sanitary Protection Zone
LRW	Liquid Radioactive Waste
TD	Technological Design
VATESI	State Nuclear Power Safety Inspectorate
SE INPP	State Enterprise Ignalina Nuclear Power Plant

1. Information on the Project and its Location

The organiser of the Project: State Enterprise Ignalina Nuclear Power Plant, Elektrinės str. 4, K47, Drūkšiniai vil., 31152 Visaginas municipality, Lithuania.
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The project – **Decommissioning of the Ignalina NPP** – has been started with the preparatory planning in 2001 and is planned to be completed by the end of 2038 with the demolition of the relevant engineering structures on the Ignalina NPP site and the remediation of the site. The legal basis for the decommissioning of the Ignalina NPP is the Law on the Decommissioning of the Ignalina NPP [1]. In accordance with the INPP decommissioning strategy [2], approved by the Decision of the Government of the Republic of Lithuania in 2002, the decommissioning of the INPP is planned and implemented by the immediate dismantling method.

The project under consideration is included into the list of activities referred to in Appendix I, paragraph 2(b) of the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention) - i.e. nuclear power stations and other nuclear reactors, including **the dismantling or decommissioning of such power stations or reactors** (except research installations for the production and conversion of fissionable and fertile materials, whose maximum power does not exceed 1 kilowatt continuous thermal load). Two countries – the Republic of Belarus and the Republic of Latvia – are relatively close to the location of the proposed economic activity. The state border of Lithuania and Belarus is located about 5 km to the east of the INPP power units, and the state border of Lithuania and Latvia is located about 8 km to the north of the INPP power units.

Figure 1-1 Location of the INPP in relation to the neighbouring countries

The project will be carried out within the INPP industrial site. The area of the INPP site is 82 ha. The INPP site is a territory that is bounded by the INPP physical security perimeter (physical barrier). The INPP as the nuclear facility under the decommissioning consists of 71 engineering structures, see Figure 1-2. A sanitary protection zone (SPZ) is established around the INPP site within a radius of 3 km. There are no permanent residents within the boundaries of the SPZ, and implementation of other economic activities is limited. The nearest residential area is located about 3.5 km southwest of the INPP site.

Figure 1-2 Location of the project

2. Brief Information on the Decommissioning Process of the Ignalina NPP

The INPP operated two power units with RBMK-1500 type reactors (electrical power - 1500 MW). The first power unit was operated from December 1983 to 31 December 2004, the second power unit - from August 1987 to 31 December 2009.

Pursuant to the National Energy Strategy adopted by the Seimas of the Republic of Lithuania [2], the State Enterprise Ignalina Nuclear Power Plant completely ceased to produce electricity on 31 December 2009 as a consequence of fulfilment of the obligations of Lithuania under the Treaty of Accession to the European Union. The facility has become an enterprise that has ceased its activities as an electricity producer but has retained the status of an organisation that operates nuclear facilities, whose main activity has gradually become the management of radioactive waste.

The INPP decommissioning process was divided into a number of decommissioning projects, all of which are combined into one large project – the INPP Decommissioning Megaproject [3]. Each project is a separate specific process covering a defined area of activity, according to which the scope of works is determined, the organisation and performance of the works are planned, the environmental impact assessment and the safety justification of the planned works are carried out. The INPP Decommissioning Megaproject [3] covers the entire INPP decommissioning period until 2038, i.e. the date of the INPP decommissioning completion as specified in the INPP Final Decommissioning Plan (FDP) [4]. Taking into account the INPP decommissioning activities and projects widespread in time, the entire INPP decommissioning period is divided into several stages in order to ensure proper risk management, facilitate the licensing process, consistently allocate the necessary funds and carry out the works. The main dates of the proposed economic activity are shown schematically in Figure 1-3.

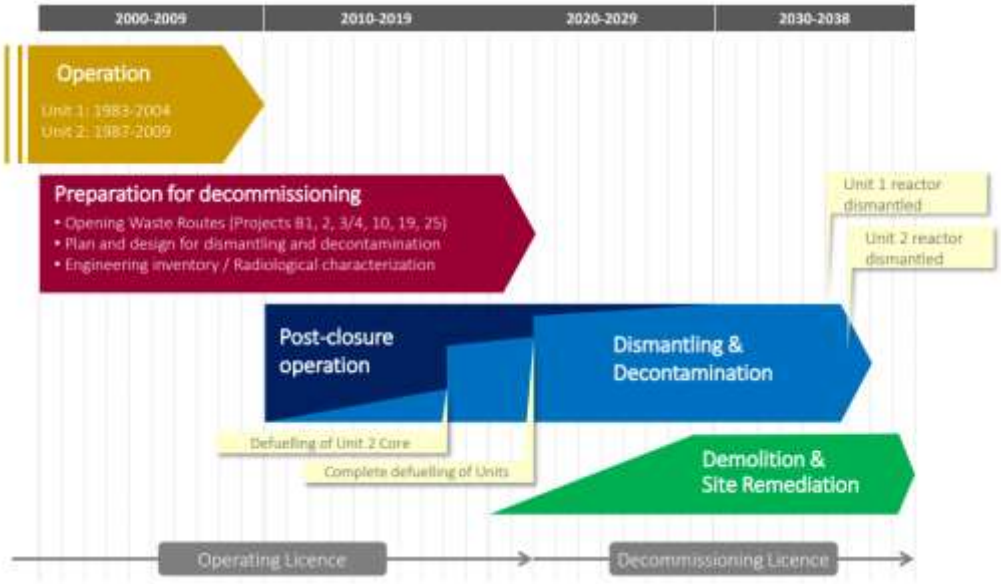

Figure 1-3 INPP decommissioning schedule

In 2002, when the INPP decommissioning process has been started, the Ignalina NPP Decommissioning Environmental Impact Assessment Programme (hereinafter referred to as the Programme) [5] was prepared by Ignalina NPP and approved by the responsible authority in 2004, it was decided that a separate EIA Report would be developed for each decommissioning project, and that during the EIA of each subsequent decommissioning project the results of the previous EIAs should be considered in order to provide the most accurate and comprehensive environmental impact assessment of the INPP decommissioning activities and to apply the necessary measures to eliminate, reduce or compensate possible significant negative impacts on the environment and the public health. Thus, since the approval of the first Programme [5] the INPP has carried out environmental impact assessments for 19 decommissioning projects and the responsible authority has taken 19 positive decisions. SE INPP has developed separate EIARs at the initial stage of decommissioning, with the aim to carry out EIAs using the latest available data and "know-how" gained during the implementation of previous projects. It should be mentioned that assessments were done by applying conservative assumptions and assessing the cumulative impact of all projects carried out on the INPP site, applying the requirements on the environmental impact assessment [6-7].

Since the INPP decommissioning process has already been a considerably advanced process and the INPP Decommissioning Strategy, stipulating the INPP decommissioning method, was approved by the Decision of the Government of the Republic of Lithuania [2] back in 2002, and taking into account the fact that the previous EIA Programme [5] analysed in detail the possible alternatives of the INPP decommissioning method on the basis of the of international experts assessments, therefore, the alternatives of the INPP decommissioning method, location and the time-frame are considered neither in the Programme, nor in the EIA Report. The alternatives of organisation of the decommissioning works, alternatives of the selected technological and technical solutions, as well as the alternatives of the mitigation measures will be considered in the EIA Report.

It should be noted that during the INPP decommissioning, the discharges of radionuclides to both air and water (data based on the ongoing environmental monitoring), and the resultant doses to the employees and the representative person did not exceed the established limit values and constitute only a very small part of the permitted norms. The actual environmental impact of the implemented projects is significantly lower than the estimated impact during the environmental impact assessment. In addition, the regulatory authority – VATESI – continuously carries out surveillance

of the ongoing decommissioning activities at the INPP site and its compliance with the requirements of the legal acts regulating nuclear, radiation, fire, and physical safety. All the documents necessary for the implementation of the projects and for obtaining of appropriate permits: technological designs, safety analysis reports, are examined and agreed by VATESI, including performance of independent technical expertise.

2.1. INPP Decommissioning Progress

After the shutdown of the INPP Units 1 and 2 at the end of 2004 and 2009, respectively, they were assigned the status of finally shutdown units. According to the legal regulation of the Republic of Lithuania [8], the units were considered to be in operation till all spent nuclear fuel (SNF) would be removed from the units. The SNF was completely unloaded from Unit 1 reactor in December 2009 and from Unit 2 reactor – in February 2018. The transport of all SNF from the INPP fuel storage pools to the Interim Spent Fuel Storage Facility was completed on 21 April 2022.

According to the Nuclear Safety Requirements BSR-1.5.1-2019 "Decommissioning of Nuclear Facilities" [9] regulating the decommissioning of the NF, during the NF final shutdown it is allowed to carry out decommissioning preparatory measures, i.e. to carry out such measures as the unloading and removal of the SNF from the units, isolation, dismantling and decontamination of the redundant systems, handling of radioactive waste generated during the NF operation.

Thus, during the analysis of the systems carried out within the framework of the INPP Unit 1 and Unit 2 decommissioning projects U1DP0, U2DP0 [10, 11], the systems or their parts that can be decommissioned after the reactor final shutdown by isolating, modifying and preparing for the subsequent dismantling were identified. These systems or their parts do not longer perform safety relevant and non-safety relevant functions during the separate fuel unloading from the reactor stages. The EIA for these INPP decommissioning stages has already been carried out.

Dismantling of the INPP Units technological equipment was started in 2010 by dismantling of Unit 1 reactor emergency core cooling system equipment (building 117/1). Since then, the INPP has been carrying out isolation and dismantling of technological equipment that was no longer required for further operation or decommissioning purposes, as well as initial treatment of generated waste, following the dismantling strategy "one building after another", starting from the least radionuclide contaminated buildings and moving to more radionuclide contaminated buildings.

Thus, during the reactor final shutdown stage, the following dismantling and decontamination projects were implemented or started to be implemented, the potential environmental impact of each of this activity has been assessed individually:

- D&D works in building 117/1 (Emergency Core Cooling System accumulation tanks and pipelines). The works were started in November 2010 and completed on 30 December 2011.
- D&D works in building 119 (Heat Plant systems). The dismantling works started in December 2011, completed in February 2013.
- D&D works in building G1 (Turbine Hall systems and equipment). The dismantling works started in December 2011, completed in 2016, the initial treatment of waste was completed in 2019.
- D&D works in building V1 (Reactor Gas Circuit, Off-Gas Purification Systems, Emergency Core Cooling Systems and related auxiliary equipment). The dismantling works started in 2011, completed in 2019 (Phase D1).
- D&D works in building 117/2 (Emergency Core Cooling System accumulation tanks and pipelines). The dismantling works started in 2013, completed in 2015.
- D&D works in the building G2 (Turbine Hall systems and equipment). The dismantling works started in 2014, completed in 2021, the initial treatment of waste was completed in

2022.

- The D&D works in buildings D0 and D1 (electrical, control equipment and deaerators, their feeding system and transit pipelines of relatively clean steam and transit pipelines of relatively clean steam condensate, fresh steam pipelines, feeding water, other pipelines). The dismantling works in building D0 started in 2014, completed in 2015, the works in building D1 finished in 2019.
- D&D works in building D2 (deaerators, their feeding system and transit pipelines of relatively clean steam and pipelines of relatively clean steam condensate, pipelines of fresh steam, feeding water, other pipelines). The works started in 2018, completed in 2022.
- D&D works in building A1 of Unit 1 (Multiple Forced Circulation Circuit pipelines, main circulation pumps, drum-separators, and other equipment), Phase 1. The dismantling works started in 2021, the works are planned to be completed in 2028.
- D&D works in Unit 1 reactor R1 and R2 zones (upper and lower reactor communication pipelines). The dismantling works started in 2021 and are planned to be completed in 2026.
- D&D works in building A2 of Unit 2 (Multiple Forced Circulation Circuit pipelines, main circulation pumps, drum-separators, and other equipment) and building V2 of Unit 2 (Reactor Gas Circuit System, Off-Gas Purification Systems, Emergency Core Cooling Systems and related auxiliary equipment), Phase 1. The works are planned to start in 2024, to complete – in 2031.
- D&D works in Unit 2 reactor R1 and R2 zones (upper and lower reactor communication pipelines). The works are planned to start in 2024, to complete – in 2028.
- D&D of the remaining equipment (after the main process equipment dismantling) in the INPP buildings 119, G1, G2, D0, D1, D2 (building engineering systems equipment (radiation protection, ventilation, electricity, water supply, sewage, compressed air, etc.), lifting devices and equipment of the waste pre-treatment sites). The works in buildings of Unit 1 started in 2022, planned to be completed in 2031. The works in buildings of Unit 2 started in 2022, planned to be completed in 2034.
- D&D of low salinity water collection tanks (buildings 152/1A, B; 152/2A, B) and associated technological equipment of buildings B1,2 (rooms 012, 014). The works related to building 152/1A, B D&D are planned to start and complete in 2023. The works related to building 152/2A, B D&D are planned to start and complete in 2024.

The actual status of D&D works at the INPP Units is shown in the figure below.

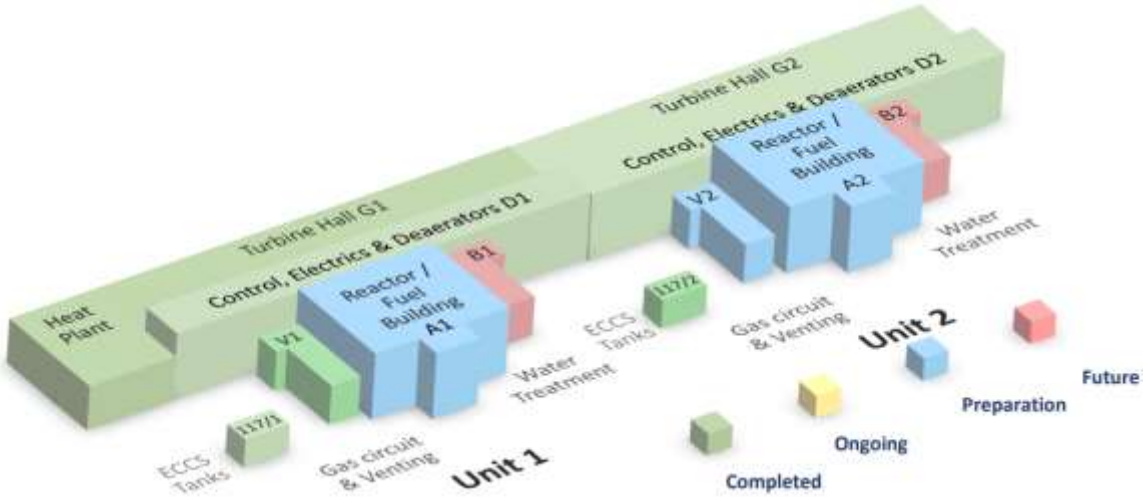

Figure 2-1 Layout of the INPP Units and the actual status of D&D works

In addition to the D&D projects already completed, the new spent nuclear fuel and radioactive waste management facilities have been built as part of the INPP decommissioning, including few radioactive waste repositories to be still constructed in future. These facilities will be operated for a long time after completion of the INPP decommissioning programme:

- Interim Spent Fuel Storage Facility (B1 project),
- Solid Waste Treatment and Storage Facilities (B3,4 project),
- Repository for Short-Lived Very Low-Level Radioactive Waste (B19-2 project),
- Near Surface Repository for Short-lived Low and Intermediate Level Radioactive Waste (to be constructed under the B25-2 project).

The environmental impact assessments for all these new NFs have already been carried out, including in a transboundary context [1212–15]. The release of radionuclides from these facilities and the determined doses to the representative person will be considered in the EIA Report while assessing the potential cumulative impact of the entire decommissioning process on the environment and the public health.

2.2. Works to Be Carried Out as Part of the Proposed Economic Activity

In the scope of the proposed economic activity, the following works are planned to be carried out:

- D&D works in buildings B1 and B2 of Units 1 and 2 (Multiple Forced Circulation Circuit cooling and cleaning equipment, intermediate circuit equipment, various water filtration equipment, etc.). The works in building B1 are planned to start in 2025, to complete – in 2026. The works in building B2 are planned to start in 2029, to complete – in 2030.
- Dismantling of Units 1 and 2 reactor cores (R3 zone) (graphite stacks, reactor metal structures (so-called schemes E, L, D, KZh, OR, G, Э, C), structures and cavity fillers (sand, serpentinite, water) as well as installation of the Reactor Waste Storage Facility. Dismantling of the reactor cores of both units is planned to start in 2028, to complete – in 2034.
- D&D works in buildings A1, A2, V2 of Units 1 and 2, Phase 2 (spent nuclear fuel handling and storage system components in the Reactor Hall and equipment of the fuel storage pools, as this equipment will be used for dismantling of Units 1 and 2 reactor cores). The works in building A1 are planned to start and complete in 2034, the works in building V2 are planned to start in 2033, to complete– in 2034, the works in building A2 are planned to start and complete in 2035.
- D&D of the remaining equipment of buildings A1, A2, B1, B2, V2 of Units 1 and 2, which continued to be operated after dismantling of the main technological equipment, building engineering systems equipment (ventilation, electricity, water supply, sewage, ventilation stacks of buildings A1, A2, etc.), as well as equipment of the initial waste pre-treatment sites. The works are planned to start in 2028, to complete – in 2035.
- Dismantling of the equipment of other facilities in the controlled area (auxiliary engineering structures in the controlled area of the INPP site):
    - Gas retention cameras of Units 1 and 2 (buildings 135/1, 135/2);
    - Special laundry (building 156);
    - Personnel hygiene lock facilities (buildings 140/1, 140/2a).

  The start of equipment dismantling at these facilities is scheduled to take place over a long period of time, from 2025 to 2036.

- Dismantling of the waste treatment facilities equipment:
    - Repair workshops (“contaminated” part) (building 130/2) containing equipment for treatment of decommissioning metal waste of Class A (fragmentation,

decontamination);

- Liquid radioactive waste treatment facilities (bituminisation, cementation, evaporation facilities in building 150), the ventilation stack of building 150 (structure 153), the communication bridge between buildings 101/1 and 150 (structure 175);
- Sewage (drainage) and treated water collection tanks (buildings 151, 154, 154a, b);
- Solid radioactive waste storage facilities (buildings 155, 155/1, 157, 157/1) and waste retrieval and sorting facilities (B2-1);
- Free-release measurement facility (facility B10 and building 159B).

The start of equipment dismantling at these facilities is scheduled to take place over a long period time, from 2031 to 2035.

- Sequential demolition of buildings.
- Remediation of the site – in 2038.

INPP engineering structures will be demolished only after all the equipment inside these structures will be dismantled, the structural components will be decontaminated, if necessary, and it will be proved that the contamination of the building structures does not exceed free release levels, i.e. such an engineering structure is no longer considered to be an NF structure and can be demolished as any other civil structure.

After the demolition of the individual buildings, following the established procedure [16] after confirming that the site of the building, or a part of it, including the adjacent territories are not radionuclide contaminated and their radiological control can be terminated, the site remediation works will be carried out, the necessary soil will be prepared and the territory will be levelled for planting, thus reducing the scope of remediation of the territory to be carried out at the end of the decommissioning programme.

Demolition of on-site INPP buildings and engineering structures will enable to achieve the planned INPP site status set in the FDP [4] – to clean and transfer for uncontrolled use as large as possible part of the Ignalina NPP territory (to grant the status of a "green field"[1] to this part), since the entire INPP site cannot be converted into a "green" field as after the completion of the INPP decommissioning programme the following separate NFs will still remain in operation on the INPP site for a long time:

- Cemented Liquid Radioactive Waste Storage Facility (building 158/2), if selected as an Interim Reactor Waste Storage Facility, which will be also temporarily used for storage of a relatively small amount of graphite waste generated during the dismantling of the reactor channels, otherwise this storage facility will be demolished by 2037;
- Bitumised Radioactive Waste Repository (building 158) after the transformation of the Bitumised Radioactive Waste Storage Facility into the repository;
- VLLW buffer storage facility (B19-1) which will be operated until the VLLW repository is in operation, i.e. until all waste generated during the decommissioning and meeting the acceptance criteria for disposal in the VLLW repository, is disposed of.

Uncertainty also remains with regard to the industrial waste storage site, as only the results of the design engineering geological surveys, the results of the radiological surveys of the waste stored in the industrial waste storage site and the analysis of the chemical and physical composition of

[1] "Green field" status means the final condition of the NF and/or its site, when the radionuclide activity concentration in the buildings and on the site (or its part) does not exceed the unconditional clearance levels, and no limitations on the use of the facility site and the buildings due to the potential exposure to ionising radiation are established.

waste will enable to determine whether the waste stored therein will be left in-situ, i.e. by converting this industrial waste storage site into a conventional waste dump site or whether the waste stored therein will have to be retrieved and treated in other way. If the results of the surveys confirm the possibility to convert into a conventional waste dump site, the additional protective barriers will be installed to limit/prevent spread of radionuclides into the environment, the conditional clearance levels will be established, and the termination of the radiological control of the industrial waste storage site will be validated. Therefore, at this stage of the decommissioning, when the surveys of the industrial waste storage site are carried out, the territory of the industrial waste storage site is assigned as a "brown field". This implies such final condition of the NF and/or its site, when the radionuclide activity concentration in the buildings and/or on the site (or its part) exceeds the unconditional clearance levels, and the use of the facility buildings and the site (or its part) is only possible with some limitations due to the potential exposure to ionising radiation. The safety during the further use of the site is ensured by administrative means. During the preparation of the EIA Report, the status of the industrial waste storage site and, consequently, the final status of the INPP site will be specified.

Another uncertainty is related to the preparation for demolition of the main INPP buildings whose concrete structures are radionuclide contaminated and the management of the generated waste, since according to the radiological surveys results part of the structures has more deeper radionuclide contamination (50 cm deep / through the entire thickness of the structure), therefore their decontamination by removing the surface layer may not be possible or insufficient. Therefore, it will lead to generation of a large amount of concrete waste which will have to be treated as radioactive waste. For this purpose, the feasibility study on the performance of the INPP Units building structures decontamination will be carried out. Options for the treatment of the contaminated concrete waste in priority order:

- Removal of the contaminated concrete and disposal in a new repository;
- Determination of conditional clearance levels for reuse of the concrete. If concrete will be used at the INPP site, then that part of the site should be classified as a "brown field";
- Installation of the contaminated concrete repository on the INPP site, e.g., on the site of the INPP units – in this case, a new NF will be built on the INPP site, but in this case the underground structures of the building would not be dismantled, as they could be used as cavities for placing of the concrete scrap of the ground structures. However, such a decision can only be made if it is ensured that such a repository design will allow the installation of appropriate engineering barriers limiting the spread of radionuclides and will ensure the long term safety of the population and the environment.

The decision on the management of the contaminated concrete of the main engineering structures of the power units must be made considering all requirements: legal, radioactive waste management safety, radiation protection, environmental protection, and economic and social factors.

The intended status of the INPP site with the NF remaining in operation on the INPP site and the industrial waste storage site is shown in Figure 2-2.

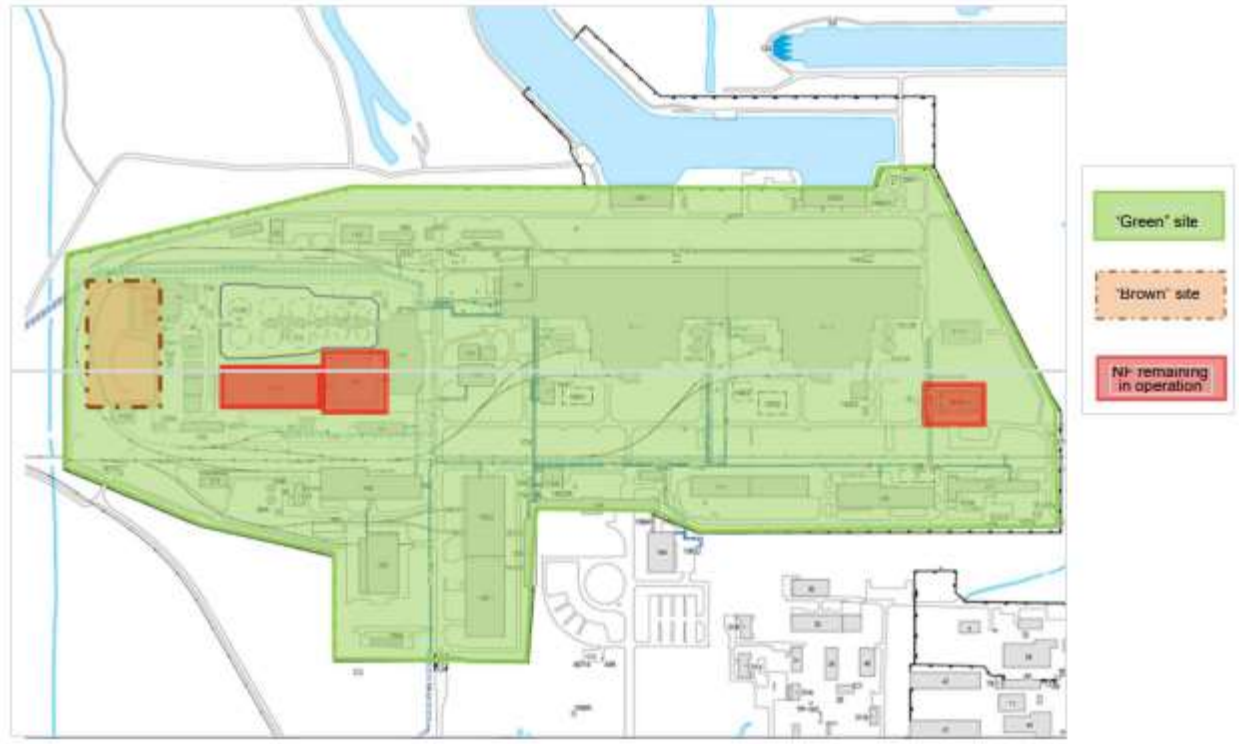

Figure 2-2 Intended status of the INPP site

2.3. Technological Processes

The environmental impact of the following INPP decommissioning technological processes will be assessed:

- Dismantling of equipment;
- Decontamination;
- Waste management;
- Demolition of buildings and remediation of the site.

For better planning of the decommissioning works, an engineering inventory and radiological characterisation is being carried out in order to create a comprehensive and reliable database of all equipment, components, building structures and their contamination levels allowing to better plan the waste flows and capacities of the RW treatment facilities.

2.3.1. Dismantling of Equipment

During the INPP decommissioning the structures, systems, and components (SSC) are dismantled in accordance with the Nuclear Safety Requirements BSR-1.5.1-2019 "Decommissioning of Nuclear Facilities" [9].

Dismantling activities are organised according to the "territorial-geographical" principle, i.e. by individual buildings (Units) when dismantling of equipment and pre-treatment of waste and related structures in buildings (Units) or individual rooms of Units are distinguished into separate projects.

Dismantling projects are carried out in separate stages:

- Preparation of equipment for dismantling:
  - Preparation of the equipment isolation and dismantling modifications;
  - Isolation of equipment and systems and performance of works ensuring the safe configuration of the SSC important to safety of the NF;

  - Performance of engineering inventory and radiological surveys;
  - Preparation of licensing documents (D&D Technological Design, SAR);
  - Preparatory works in the dismantling zone and development of detailed documents for the actual dismantling of equipment;
  - Training and certification of personnel;
  - Preparatory works (e.g., procurement and installation of the necessary equipment, rerouting of communications, modification of existing systems, organisation of waste pre-treatment sites);
- Dismantling of equipment, including waste pre-treatment;
- Acceptance of the facilities after equipment dismantling;
- Control of the transfer of dual-purpose goods (during the performance of all works, including preparatory works and equipment dismantling).

Information on the dismantling methods and equipment used for each D&D project shall be provided in the relevant technological designs. The decision on the relevance of using one or another dismantling method is made in the D&D designs on the basis of the alternatives assessment made during the EIA process, as well as on the basis of the assessment of the available own practise and the best global practices. The preparation of the equipment dismantling project documentation includes development of the TD and SAR which shall be agreed with VATESI in accordance with the established procedure, including the independent expertise.

The following are the main dismantling equipment/tools used or considered for use in D&D projects:

- Mechanical dismantling equipment:
  - Grinding device;
  - Cable saw;
  - Grip pipe cutter;
  - Circular saw for solid alloys;
  - Sabre saw;
  - Hydraulic shears;
  - Water jet cutting machine;
  - Splitting hammer.
- Thermal dismantling equipment:
  - Gas and flame cutting;
  - Plasma cutting;
  - Laser cutting.

In order to reduce the personnel exposure doses remote dismantling methods are preferred as they reduce the time of the personnel presence and their exposure from the dismantled equipment. Remote methods are adjusted for controlling the above indicated tools by manipulators.

Planned solutions for the equipment dismantling will be described in the EIA Report.

Brief Description of the Reactor Core Structure

The reactor core is structurally divided into three zones: R1, R2 and R3.

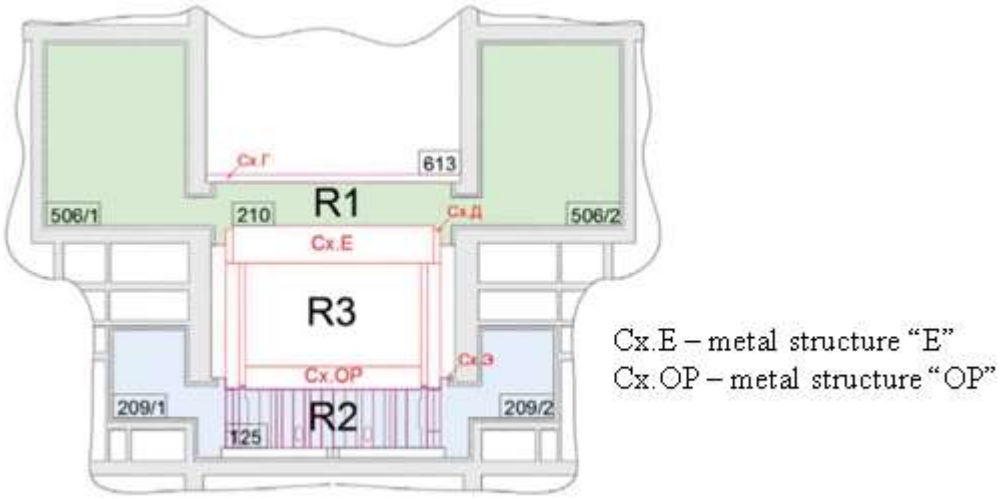

Figure 2-3 Reactor dismantling zones

R1 zone includes the reactor components (steam-water pipelines) located in the reactor shaft (room 210) and partly in rooms 506/1,2 located above the height of +20.70 (above the metal structure "E"), reactor fuel channels and Control and Protection System channels.

R2 zone includes reactor components (lower water communications) located in the reactor shaft (room 125) and partly in rooms 209/1,2, located between the heights of +0.9 m and +5.95 m (below the metal structure "OR").

R3 zone includes reactor metal structures located in the reactor shaft (room 210) from the height of +5.95 m to the height of +20.70 m, the graphite stack and fillers. Dismantling of this zone will be carried out after dismantling of R1 and R2 zones. The EIA of R1 and R2 zones of both Units were completed in 2016 and 2022, and the decisions of the responsible institution on the possibility to implement PEA were received accordingly.

Works related to Dismantling of R3 Zones and Waste Management

Works related to dismantling of R3 zone and waste management are divided into:

- Organisation of access to the graphite stack and other components of R3 zone (access from above, access from the side and bottom premises or a combination of both options);
- Dismantling and retrieval;
- Treatment, packaging, and transfer of waste;
- Installation of the Reactor Waste Storage Facility (RWSF);
- Completion of works and cleaning.

The methods for dismantling and retrieval of the components from the R3 zone indicated hereafter below (sequence of works, machinery, and equipment) will be described in the EIA Report based on the available data. The final decisions will be made during the development of the Technological Design and will be justified from the safety point of view in the SAR:

- Irradiated graphite stack;
- Metal structures and their components;
- Solid fillers;
- Water filler;
- Waste remaining after dismantling of R1/R2 zones, which will be temporarily stored in the fuel storage pools.

The facilities for pre-treatment (fragmentation, sorting and packaging into transport containers) of short-lived and conditionally non-radioactive waste installed in the reactor buildings of Units 1 and 2 and the places of temporary storage of such waste arranged within the scope of the previously implemented D&D projects will be used (to the extent technically possible and cost-efficient) for treatment of waste generated during dismantling of R3 zones.

Depending on selected dismantling and retrieval method of the reactor equipment, the selected containers and equipment, the following waste treatment and packaging solutions will be selected:

- Sorting of primary waste, fragmentation, sorting, decontamination of short-lived waste with surface contamination (if justified), radiological measurements and evaluation/characterisation, packaging, accumulation of packages at temporary storage (buffer) sites;
- Possible other sequence of treatment;
- Waste treatment methods for further disposal in the Near Surface and/or VLLW Repositories.

It will be ensured that the amount of secondary waste generated during the dismantling and pre-treatment of the primary waste is kept to the minimum. The waste will be treated as close as possible to the waste generation sites.

Reactor waste of different classes will be transported from the packaging places to the existing INPP RW management facilities for further decontamination, characterisation, storage, disposal or free release, see Figure 2-3. Only existing INPP technological roads (non-public roads) will be used for the transport of waste packages by the established transport routes and by motor vehicles transporting waste to the relevant facilities, including inside the reactor building.

The volume of the reactor dismantling waste to be temporarily stored at the RWSF for at least 50 years is as follows:

- Class D graphite waste – ~3 766 t (3 519 t graphite stack blocks + 246 t reactor channel graphite, which will be dismantled from R1 zones of both Units and temporarily stored in building 158/2);
- Class D + Class E steel waste – ~2 195 t;
- Class D fillers' waste – ~1 018 t.

The following options for installation of RWSF are considered:

- By changing of the purpose of the INPP owned building;
- By constructing one or more new buildings;
- By any reasonable combination of bullets 1 and 2.

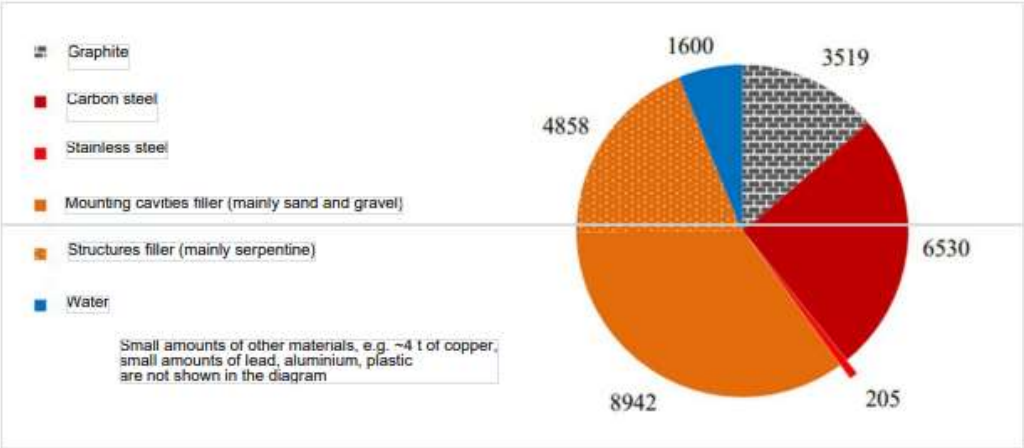

Figure 2-3 Estimated amount of R3 zone materials (tonnes, both Units)

2.3.2. Decontamination of Equipment

The objectives of the decontamination process at the INPP are as follows:

- Reduction of the entire decommissioning waste volumes to be temporarily stored or to be disposed of in the future, as well as an increase in the mass of materials, structures, and equipment for free release at present time or in the future;
- Reclassification of radioactive waste into a lower class enabling to change the final disposal method, i.e., from disposal in the Near Surface Repository (B25) to the disposal into the Landfill Repository (B19);
- Reduction of the radioactive contamination level of facilities and/or their components, thus improving working conditions during performance of dismantling works and reducing the personnel exposure;
- Reduction of gamma radiation equivalent dose level (resulting in reduction of the personnel individual and collective exposure doses) in premises and zones where the personnel are present during D&D in order to comply with the ALARA principle;
- Reduction of the risk of spreading of surface (transferrable) contamination during carrying out of the dismantling works;
- Possibility to reuse materials, equipment and premises for the INPP purposes;
- Ensuring that the negative impact of decontamination on personnel and population exposure is less than its positive impact.

The decision on the decontamination relevance and necessity is made in the D&D design documents based on the alternatives assessment made during the EIA process, as well as based on the assessment of industrial and available own experience gained during decontamination and/or additional pilot decontamination performance.

The choice of the decontamination method is determined by the nature of the surface to be decontaminated and the origin of the radioactive contamination, as well as the type and overall dimensions of the decontaminated waste. Considering the strength of the interaction between the contaminant and the surface, contaminants are classified as non-fixed, weakly fixed and strongly fixed. The nature of the surface and the strength of the retention of radioactive contaminants determine the selection of decontamination techniques and methods. According to cl. 134 of the Nuclear Safety Requirements BSR-1.5.1-2019 “Decommissioning of Nuclear Facilities” [9], in selecting the decontamination method its effectiveness shall be assessed.

The used decontamination technologies, depending on the operating mechanism, can be grouped as follows:

- Mechanical removal of contaminants (water treatment, dust cleaning with a vacuum cleaner, shot blast (abrasive) cleaning), abrasive cleaning, high and extra-high pressure water jet, picking);
- Partial dissolution of radioactive substances by treating surfaces with non-aggressive decontamination solutions;
- Physical-chemical methods used to partially degrade or dissolve the surface or the surface layer of the decontaminated material (chemical solutions, multi-phase processing processes);
- Other decontamination techniques (electropolishing (IBS), ultrasonic cleaning, coating with polymer films).

Decontamination of circuits/equipment may be internal (prior to dismantling of the equipment) when the decontamination solution circulates within to be decontaminated system, or external

when to be decontaminated equipment is fragmented and decontaminated by using specially designed equipment.

2.3.3. Radioactive Waste Management

The INPP radioactive waste management strategy is set in the Radioactive Waste Management Programme [17] aiming to:

- Manage all radioactive waste and the SNF by ensuring high level of nuclear and radiation safety and environmental protection during their handling;
- Ensure the long-term safety of the SNF and long-lived radioactive waste;
- Reduce the radioactive waste volumes and seeking to free release as much as possible of the waste/material volumes (where practically possible and economically feasible).

Solid, liquid, and gaseous radioactive waste is generated during the decommissioning process. According to its physical and radiological characteristics the radioactive waste is very diverse, and the types of RW management depend on its characteristics. Depending on the used RW treatment methods the solid RW is additionally classified as combustible/non-combustible, compactable/non-compactable, as well as containing long-lived/short-lived radionuclides.

The INPP waste management is conducted in accordance with the legal acts of the Republic of Lithuania regulating the waste management [18-21]. Requirements and principles of the RW classification are set out in the Nuclear Safety Requirements BSR-3.1.2-2017 "Pre-disposal Management of Radioactive Waste at Nuclear Installations" [18].

Solid Radioactive Waste

SRW is subdivided into the following flows:

- SRW flows generated during the operation: SRW generated during the INPP operation, post-operational phase and during handling of the interim storage facilities of the operational waste;
- SRW flows generated during decommissioning: SRW generated during equipment dismantling and/or dismantling of the INPP systems and related structures and during demolition of buildings and engineering structures;
- SRW produced by external suppliers and unproperly maintained SRW found on the territory of Lithuania.

The management of SRW at the INPP (from its generation to disposal) consists of the following main stages:

- Collection and initial sorting of SRW in order to manage it according to separate waste streams;
- Pre-treatment of waste (including primary sorting and decontamination);
- Main treatment and conditioning of waste;
- Radiological measurements of waste (at all stages of pre-treatment and further treatment);
- Formation of waste packages;
- Radiological characterisation of Class 0 waste, radiological characterisation of final packages of short-lived RW (Classes A, B and C) and radiological measurements of temporary storage packages of long-lived RW (Classes D and E) and SSS (Class F);
- Buffer and temporary storage of SRW;
- Disposal of packages containing SRW at repositories.

Liquid Radioactive Waste

The management of LRW at the INPP (from its generation to disposal) includes:

- Collection and sorting of LRW for further processing;
- Initial treatment of LRW;
- Temporary storage of LRW before processing;
- Initial treatment of LRW (homogenising, pH adjustment);
- Main treatment and conditioning of LRW;
- Radiological characterisation of the solidified LRW packages;
- Temporary storage of the solidified LRW packages;
- Disposal of waste packages to repositories.

LRW generated at the INPP facilities (buildings 101/1, 101/2, 120/2, 150, 156, 159, 140/1, 140/2) is transported from the collection tanks via technological pipelines to buildings 151/154 into the special LRW storage and homogenisation tanks. To reduce the LRW volume, the waste is treated at the cementation facility where the waste is cement solidified.

Gaseous Radioactive Waste

To reduce the discharge of gaseous radioactive waste, off-gas purification systems are installed in the ventilation systems. The main tasks of the ventilation and off-gas purification systems are:

- Off-gas flows purification prior to discharge into the atmosphere;
- Reduction of the radioactive contamination level in work premises and its maintaining within the permissible safe limits;
- Maintaining of the minimum dust concentration in work premises and reduction of the surface contamination;
- Creating of the normal climatic conditions by heating or cooling of the premises and by humidifying or dehumidifying the supplied air;
- Maintaining of the air flow direction from the less contaminated volume to a more contaminated volume, thus protecting the premises from uncontrolled spread of contamination.

The INPP equipment and premises ventilation system consists of two subsystems: supply and exhaust ventilation. To increase the reliability of the exhaust ventilation systems, the off-gas purification equipment is partially or fully duplicated. The discharge points of the preliminary filter purified air are sufficiently high to ensure good dispersion of the discharges. The most important components of the off-gas purification system are the aerosol filters.

The simplified waste management scheme for the decommissioning of the SE INPP is shown in Figure 2-4.

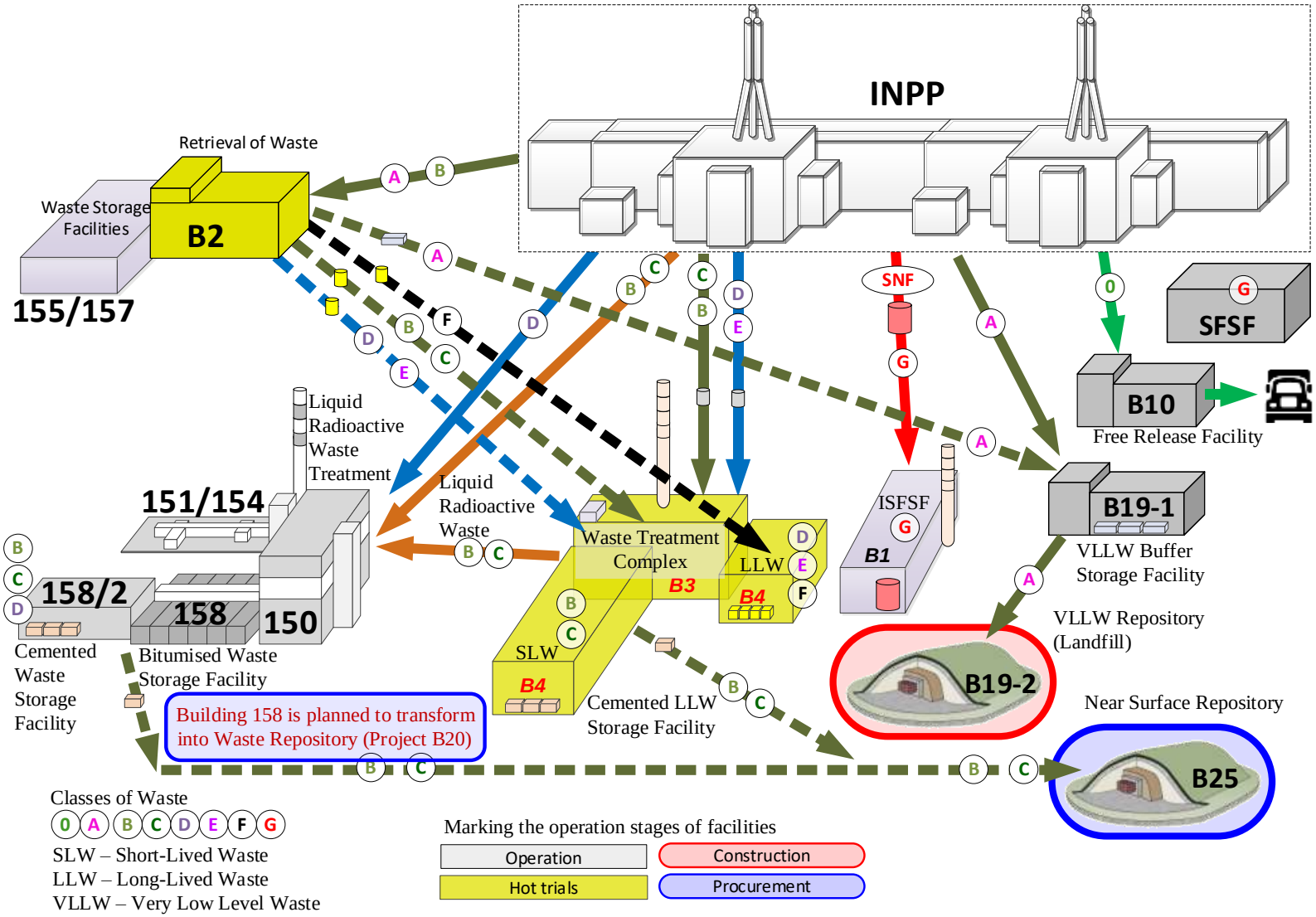

Figure 2-4 Simplified scheme of the waste management

2.4. Demolition of Buildings and Engineering Structures

The buildings whose structures potentially are not contaminated with radionuclides and may meet the free release levels, after proving that these buildings no further meet the requirements set for the NF structures will be demolished in the following sequence:

- after dismantling of all the equipment inside the building, radiological surveys of the structural components will be carried out by identifying the "hot" spots, if any;
- the structural components will be decontaminated, if necessary;
- the final radiological surveys will be carried out in order to confirm the compliance of the structural components with the free release levels [16];
- the radiological control of the building will be terminated and the building will be demolished as conventional civil engineering structures after obtaining a defined permit for demolition in accordance with the Technical Construction Regulation STR 1.05.01:2017 "Documents permitting construction. Completion of construction. Suspension of construction. Elimination of consequences of arbitrary construction. Elimination of consequences of construction resulting from illegal issuance of documents permitting construction" [22].

Engineering structures contaminated with radionuclides whose contamination exceeds the free release levels will be demolished as the NF engineering structures and the permit for demolition works will be issued in accordance with the Rules approved by the Resolution of the Government of the Republic of Lithuania [23]. Demolition designs (for special engineering structures) or demolition descriptions will be developed for the demolition of such engineering structures, describing in detail the management of the generated waste, the procedure for organising the demolition works, and measures for minimising of such factors as, for example, noise and dust that can have an impact on the environment and are common during performance of demolition works. Such engineering structures will be demolished in such a way that radionuclides are not spread into the environment, and the waste generated during the works will be handled as radioactive waste.

During the demolition of engineering structures meeting the free release levels, the above-ground structures will be demolished (to a depth of 0.5 m below the surface in accordance with the legal acts regulating construction). Underground parts deeper than 0.5 m from the ground surface will be left, the vaults of the buildings will be filled with concrete rubble produced by demolishing buildings/engineering structures.

The demolition of the INPP main buildings 101/1 and 101/2 will be carried out at a later stage of the decommissioning in the sequence "building after building" according to the geographical principle, see Figure 1-3, starting from radionuclide non-contaminated buildings and moving to potentially radionuclide contaminated buildings by ensuring stability of adjacent buildings and preventing their re-contamination. It is expected, but it should be confirmed by radiological surveys, that the structures of buildings G1,2; D0; D1,2 and 119 will meet the free release levels. And the contamination of concrete structures of buildings A1,2; B1,2 and V1,2 will probably exceed these levels. The demolition designs will include the sequential performance of demolition works and appropriate measures to ensure radiation protection during the performance of the works, to reduce the impact on personnel, the environment, and the public, to prevent the spread of radionuclides into the environment, as well as management of the generated waste as radioactive waste. The demolition works of individual buildings of Units 101/1 and 101/2 will be started after completion of the decontamination works (after removal of contaminated structural parts, radioactive "hot" spots) and the final radiological surveys of the building structures.

Once all the accumulated radioactive waste and most of the radioactive waste generated during the dismantling process are treated, the radioactive waste treatment facilities located on the INPP site (both old storage facilities and facilities built for decommissioning needs) will be demolished. Finally, unnecessary engineering networks will be dismantled and final work on the site remediation will be carried out. In this way, the intended status of the INPP and its site will be achieved – as larger as possible part of the Ignalina NPP territory transferred for uncontrolled use by assigning the status of a "green field" to this part of the site.

2.5. Risk Assessment

The analysis of potential incidents of already completed dismantling projects showed that the only possible insignificant negative impact could be on personnel directly working at the work performance sites and to prevent such risks mitigation measures have been developed for each of these projects. An increase in the impact on the environment is not expected due to incidents related to the dismantling of contaminated equipment as all the workplaces are equipped with highly effective radioactive discharges cleaning systems.

The analysis of incidents related to damage of RW packages during transportation by the INPP internal roads was carried out for separate RW flows in the previously approved and agreed documents: EIAR and SAR for RW treatment and storage facilities – B3,4, B19, B25 and Bld.158 demonstrating that the potential impact on the representative person is significantly below the permissible limit values.

The planned design solutions will be based on the concept of various barriers for localisation, containment and collection of any significant radioactive discharges and releases into the working environment and/or atmosphere.

3. Information on the Expected Impact on the Environment and Mitigation Measures

Health and Safety of the Population

The project will be carried out within the INPP industrial site. A sanitary protection zone is established around the INPP with a radius of 3 km with no permanent residents. The nearest settlements are located more distantly from the INPP, therefore the impact of D&D works or transportation of loads within the INPP site will not be significant. No impact on the water is also expected during the implementation of the project.

Potential airborne discharges and their potential impacts will be assessed in the EIA Report. The potential impact of the proposed economic activity will be reduced by using high efficiency filters and by ensuring good conditions for the dispersion of contaminants. As the nearest settlements are more distantly located from the place of the proposed economic activity, thus it is not expected an impact on the health of the population either in the INPP region or in other regions of Lithuania. The records on implementation of the previous INPP D&D projects prove the absence of such impact which is confirmed by the annual reports of the Radiation Protection Centre [24]. The Radiation Protection Centre, in order to assess the impact of the INPP activities on the external exposure dose to the population of Lithuania, has been carrying out equivalent dose assessments in the Ignalina district for many years and compares it with equivalent dose in other regions significantly distant from the INPP region.

The following table provides information on the exposure dose of the representative person which was previously conservatively estimated for the already implemented decommissioning projects or the projects that are under implementation, as well as the information on the contribution of each of these projects to the half of the dose constraint 0.1 mSv of the annual effective dose - 0.2 mSv due to airborne discharges, since waterborne discharges are not expected during these projects, except for projects U1DP0 and U2DP0 for which the exposure dose is assessed against the dose constraint of 0.2 mSv [25].

Table 3-1 Information on the assessed exposure doses of the representative person during the implementation of the INPP decommissioning projects

No.	INPP decommissioning projects for which the EIA is performed	The assessed exposure dose of the representative person, mSv	Share of the half (0.1 mSv) of the dose constraint, %
1.	Unit 1 decommissioning project, U1DP0	1.60E-03	0.8
2.	D&D of building 117/1 equipment	3.76E-07	3.76E-04
3.	D&D of building 119 equipment	8.54E-10	8.54E-07
4.	D&D of building G1 equipment	3.93E-09	3.93E-06
5.	D&D of building V1 equipment	1.80E-06	1.80E-03
6.	Unit 2 decommissioning project, U2DP0	3.78E-03	1.89
7.	D&D of building 117/2 equipment	3.75E-07	3.75E-04
8.	D&D of building G2 equipment	3.93E-09	3.93E-06
9.	D&D of buildings D0, D1, D2 equipment	5.95E-11	5.95E-08
10.	D&D of building A1 equipment	9.57E-09	9.57E-06
11.	D&D of Unit 1 reactor R1 and R2 zones equipment	9.40E-09	9.40E-06
12.	D&D of buildings A2 and V2 equipment	1.08E-04	1.08E-01
13.	D&D of Unit 2 reactor R1 and R2 zones equipment	7.47E-06	7.47E-03
14.	D&D of building 119, and buildings G1, G2, D0, D1, D2 remaining equipment	7.97E-10	7.97E-07
15.	D&D of buildings 152/ 1A, B; 152/2A, B equipment	1.92E-08	1.92E-05

As it could be seen from the data presented in the table, the maximum exposure dose values were conservatively assessed for the INPP Unit 1 and Unit 2 decommissioning projects U1DP0, U2DP0, but even the contribution of these projects to the exposure dose due to airborne discharges did not exceed 4%. The design and safety justification of all future decommissioning projects will also be conducted by applying the methods selected in a responsible manner.

The EIA Report will summarise the impact on the public health of the already implemented INPP decommissioning projects, also it will provide the conservative assessment of the impact of future decommissioning projects on the population, thus summarising the cumulative impact of the entire INPP decommissioning process on the public health due to all nuclear facilities and activities conducted at the INPP. Detailed calculations will be made at the stage of technological design and safety justification.

Biodiversity

The proposed economic activity will be carried out within the INPP industrial site where no species of flora and fauna that are protected under the legal acts of Lithuania and the European Union are found. The impact of the proposed economic activity on biodiversity outside the INPP industrial site will be very insignificant and will only be related to motor vehicle exhaust gas, noise, and light signals. The traffic of machinery will be planned only during the day without changing the current traffic intensity.

There will be no noise in the territories of Braslav district of Belarus and Daugavpils region of Latvia, as they are further than 5 km to the INPP site.

The INPP ensures the monitoring of the level of radionuclides in the vegetation, vegetables and food samples selected in the INPP region.

Water

The Ignalina NPP is built on the southern shore of Lake Drūkšiai which has performed the cooling function during the operation of the INPP. The main buildings of the power plant are located 400–500 metres away from the shore of Lake Drūkšiai.

The comparison of the multi-year average concentrations of water quality indicators in the period before the start of the power plant operation (1979-1983) [26] and after the start of the INPP operation [27-29] leads to the conclusion that the water quality indicators of Lake Drūkšiai comply with the established standards [31-33] and that the lake is regenerating normally. According to the conclusions of the report [26] based on the water quality Lake Drūkšiai can be assigned to the Class of a very good ecological condition [27].

Surface water shall not be used for dismantling and decontamination of equipment. Only artesian water is used for technological purposes and for the sanitary and hygienic needs of the personnel.

Decommissioning projects that have already been completed, as well as ongoing projects, have been organised in such a way as to avoid the generation of industrial wastewater. The same approach will be also used in the preparation of the technical documentation for future projects.

Surface run-off from the INPP territory due to precipitation is discharged into the environment (Lake Drūkšiai) via the industrial surface sewerage channels equipped with mechanical oil traps. The INPP ensures continuous monitoring of the groundwater, monitoring of surface and industrial wastewater into Lake Drūkšiai, and monitoring of Lake Drūkšiai.

More than 100 monitoring wells have been installed on the INPP territory to control the groundwater level, physical and chemical parameters, and the concentrations of radionuclides. The groundwater monitoring is carried out regularly in the INPP region in accordance with the INPP environmental monitoring programme.

The impact of the proposed economic activity on the surface water and groundwater in the INPP region and the neighbouring countries is not expected, since:

- PEA will be carried out within the INPP industrial site;
- It is not planned to increase consumption of groundwater and surface water, so the impact on the regional hydrology is not expected;
- Under normal conditions of work performance uncontrolled wastewater discharges into the environment are prevented during PEA;
- Industrial wastewater will be treated as potentially radioactive wastewater to prevent spread of radionuclides into the environment;
- Domestic wastewater generated at the INPP is directed for processing and treatment to JSC “Visagino energija”;
- Surface run-off from the INPP territory is discharged into the environment (Lake Drūkšiai) through the industrial rainwater drainage channels equipped with mechanical oil traps;
- PEA will be carried out outside the SPZ of the Visaginas waterworks facilities and wells located at the distance of 3 km to the southwest of the INPP site. The sources of drinking water in the Daugavpils region of Latvia and the Braslav district of Belarus are more distant;
- According to the data of the chemical and radiological monitoring of environmental water elements carried out since the start of the INPP operation, the INPP decommissioning works did not have significant negative impact on these environmental elements.

Considering that the proposed economic activity is not expected to have an impact on the environmental water, no measures are planned to reduce this impact.

Environmental Air and Climate

Information on the climate, temperature, wind, precipitation, etc. at the site where the Ignalina NPP decommissioning activities are carried out is analysed in detail in the initial Ignalina NPP Decommissioning Environmental Impact Assessment Programme [3] and during subsequent environmental impact assessments of the INPP decommissioning projects. This information will be updated in the EIA Report.

According to the environmental impact assessments of the previously performed decommissioning projects, the releases of non-radiological contaminants from the Ignalina NPP are not significant and are much below the established limit values. The traffic of motor vehicles transporting equipment dismantling materials and demolition of buildings will be limited within the INPP industrial site, therefore no significant impact on air quality is expected. Thus, the proposed economic activity will not have a negative non-radiological impact on the environment of the nearest regions of Belarus and Latvia.

Considering the data of the chemical and radiological monitoring of the environmental air carried out since the start of the INPP operation, the completed INPP decommissioning works did not have significant negative impact on the environmental air. The EIA Report will provide an assessment of the INPP decommissioning cumulative impact on the environmental air by summarising the results of the already implemented decommissioning projects for which the EIA has already been carried out, as well as providing the impact assessment on the environmental air of the planned decommissioning projects, thus assessing the annual impact of the entire INPP decommissioning Megaproject on the environmental air.

The conservative assessment of the discharges for the planned decommissioning projects will be made based on the experience gained in the implementation of the INPP equipment dismantling and decontamination projects and on the world best practice considering the measurements results of airborne discharges from the INPP organised discharge sources.

Social and Economic Environment

The proposed economic activity will take place within the INPP industrial site, far from permanent residential areas either in Lithuania, or in Latvia or Belarus. No impact on the population of Latvia and Belarus or any obvious changes in the social and economic environment are expected.

The INPP has sufficient production resources, qualified personnel and experience gained from already implemented decommissioning projects to successfully complete all decommissioning.

As during the implementation of the already completed decommissioning projects, the planned decommissioning works will be also carried out in accordance with the modern safety and environmental requirements, using state-of-the-art technologies, with the priority given to the use of remote dismantling techniques, the principles established by the IAEA for the management of radioactive waste and current best practices of the European Union countries.

No exceptional and specific measures are envisaged to reduce the impact of the proposed economic activity on the social and economic environment. The implementation of the decommissioning through the immediate dismantling strategy by using to the maximum extent the existing workforce resources and competences of the INPP is one of the important factors reducing the impact on the social and economic environment of the INPP region. In addition, the NFs will continue to be operated on the INPP site after completion of the INPP decommissioning works and, therefore, the personnel operating these NFs will be further involved in this activity. Since most of the nuclear power plants worldwide have been built long time ago and many of them will be decommissioned in the course of time, the INPP has already gained and will continue to gain unique experience through the dismantling of reactors. Such experience can be applied to other

projects in the nuclear power sector, in particular for NFs decommissioning and radioactive waste management, and, therefore, upon completion of the INPP decommissioning works, the personnel with appropriate competences will be able to provide such services.

Immovable Assets of the Cultural Heritage

The proposed economic activity will be carried out within the INPP industrial site and will not affect cultural heritage objects and zones outside the INPP site. As the proposed economic activity will have no impact on the cultural heritage of the region, no mitigation measures are planned.

Soil

The proposed economic activity will be carried out within the INPP industrial site, therefore no impact on the soil and its geological structure outside the INPP industrial site including the Braslav district of Belarus and the Daugavpils region of Latvia is expected. As no impact of the proposed economic activity is expected, no additional measures are planned to reduce such impact.

The INPP ensures continuous monitoring of soil, groundwater, wastewater discharges into Lake Drūkšiai and monitoring of Lake Drūkšiai.

Landscape

The current landscape around the INPP with power generation facilities, auxiliary structures, spent fuel storage facilities, wastewater treatment structures and pipelines of the Visaginas city heating system is characterised as industrial.

The landscape around the nuclear power plant consists mainly of forests and wetlands. Lake Drūkšiai is the main element of the natural landscape.

Recreational zones along Lake Drūkšiai, outside the existing Ignalina NPP SPZ, are very picturesque and important for recreation and fishing. The landscape of Lake Drūkšiai basin is characterised by the relief that formed during the glacial period, it is characterised by picturesque hills, valleys, lakes, and plains, as well as pine forests and ample watery meadows.

The most valuable landscape areas, such as the Gražutė Regional Park, the Smalvos hydrographic reserve, the Smalvos landscape reserve, the Pušnis protected area and the Tilžė protected area, which is a geomorphological reserve, are located at the distance of 10 km and more around the INPP territory. Residential areas are small villages with traditional houses. They are located outside the existing INPP sanitary protection zone, within a radius of more than 3 km.

The demolition of buildings and engineering structures located on the INPP site will enable to achieve the planned status of the INPP and its site – to clean and transfer for uncontrolled use as large as possible part of the Ignalina NPP territory (to grant the status of a “green field” to this part), though the entire INPP site cannot be converted into a “green field” even after the full completion of the INPP decommissioning programme, only the separate nuclear facilities will remain in operation on its territory for a long time. Therefore, the proposed economic activity will not have a significant negative impact on the landscape.

4. Assessment of the Impact on the Neighbouring Countries

Two states, the Republic of Belarus, and the Republic of Latvia, are relatively close to the location of proposed economic activity. The state border between Lithuania and Belarus is about 5 km east of the INPP power units, and the state border between Lithuania and Latvia is about 8 km north of the INPP power units. Other countries are more than several hundred kilometres away from the location of the PEA, so the impact of the proposed economic activity on these countries is not expected.

The impact on the environment and the public of the neighbouring countries has been considered in the EIAs of all previously completed decommissioning projects. During the conservative assessment of the environmental impact under the worst-case scenario conditions the radiological impact of the projects on the environment and on the population has been assessed as being of local nature and insignificant, i.e. the estimated annual effective dose of the representative person due to radionuclide discharges into the air at the boundaries of the sanitary protection zone constituted only a very small share of the half[2]of the dose constraint. The selection of safe and effective technological solutions, the solutions related to planning, organisation and execution of the works, management of all types and classes of generated radioactive and non-radioactive waste, and the implementation of preventive measures to ensure the safety of the works, including training of personnel, use of personal protective equipment, dosimetry control during works, monitoring of potential contamination, other measures taken to avoid or reduce potential environmental contamination enable to draw such conclusions. Taking into account that the immediate settlements of the neighbouring countries are located further from the location of the proposed economic activity (5 and 8 km), i.e. more than the distance considered in the assessment of the radiological impact on the representative person (3 km), the impact on the health of the population of the neighbouring countries would be even less if the same methods of transfer of radioactive contamination is applied as for the representative person living in the vicinity of the INPP, since considering the dispersion factor the radionuclide activity concentrations and the resulting exposure doses decrease with the increased distance from the discharge source.

The EIA Report will provide the cumulative environmental impact assessment of all the projects planned for the entire INPP decommissioning period by year considering the results of the already carried out environmental impact assessments for the decommissioning projects and the EIA results of future projects.

According to the Nuclear Safety Requirements BSR-1.9.1-2017 [35], the assessment of the environmental impact of NF must include the different radionuclide discharge pathways to the environment (ambient air and water) and the impact of all the NF located within the same territory on the representative person. The annual effective dose of the representative person shall not exceed the dose constraint of 0.2 mSv [25].

It is estimated that the project will not have significant negative impact on the population and the environment of the neighbouring countries since the project will be carried out within the INPP industrial site, i.e. far from permanent residential areas in Lithuania, Latvia and Belarus, and at different time scale, the good practices of the already implemented decommissioning projects, including the best worldwide technological and environmental practices will also be applied to the future decommissioning projects, foreign companies well-known in the field of nuclear energy have been contracted for design of the most optimal and safest dismantling option of the RBMK reactor cores, including the option for management of the generated radioactive waste. Besides, the implementation of the necessary measures to avoid or reduce significant adverse impact which will be analysed in detail and justified during the subsequent design and safety justification stages is also envisaged. The EIA Report will include the analysis of potential transboundary environmental impact and the grounded conclusion on the transboundary environmental impact will be provided.

In addition, taking into account the final goal of the INPP decommissioning when all the engineering structures of the INPP as the nuclear facility are dismantled and demolished, and all

[2] Due to different pathways of the radionuclide discharge into the environment (airborne and waterborne), the dose constraint (0.2 mSv) of the representative person is divided into two equal parts of 0.1 mSv for each flow. As the environmental impact assessment of the decommissioning projects showed that uncontrolled waterborne discharges are eliminated, only the exposure of the representative person due to the airborne radionuclide discharges is assessed.

the waste generated during the decommissioning process is appropriately managed, and it is demonstrated that the radioactive contamination of the site is below the free release levels and the site of the former NF can be used for other purposes, it will allow to eliminate the major part of the radiological contamination sources, except for the NF remaining in operation, and will result in a significantly better situation from the point of view of the radiological contamination and significantly better situation will arise than during the operation or decommissioning of the INPP and significantly lower potential exposure doses of the population will be ensured.

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