

NUCLEAR POWER
SAFETY IN LITHUANIA



ANNUAL REPORT
2022

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Foreword by the Head of VATESI



In 2022, there were no events in Lithuanian nuclear facilities or activities with nuclear and nuclear fuel cycle material that had any impact on nuclear safety. In 2022, Ignalina NPP recorded four unusual notifiable events that were below the scale threshold at level 0 on the International Nuclear and Radiological Event Scale (INES scale). They neither damaged radionuclide containment and/or radiation suppression barriers, nor had any impact on the levels of occupational exposure and indoor radionuclide contamination that stayed within the established permissible limits, nor caused radionuclide releases into the environment. The low level of unusual events and the fact that they had no impact on safety indicate a high level of nuclear safety at Ignalina NPP and other nuclear facilities in Lithuania.

Declared a threat to Lithuania's national security, Belarusian NPP has been operating for the second year by now. However, its erratic operation, equipment failures and the resulting unplanned outages, as well as multiple other unresolved issues to ensure safety, caused justified concerns. In order to respond to the information needs of the Lithuanian population and to protect it adequately, we assessed information on unplanned outages of Belarusian NPP, verified facts, provided information to the public, reinforced our level of emergency preparedness, as well as strengthened our interaction with other responsible

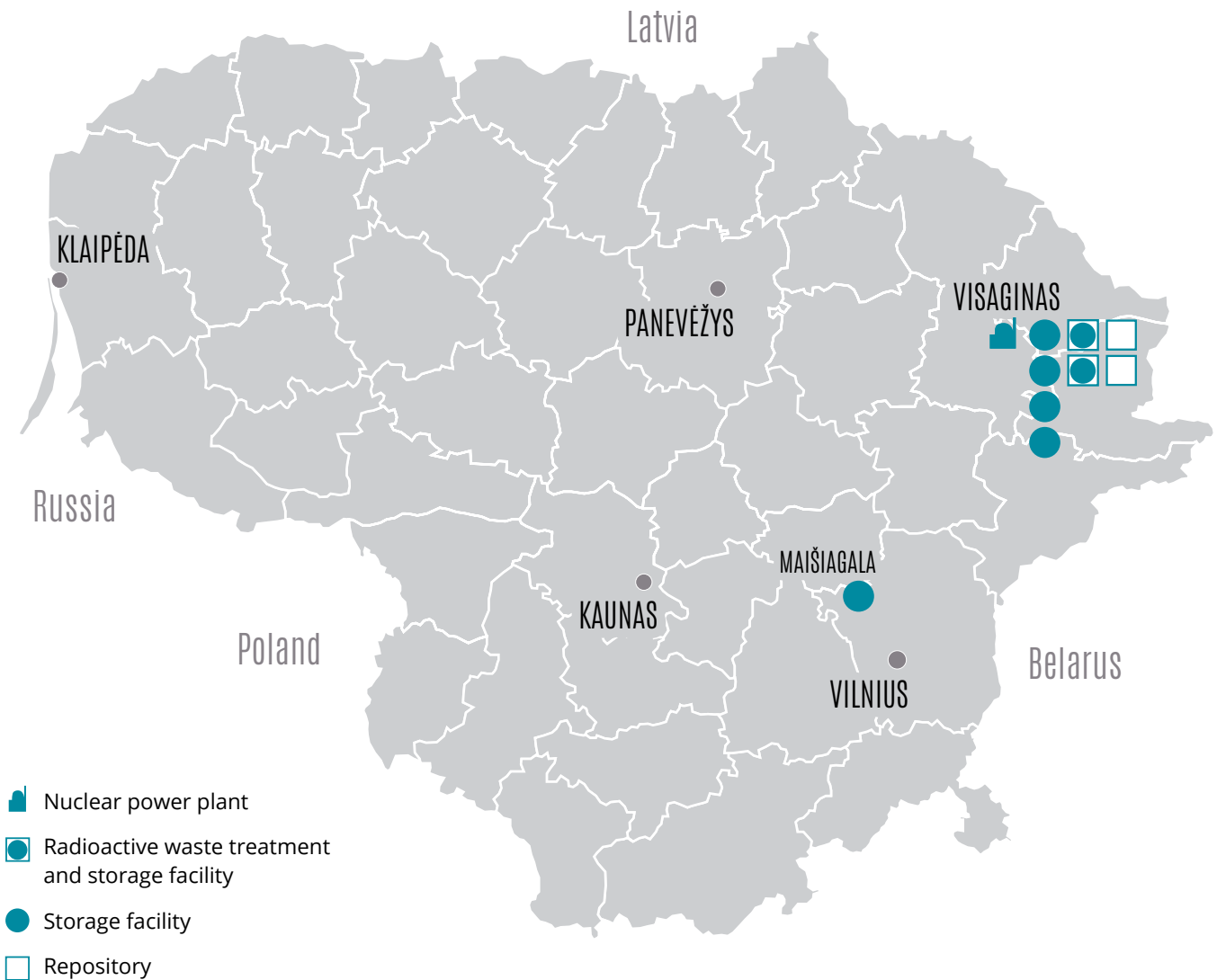
authorities. VATESI has repeatedly urged the Belarusian nuclear safety regulator, the Ministry for Emergency Situations, to suspend the operation and commissioning of Units 1 and 2 of Belarusian NPP until all the nuclear safety issues identified during the stress tests, other international missions and review processes have been addressed.

Moreover, we strongly felt an ongoing public concern about security due to the military aggression in Ukraine, which is a continuous threat to the safety and security of its nuclear facilities. In various formats, VATESI condemned the actions of the aggressor country and supported the Ukrainian nuclear safety regulator and its staff, as well as the staff of the Ukrainian nuclear facilities, who keep working in the extremely challenging environment in order to prevent potential incidents due to military action. Civilian nuclear installations are not designed to withstand military action, thus under no circumstances may they be targeted by or located in the area of such military action.

Ensuring nuclear safety is pertinent to a wide range of stakeholders, including the international community. VATESI participated in accepting the Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (ARTEMIS) of the International Atomic Energy Agency (IAEA). The ARTEMIS experts had a positive opinion of the development of the radioactive waste management framework in Lithuania and the communication with stakeholders. Moreover, VATESI experts attended IAEA safety assessment missions in various fields that took place in other countries, as well as international nuclear safety meetings of various formats.

The priorities of VATESI activity remain the same in the near future: to supervise the safety of Ignalina NPP's decommissioning activities and radioactive waste management, the compliance with international non-proliferation commitments undertaken by Lithuania, to consistently upgrade the framework of nuclear safety regulation and supervision, and to be prepared for potential nuclear and radiological accidents in Lithuania and abroad.

Head of VATESI
Michail Demčenko



Nuclear facilities in Lithuania

1. Ignalina Nuclear Power Plant – Drūkšiniai, Visaginas m.
2. Closed Maišiagala storage facility of radioactive waste – Bartkuškis forest, Širvintos.
3. Spent nuclear fuel storage facility (SFSF-1) – Drūkšiniai, Visaginas m.
4. Spent nuclear fuel storage facility (SFSF-2) – Drūkšiniai, Visaginas m.
5. Very low level waste storage facility – Drūkšiniai, Visaginas m.
6. Cemented radioactive waste storage facility – Drūkšiniai, Visaginas m.
7. Facilities for treatment and storage of solid radioactive waste – Drūkšiniai, Visaginas m.
8. Solid radioactive waste retrieval facilities – Drūkšiniai, Visaginas m.
9. Very low level radioactive waste repository – Drūkšiniai, Visaginas m.

Nuclear facilities under construction

Low and intermediate level radioactive waste repository – Stabatiškės, Visaginas m.

STATE NUCLEAR POWER SAFETY INSPECTORATE

The State Nuclear Power Safety Inspectorate (VATESI) is a state authority that regulates and supervises nuclear safety and activities with radiation sources in this area. VATESI sets forth safety regulations and requirements, supervises compliance with them, issues licenses and permits, assesses nuclear facilities for safety, conducts inspections and carries out other functions.

Within its remit, VATESI ensures compliance with the obligations of the Republic of Lithuania established in international agreements, and represents the national interests in international organizations.

VATESI is an independent State institution, established in 1991. Its activities are financed by the appropriations of the Lithuanian State budget and by other legally generated revenue.

VATESI is headed by the Head of VATESI appointed by the President of the Republic of Lithuania based on the recommendation of the Prime Minister. The Deputy Heads are appointed by the Prime Minister based on the recommendation of the Head of VATESI.

VATESI VISION

The public and the environment are reliably protected in accordance with the highest and modern safety standards.

Nuclear safety regulation is explicit and prudent.

Work at VATESI is highly respected, valued and motivating.

VATESI mission is to perform the state regulation and supervision of the safety of nuclear facilities and activities related to nuclear and nuclear fuel cycle material in order to protect the public and the environment from the harmful effects of radiation.

THE MAIN ACTIVITY PRIORITIES OF VATESI ARE AS FOLLOWS:

- ◆ To supervise safety of the permanently shut-down units of Ignalina NPP and their decommissioning,
- ◆ To supervise safety of construction and operation of radioactive waste management facilities,
- ◆ To ensure and supervise compliance with the international non-proliferation obligations undertaken by the Republic of Lithuania,
- ◆ To improve the framework of regulation and supervision of nuclear safety in Lithuania,
- ◆ To assess, within the remit, the compliance of the nuclear power plants of the neighbouring countries with the requirements of the international safety standards, and to raise questions to address the identified safety issues,

- ◆ To prepare, within the remit, for nuclear and radiological accidents that may occur in Lithuania and abroad.

Key events and results achieved in 2022

The strategic goal of VATESI is to ensure a high level of nuclear safety through state regulation and supervision.

To achieve the above strategic goal, two effect criteria were set and achieved in 2022:

- ◆ There were no unusual events of Level 2 and higher according to the International Nuclear Event Scale (INES) in Lithuanian nuclear facilities (target value – 0),
- ◆ There were no cases of use of nuclear material, nuclear dual-use items and undeclared research and development related to the nuclear fuel cycle in Lithuania for non-peaceful purposes (target value – 0).

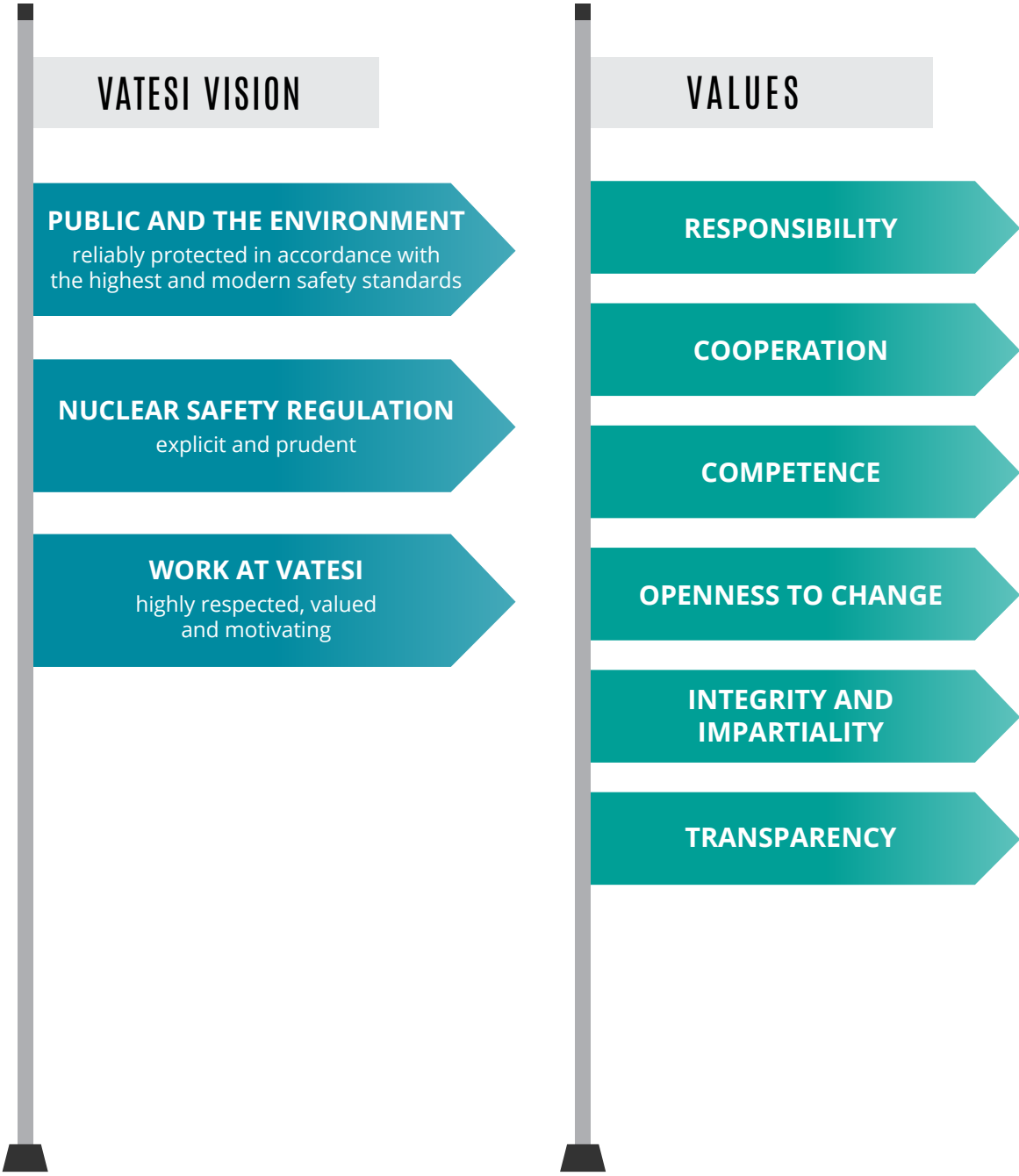
In 2022, to implement the Programme of Nuclear Safety Regulation and Supervision, VATESI successfully reached the three follow-up objectives as follows:

- ◆ To authorise and supervise activities within the supervision area delegated to VATESI;
- ◆ To improve the regulatory and supervisory framework for nuclear safety;
- ◆ To assess the compliance of nuclear power plants in neighbouring countries with international safety standards and prepare for possible nuclear and radiological accidents there.

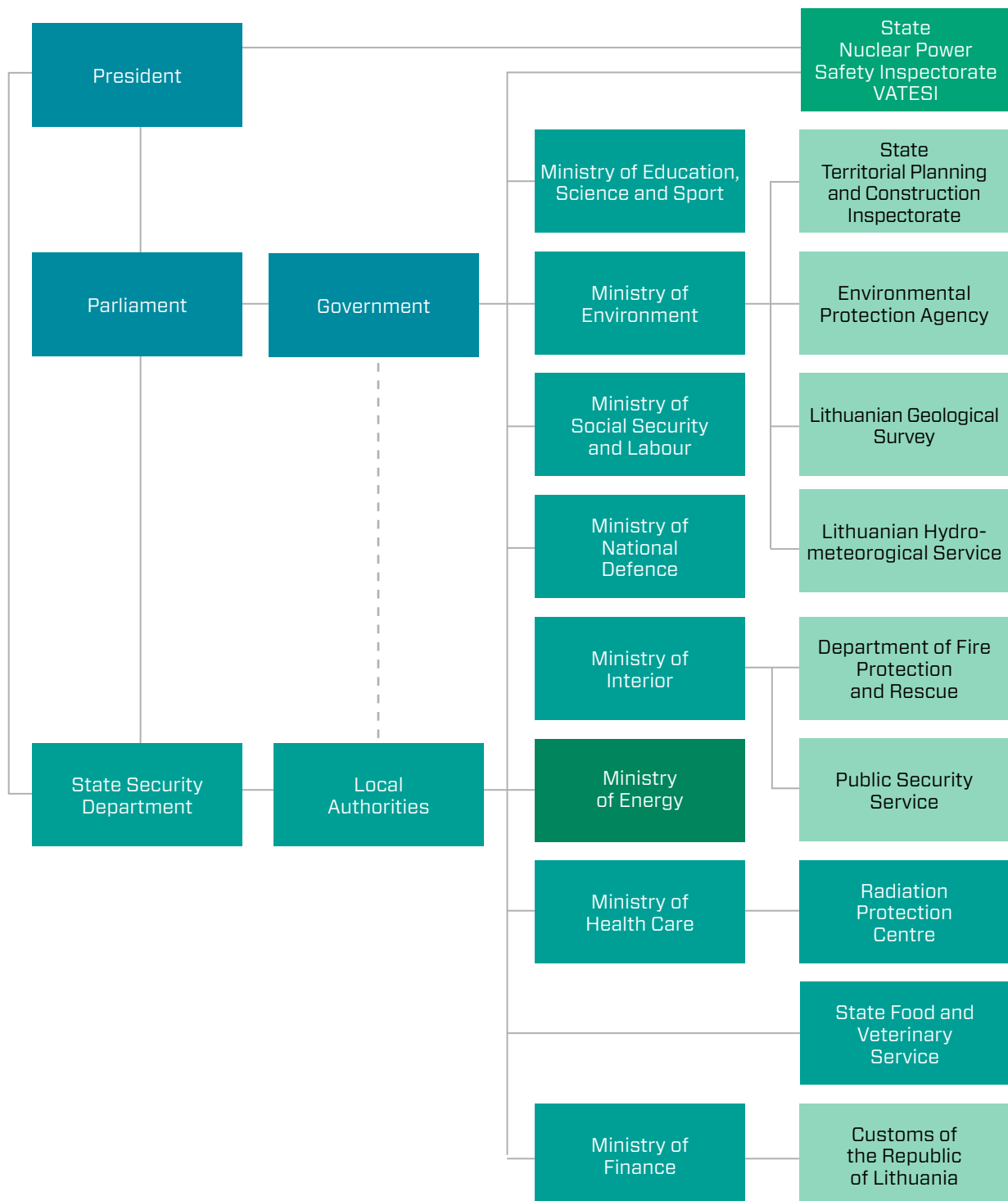
In 2022, to carry out the functions of state supervision and regulation of nuclear safety, VATESI performed the following key activities:

- ◆ Carried out licensing in the field of nuclear energy activities and made decisions on granting and/or amending licenses,
- ◆ Supervised the safety of the permanently shut-down Ignalina NPP Units 1 and 2 and their decommissioning,
- ◆ Supervised the safety of the decommissioning of Maišiagala Radioactive Waste Storage Facility,
- ◆ Supervised the safety of construction and operation of spent nuclear fuel and radioactive waste management facilities,
- ◆ Drafted legal acts regulating nuclear safety,
- ◆ Inspected compliance of activities of economic entities with established requirements,
- ◆ Supervised compliance with international nuclear non-proliferation obligations undertaken by Lithuania,
- ◆ Implemented international commitments in the field of nuclear safety regulation and supervision, and provided reporting information,
- ◆ Consulted economic entities and public authorities,

State Nuclear Power Safety Inspectorate (VATESI)



Nuclear and radiation safety regulatory infrastructure in Lithuania



- ◆ Assessed nuclear safety of NPPs of the neighbouring countries.
- ◆ Prepared for nuclear and radiological accidents that may occur in Lithuania or abroad.

In 2022, the Programme of Nuclear Safety Regulation and Supervision largely met or exceeded the planned values of all monitoring indicators:

- ◆ There were no INES Level 1 events related to deficiencies based on the defence-in-depth principle (planned value 1 or less);
- ◆ There were no INES Level 1 events related to radionuclide discharges and radiation exposure (planned value 1 or less);
- ◆ There were no INES Level 1 events related to nuclear safety incidents (planned value 1 or less);
- ◆ There were no failures of nuclear safety legislation to comply with international treaties, European Union and Lithuanian legislation (planned value 0).

In 2022, the follow-up objectives implemented and results achieved by VATESI contributed to the following:

- ◆ Initiatives in the areas of Strengthening Energy Security (242.2, 242.4) and Effective Crisis and Emergency Management System (246.1) of the Programme of the Eighteenth Government of the Republic of Lithuania, approved by Resolution No. XIV-72 of the Seimas of the Republic of Lithuania "On the Programme of the Eighteenth Government of the Republic of Lithuania" of 11 December 2020.
- ◆ Action 11.5.11 "Mobilize international support for Lithuania's position on the Ostrovets NPP and ensure coordinated participation of Lithuanian institutions in addressing nuclear safety and environmental issues in EU institutions, international organisations and bilateral agendas" and Action 11.5.16 "Start dismantling the reactor equipment of Ignalina Nuclear Power Plant" of the Implementation Plan for the Provisions of the Programme of the Eighteenth Government of the Republic of Lithuania, approved by Resolution No. 155 of the Government of the Republic of Lithuania of 10 March 2021 "On the Approval of the Plan for the Implementation of the Provisions of the Eighteenth Programme of the Government of the Republic of Lithuania".



ARTEMIS mission expert visit to Ignalina NPP

KEY EVENTS IN 2022

◆ 27 February

At 3:20 a.m., VATESI Emergency Operations Centre was activated following information from the Ukrainian regulator (SNRIU) and the International Atomic Energy Agency (IAEA) that a missile had struck the radioactive waste repository of the Kyiv Branch of the Ukrainian State-Owned Specialised Enterprise Radon. Since the very beginning of Russia's military aggression against Ukraine, VATESI experts have been continuously monitoring the situation at Ukraine's nuclear facilities, making assessments based on official information received from the IAEA and SNRIU, and informing state institutions and the population at large.

◆ 28 March

VATESI issued a permit to the State Enterprise Ignalina NPP for industrial operation of the solid radioactive waste management and storage facilities.

◆ 1 April

VATESI issued a permit to the State Enterprise Ignalina NPP for transportation of radioactive waste to the very low level radioactive waste repository and for conducting first tests of the repository systems using radioactive waste.

◆ 21 April

The State Enterprise Ignalina NPP completed the management of spent nuclear fuel at the units of Ignalina NPP and transported it from both units to the second interim spent fuel storage facility (SFSF-2).

◆ 16 – 25 May

The Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (ARTEMIS) of the IAEA took place in Lithuania.

◆ 20 – 21 June

VATESI representatives participated in the sixth conference "Nuclear Safety in Europe" of the European Nuclear Safety Regulators Group (ENSREG), which discussed topics of interest to nuclear safety regulators in Europe and worldwide.

◆ 22 June

VATESI experts participated in a national functional exercise on civil protection that was organised by the Ministry of the Interior in cooperation with the Fire Protection and Rescue Department (PAGD).

◆ 27 June – 8 July

The Lithuanian delegation presented a national report on the activities completed over the last four years in the field of safe management of spent fuel and radioactive waste at the Review Meeting of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

◆ **3 August**

VATESI submitted the Lithuanian National Report under the Convention on Nuclear Safety (CNS) to the IAEA on the implementation of its obligations under the CNS, which provided information on the safety of nuclear facilities in Lithuania, developments in the nuclear and radiation safety and supervision framework during the past six years, as well as the key issues to be addressed and measures to be applied in the future.

◆ **October**

Meetings were held with population of Ignalina, Zarasai and Visaginas districts, during which experts from VATESI and the Radiation Protection Centre (RSC) covered the radiological impact of nuclear facilities on the population and the environment, and answered attendee questions.

◆ **14–18 November**

Together with IAEA, VATESI organised a workshop “Developing and Reviewing a Protection Strategy for a Nuclear or Radiological Emergency” for Lithuanian experts.

Results of supervision of economic entity activities

To carry out its activities and achieve the main goal, VATESI has introduced performance indicators in the following four areas: nuclear safety, radiation protection, physical security and compliance with non-proliferation obligations. These indicators are used as a tool for planning, management and best public governance which helps to achieve the main goal, to perform efficiently and effectively, to use financial and human resources efficiently by constantly monitoring, measuring and evaluating performance, and to make appropriate management decisions in a timely manner to improve performance.

Performance indicators of VATESI supervision of 2022 are presented in the table below.

PERFORMANCE INDICATORS OF SUPERVISING ECONOMIC ENTITY ACTIVITIES	2022	EXPLANATION
Nuclear safety: The number of Level 1 events under IAEA INES scale related to the weaknesses in compliance with the defence in depth principle – no more than 1.	0	The level of nuclear safety in 2022 was acceptable.
Radiation protection: The number of Level 1 events under INES scale, related to radionuclide emissions and exposure to radiation – no more than 1.	0	The level of radiation protection in 2022 was acceptable.
Physical security: 1. The number of events related to the loss of control of nuclear and nuclear fuel cycle material, radiation sources used in the activities in the field of nuclear energy with radiation sources (classified as Level 1 events under INES scale) – no more than 1; 2. The number of events related to damage to important and critical equipment by deliberate acts (classified as Level 1 events according to INES scale) – no more than 1.	0	The level of physical security in 2022 was acceptable.
Compliance with nuclear non-proliferation commitments: The number of cases of use of nuclear material, nuclear dual-use items in Lithuania or research related to the nuclear fuel cycle carried out in Lithuania for non-peaceful purposes – 0.	0	Compliance with nuclear non-proliferation commitments in 2022 was acceptable.

VATESI 2022 in numbers



In 2022, VATESI supervised activities of 49 economic entities in total. Ignalina NPP is the largest economic entity posing the highest risk, and is subject to the highest number of yearly inspections. To control the burden of inspections, the indicator of the planned inspection burden set for Ignalina NPP was maximum 235 hours per year, and it was not exceeded in 2022, as it amounted to 191 hours. The inspection burden on other economic entities is small and proportionate to their activities, therefore no inspection burden indicator has been set for them.

VATESI role in the civil protection system

Civil protection is an activity that covers the preparedness of government and local agencies, authorities, other institutions, non-governmental organisations, economic and other entities and population for emergencies, as well as actions taken when they are at risk of occurring or have occurred, and emergency management and mitigation of the consequences. Civil protection in Lithuania is regulated by the Law on Crisis Management and Civil Protection that establishes the legal framework for crisis and emergency prevention, crisis and emergency preparedness, as well as management and mitigation of the consequences.

In case of a risk or occurrence of a nuclear or radiological accident in Lithuania or in the neighbouring countries, and in case of a risk that radioactive material might reach the national territory, the resulting situation is managed in line with the *National Plan for Protection of Population in Case of Nuclear or Radiological Accident* (hereinafter referred to as the Plan). The Plan establishes civil protection measures for arranging and implementing protective actions to safeguard the population, the property of the population and the environment from radiation and radioactive contamination, regulates arrangements for national level emergency management in case of an emergency risk or occurrence, as well as prescribes the functions of the government and local agencies and authorities, other institutions and economic entities in this field. In line with the Plan, VATESI assesses the situation and forecasts the course of

a nuclear or radiological accident at Ignalina NPP or other nuclear facilities (NF), informs interested international and government institutions or authorities of the technical accident circumstances and forecasts of the accident course, of the mitigation measures undertaken, of the characteristics of radionuclides emitted by the NF to the environment and the related forecasts, as well as provides other information related to a nuclear or radiological accident at the NF. VATESI informs the Lithuanian Prime Minister of the NF status, of the hazard level of a nuclear or radiological accident at the NF, of the measures taken to protect the NF staff, and provides information to the population within its remit.

The Plan is regularly tested during exercises and updated as necessary to improve and practice the skills of the members of the civil protection system in order to perform the delegated functions. Members of VATESI Emergency Operations Centre must be prepared to respond to nuclear and radiological accidents, therefore they regularly participate in trainings, communication tests and exercises on various levels.

In 2022, the Centre members attended two international level emergency preparedness exercises, and five international communication drills. They improved their qualifications during emergency preparedness and civil protection trainings organised by VATESI, the ones organised by the Civil Protection Training Centre of the Fire Fighters Training School, as well as during the IAEA trainings.

On 22 June 2022, experts of VATESI Emergency Operations Centre participated in a national functional exercise on civil protection “Actions of Civil Protection System Entities in the Event of a Nuclear Accident at the Nuclear Power Plant in the Territory of the Republic of Belarus” that was organised by the Fire and Rescue Department under the Ministry of the Interior. The exercise purpose was to assess the readiness of civil protection system entities to carry out their functions prescribed in the Plan, upon receiving a notification of a nuclear and/or radiological accident at the nuclear power plant in the territory of Belarus. The exercise was attended by 18 Lithuanian municipalities, 11 ministries, four non-governmental organisations, 36 emergency operations centres (18 of them at municipalities, 18 at the Government authorities). The exercise was attended by more than 1,300 people in total.

In 2022, VATESI reviewed and updated the risk analysis of potential threats and emergencies. Moreover, in 2022, VATESI approved the Emergency Prevention Plan 2022-2025. The Emergency Prevention Plan 2022 included measures implemented to prevent the risk of fire, of communicable diseases, of disruption and/or failures of electronic communications and/or communication systems, including those caused by cyber-attacks, of heat supply disruptions and/or failures during the heating season. Moreover, VATESI implemented measures to prepare for national emergency management related to nuclear accidents.

In October 2022, the Fire and Rescue Department conducted a health check of VATESI’s civil protection system to assess VATESI’s compliance with the Law on Civil



IAEA training course: emergency preparedness exercise in Tulln (Austria)

Protection and other legislation on civil protection. The Fire and Rescue Department rated VATESI's civil protection status as good and suggested improving the preparedness of VATESI.

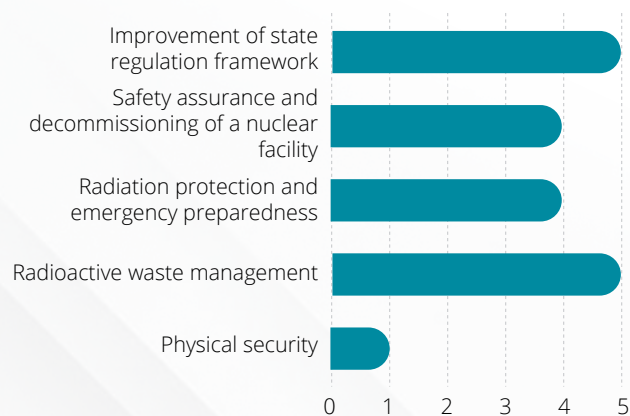
In 2022, VATESI kept corresponding with the Ministry of Emergency Situations of Belarus on safety issues related to Belarusian NPP. The incomplete answers were followed up with conclusions and information for Lithuanian stakeholder authorities and the public at large.

To adequately protect the population and meet its information needs, information received about the unplanned outages of Belarusian NPP was assessed, facts were verified, information was provided to the public, the authority's level of emergency preparedness was reinforced, and the interaction with other responsible authorities was strengthened. Belarus has not provided specific information on the choice of the location of the NPP, as in case of an accident, as much as 1/3 of the Lithuanian population could be exposed to radiation, and Lithuanian authorities would find it particularly difficult to manage the possible accident consequences in such a situation.

CHANGES IN NUCLEAR SAFETY REGULATION

Clear and consistent legal regulation in line with changes in the nuclear energy activities and the changes in the threat profile posed by them is a key precondition for an adequate nuclear safety assurance system.

Number of legal acts adopted and amended in 2022 by the area of supervision



ISSUED LICENSES AND PERMITS

In 2022, VATESI issued four licences and four permits, and approved three applications for transportation permits.

In 2022, VATESI issued four licences in the area of nuclear energy activities with radiation sources for activities in the radioactive environment at a nuclear facility. They were issued to economic entities that intended to undertake such activities at Ignalina NPP.



In 2022, VATESI issued two permits to start industrial operation of radioactive waste management facilities, one permit to transport nuclear fuel cycle material into the radioactive waste repository site and to conduct first tests with nuclear fuel cycle material there. Moreover, VATESI issued a permit to decontaminate and dismantle equipment contaminated with radionuclides.

The permits were issued following a review and assessment of the safety documentation and after verification that the applicant is capable of carrying out the licensed activities in accordance with the provisions of the nuclear safety legislation and other terms of the licensed activities, including those specified in the applicant's normative technical documents.

After issuing permits, lists of documents justifying the safety of the licensed activities were developed and approved. They are regularly updated.

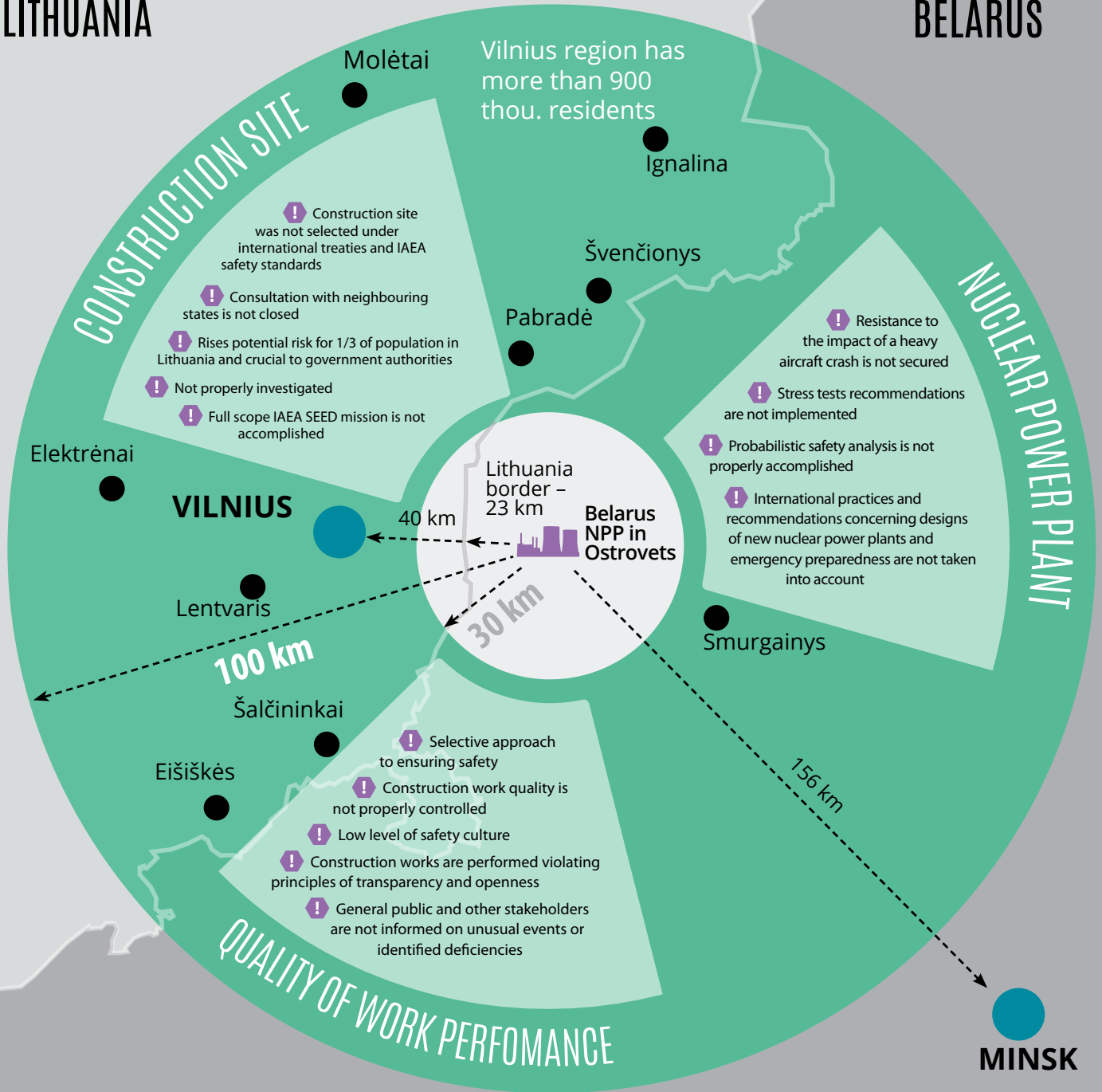
The goals of VATESI's activities include ensuring the safety of transportation of nuclear fuel cycle, nuclear and fissile material. Before issuing permits to transport such material, VATESI experts assess if the holder of the nuclear fuel cycle material is ready to transport nuclear fuel cycle and nuclear and fissile material in the required packages and in line with the safety documents and recommendations.

During 2022, VATESI experts worked hard to examine documents submitted by Ignalina NPP to obtain a licence for the transportation of: orphan nuclear fuel cycle, nuclear and fissile material in Lithuania, for nuclear and fissile material of other radioactive waste generators and for radioactive waste generated during the decommissioning of Maišiagala Radioactive Waste Storage Facility to the radioactive waste management facilities of Ignalina NPP.

To get a transportation permit for radioactive material and radioactive waste classified as nuclear material, VATESI must approve an application for a transportation permit that is later issued by the Radiation Protection Centre (RSC). The same procedure applies in case a permit is requested by an economic entity operating or decommissioning a nuclear facility, or by an economic entity engaged in activities with radiation sources in a nuclear facility or at its site. In 2022, VATESI analysed and approved three applications for transportation permits of radioactive material classified as nuclear material.

LITHUANIA

BELARUS



In 2022, no violations were found during the processes of supervising authorised activities and for activities regulated by permits, which would have led to the suspension of a license, permit or temporary permit or revocation of an issued license, permit, temporary permit or a certificate of registered activity data.

The constantly updated lists of licenses, permits, temporary permits or certificates of registered activity data issued by VATESI is available in the *Services* section of the website www.vatesi.lt.

SUPERVISION OF ECONOMIC ENTITY ACTIVITIES

Operational risk assessment, Inspection Programme

To efficiently use financial and human resources, VATESI follows the graded approach in supervising economic entity activities, i.e., it pays more attention to safety-related areas potentially posing higher risks to the population, the environment and the employees of the supervised entities, while aiming to prevent unreasonable burden on them. Inspection areas were selected after assessing the aspects directly related to risks: the amount, composition and physical state of radionuclides at the nuclear facility (NF) or its separate installation, the possibility of dispersal of these radionuclides and their potential impact on the employees, population and the environment, the risk of disintegration of physical safety barriers that contain radionuclides, the accessibility of nuclear or other radioactive material, as well as the number of employees or population that may be adversely affected by the economic entity activities, the operation of the NF or its individual installations.

At the end of 2022, to plan inspections of economic entities and the allocated resources consistently, VATESI developed the Inspection Programme for 2023-2027. The Programme was developed by taking into account the planned applications of economic entities regarding licenses or permits, as well as activities undertaken or planned by them, for instance equipment dismantling and modifications, as well as testing of newly installed equipment.





Inspection

- ◆ Metesta, UAB, and Nordic Metrology Science, AB, to check nuclear material accounting and control;
- ◆ TG Technika, UAB, NAU, UAB, and SCHINDLER LIFTAS, UAB, to check compliance with radiation protection requirements for activities in radioactive environment;
- ◆ Baltijos Informacinės Sistemų, UAB, to check compliance with radiation protection requirements in the use and storage of radiation sources.

36 VATESI employees participated in the inspection activities. The average inspection duration was four hours, including the inspector time onsite and the time spent in communication with responsible staff of the economic entities for the inspection purposes.

In 2022, inspections identified 13 violations (seven were identified in 2021), 8 minor violations of legal requirements

(11 were identified in 2021), and three best practice non-compliances. One violation was detected when examining a safety justifying document submitted by Ignalina NPP and not at the time of inspection. Administrative sanctions, namely mandatory instructions were issued regarding five violations, and administrative sanctions instructing to eliminate violations were applied in case of two minor violations. The remaining 15 violations were rectified at the time of drafting the inspection reports. The violations were related to non-compliance with legal provisions requiring economic entities to establish procedures for implementing certain processes and to follow a management system, or non-compliance with other obligations specified in other normative technical documents. The violations were committed in the supervised areas of physical security, radiation protection, decommissioning, fire safety, etc. The violations found in 2022 were rectified in a timely and proper manner.

Assessment of supervision of economic entity activities

In 2022, VATESI participated in the progress (scoreboard) assessment of the agencies supervising economic entity activities, under all the categories set out in the assessment methodology. At the time of reporting, the results of the assessment had not yet been received. According to the 2021 assessment results, VATESI has a progress index of 8.53 (No. 8 out of 47 institutions).

Taking into account the peculiarities of nuclear energy activities, VATESI will further strive to use progressive measures for supervising economic entities to the maximum extent.

Supervision of nuclear facilities



SUPERVISION OF NUCLEAR FACILITIES

Configuration, condition and maintenance of operating structures, systems and components important to safety

In line with the nuclear safety requirements approved by VATESI, Ignalina NPP must annually plan and carry out maintenance of equipment important to safety. Based on equipment maintenance plans – schedules for 2022, Ignalina NPP maintained 10,770 pieces of equipment classified as systems important to safety.

During inspections and report reviews of 2022, VATESI assessed equipment maintenance results and provided their conclusions. VATESI examined and approved the amended technological regulations for the operation of various facilities, including maintenance regulation of the Solid Radioactive Waste Management Facility and the two spent fuel storage facilities. Moreover, VATESI assessed configuration documents of equipment important to safety at all the facilities, i.e., common lists of systems important to safety, ageing management and lifting equipment.

At the time of inspections, VATESI experts evaluated the maintenance, timely technical condition checks and repairs of the following: lifting equipment and systems, measuring and control systems and other equipment both at the radioactive waste management facilities and the spent fuel storage facilities, as well as assessed their remaining lifetime.

Having analysed the documents submitted by Ignalina NPP that justified safety of structures, systems and components important to safety, and having carried out inspections and evaluated the information collected during them, VATESI experts were assured that Ignalina NPP properly maintained them and managed their ageing in 2022.

Decommissioning supervision

Since 2018, VATESI evaluates the safety justification documents provided by Ignalina NPP in line with the submitted application to license the decommissioning of nuclear facilities. According to the license application, decommissioning of Ignalina NPP Units 1 and 2, Solid Radioactive Waste Storage Facilities (buildings 155, 157, 157/1) and the radioactive waste management facilities within them, as well as Liquid Radioactive Waste Management Facilities (bituminization and cementation equipment of building 150) was planned.



Radioactive waste pre-treatment site (Unit A1)

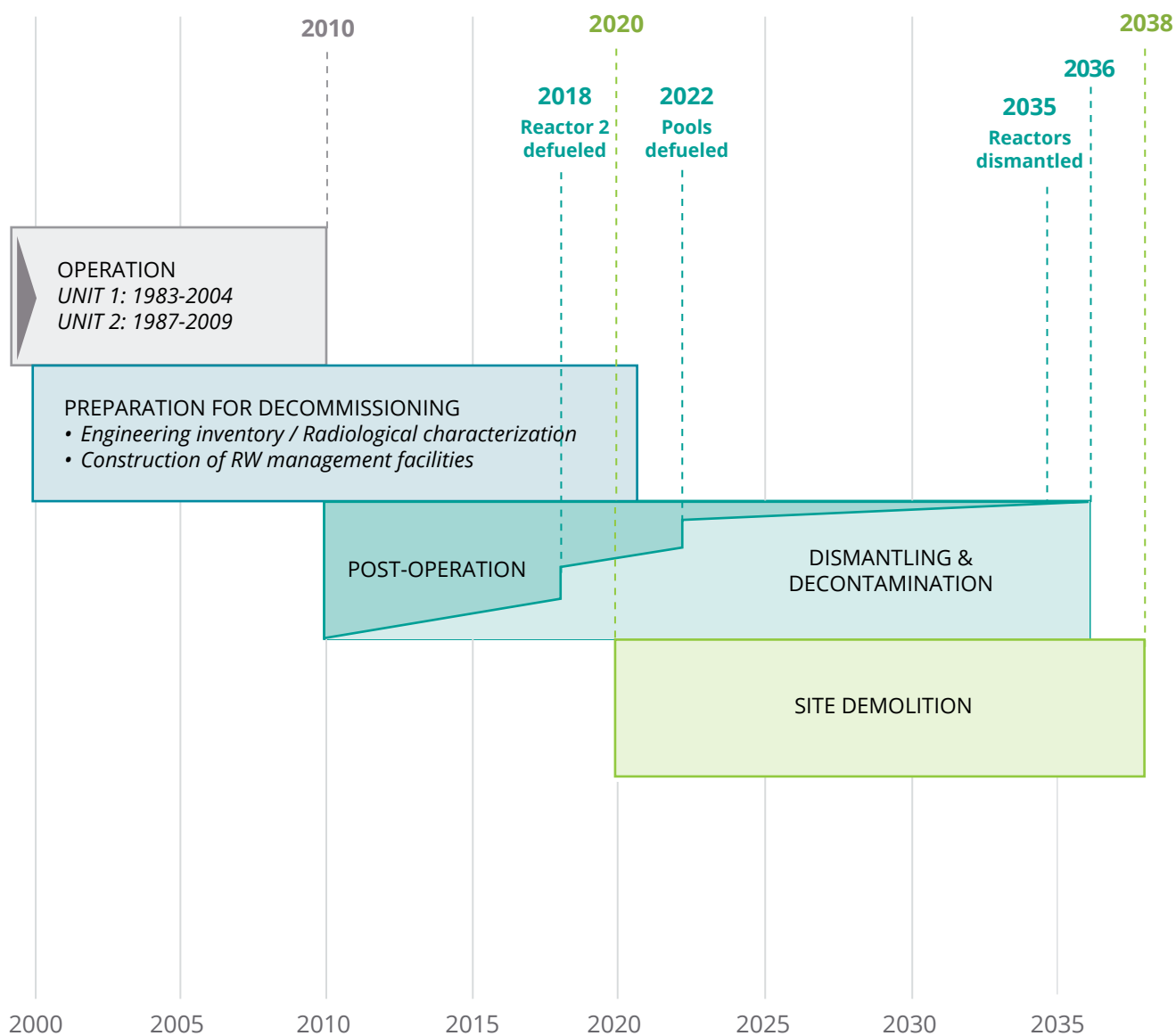
In 2022, VATESI analysed and provided comments on the Decommissioning Safety Analysis Report to justify the safe implementation of the activities planned under the Final Decommissioning Plan of Ignalina NPP.

In 2022, after Ignalina NPP did not complete the acquisition of remote equipment, and with the ongoing safety justification process for the radioactive waste pre-treatment site in Unit A1, VATESI reviewed the safety of the dismantling and decontamination works of equipment located in Unit A1 (water lines below and above the reactor, reactor coolant cleaning system, forced circulation circuit, main circulation pumps, steam separators, fuel reloading complex and other heavily contaminated equipment) in terms of occupational exposure. Then VATESI instructed Ignalina NPP to use exclusively remote equipment for dismantling equipment located in areas that were hard to access and the ones that were highly radioactive.

Dismantling and decontamination works at Ignalina NPP are carried out based on projects individually developed and approved in advance, and are subject to inspections to verify the results. In 2021, VATESI analysed the dismantling and decontamination design for the fuel reloading machine of Unit 2 and its safety analysis report for compliance with nuclear safety, radiation protection and physical security. VATESI approved the design and issued a permit to carry out the dismantling and decontamination works specified in the design.

To categorize structures and site areas of Ignalina NPP as the ones within clearance levels in terms of radiation protection, VATESI approved the radiological survey documents. In 2022, VATESI examined the historical assessments and final radiological survey programmes for redundant and disused structures of Ignalina NPP site (building 140/3, the dismantling of the following: circulation

Ignalina NPP decommissioning schedule



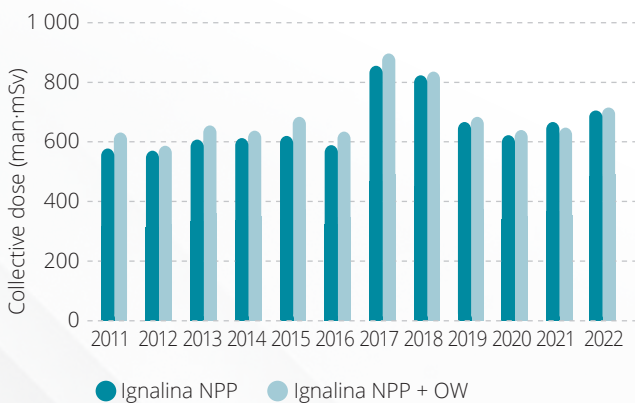
pipelines and technical water pipelines between buildings 120/1, 120/2 and 101/1, 101/2, the heating networks of Ignalina NPP site, the equipment and pipelines of the stationary water-based fire extinguishing system in building 120/2, the demolition of building 260 and building 437/1, the diesel generator equipment and the special sewer between buildings 129 and 130). VATESI approved the programmes based on the reports of the completed programme works proving that these structures were free from contamination.

Occupational radiation protection

Occupational radiation protection was supervised by conducting inspections and analysing documents submitted on the implementation of radiation protection requirements.

In 2022, the collective dose of Ignalina NPP staff and outside workers was 706.69 man·mSv (Ignalina NPP staff – 701.33 man·mSv, outside workers – 5.36 man·mSv). Compared to 2011-2021, the collective occupational dose in 2022 was similar to the level of the year before. The highest occupational exposure was caused by the works performed by the operational workers of the Technical Support Division of Ignalina NPP in the spent nuclear fuel storage pool hall, as well as works related to equipment dismantling and radioactive waste management.

Annual collective doses of Ignalina NPP staff and outside workers (OW) (man·mSv) in 2011-2022



Implementation of nuclear safety improvement measures

In 2022, VATESI supervised the implementation of measures specified in the Safety Improvement Programme of Ignalina NPP. In 2022, Ignalina NPP completed implementing the measures for spent nuclear fuel inspection in the hot cell of the Interim Spent Fuel Storage Facility, developed a safety justification for the storage of



Placing unused nuclear fuel in SFSF-2

fresh (unused) nuclear fuel packages in the Spent Fuel Storage Facility, and started operating an additional liquid radioactive waste storage tank (emergency reserve) to store liquid waste generated in case the existing tanks were full. VATESI experts analysed and approved the final reports on the implementation of the safety improvement measures. When analysing the works completed under the safety improvement measures, they found that the measures under development and implementation were sufficient and effective to ensure the safe functioning of systems important to safety. Moreover, VATESI approved the Safety Improvement Programme for 2023 developed by Ignalina NPP.

Operational experience feedback

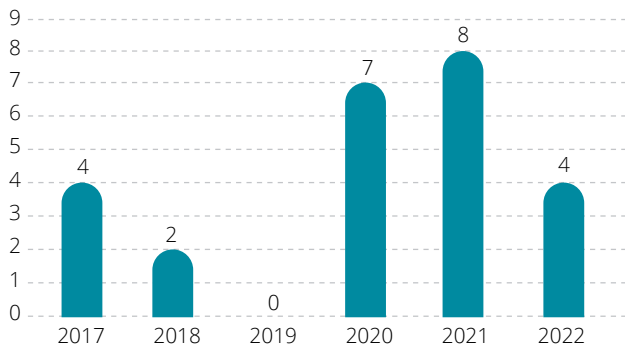
To ensure a high level of nuclear safety in Lithuania and to prevent potential accidents, incidents and unusual events important to nuclear safety, radiation protection and physical security, the operational experience of own nuclear facilities and those of other organisations operating in the nuclear energy sector (hereinafter – the operational experience) is continuously analysed. In 2022, safety of Ignalina NPP was continuously improved and ensured by analysing own experience and that of other organizations operating in the nuclear energy sector.

In 2022, four unusual events were registered at nuclear facilities of Ignalina NPP, which had to be reported to VATESI based on the requirements set by VATESI. One unusual event occurred due to improperly organised fire safety works, other two unusual events were related to deficiencies in the maintenance of the power supply system, and one unusual event was related to deficiencies in shipping a container with Class A waste consisting of electrical equipment.

The unusual events neither breached the barriers stopping radionuclides and/or inhibiting ionising radiation, nor affected nuclear safety. According to the International Nuclear and Radiological Event Scale (INES), the unusual events that occurred in 2022 were classified as *Below*

Scale Level / Level 0. The fact that they did not affect safety demonstrated that an adequate level of nuclear safety was ensured at Ignalina NPP.

Unusual events to be reported that occurred at Ignalina NPP in 2017-2022



In 2022, VATESI Standing Commission for the Analysis of Unusual Events and Operational Experience had 10 meetings. During the meetings, the Commission analysed unusual events at Ignalina NPP and nuclear facilities abroad.

Having taken into account the experience gained during operation of nuclear facilities in other countries and the lessons learnt from the unusual events, the Commission developed recommendations related to safety improvement and assurance of the nuclear facilities of Ignalina NPP. Analysing such events and applying lessons learned is necessary to prevent the recurrence of similar events at the nuclear facilities of Ignalina NPP.

Ignalina NPP safety and security culture, employee training and certification

SAFETY AND SECURITY CULTURE OF IGNALINA NPP

The attitude of the organization's managers towards employees and activities, their management style, responsibility for safety, relations, employee promotion, training and learning, the company's internal procedures and rules of procedure, as well as many other factors taken together constitute the organization culture. When it comes to the organization's safety and security culture, the aim is to focus all the factors on the main priority of the organization, namely the safe operation.

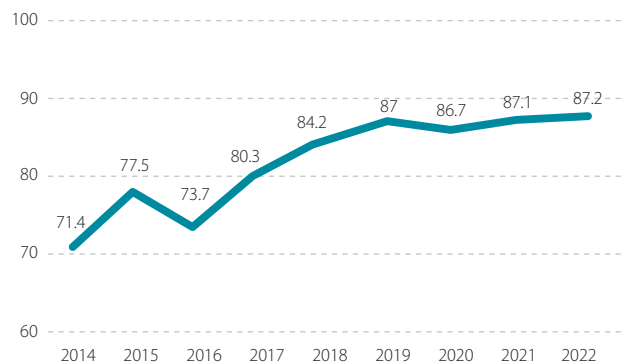
To assess the state of the safety and security culture at Ignalina NPP, the Safety and Security Culture Development Plan for 2022 was drawn up and implemented. Under the plan, the employees were anonymously surveyed on safety culture, the indicators of safety and security culture and their changes were quarterly analysed, and the results were discussed at management meetings. Moreover, the employees, including physical security staff, were trained and briefed in line with the Company's plans;

safety culture memos were developed for the Company's suppliers and contractors, and their employees were familiarised with them.

The effective use of internal and external operational experience is among indicators of a progressive safety culture. Operational experience consists of information that can be used to improve the safety of a nuclear facility, such as information on events, accidents and their precursors, defects, near-misses, low-level events, their trends, shortcomings and best practices, safety performance analysis reports, etc.

In 2022, to supervise safety culture measures of Ignalina NPP, VATESI analysed the quarterly reports on safety culture submitted by the company, indicator trend reports on safety and security culture, and the employee survey report. In 2022, the target safety culture indicator of Ignalina NPP was minimum 85%, based on self-assessment. The objective was achieved, as the safety culture status indicator exceeded 86% in 2022. The annual safety culture indicator based on self-assessments done since 2019, has remained stable at 99% for the third consecutive year.

Change of the safety culture status at Ignalina NPP, %



IGNALINA NPP EMPLOYEE TRAINING AND CERTIFICATION

The selection, introductory and follow-up training, periodic certification and continuous development of the competence improvement system of the staff working in nuclear facilities ensure an adequate level of employee competence and have a significant impact on the safety culture of the organisation.

Ensuring employee competence is among the activities of Ignalina NPP that assure the operational safety of the NF.

In 2022, VATESI approved the training programs and exam papers for Ignalina NPP employees responsible for nuclear safety, and participated in the examinations testing their knowledge. Ignalina NPP organised introductory and follow-up trainings and certified employees in order to maintain their competencies, and to provide them with new knowledge and skills required to operate new equipment under decommissioning projects. In 2022, 1,589 staff were trained and certified, including 158 managers, 754 specialists, 653 workers, and 24 office employees.

Every year, Ignalina NPP analyses the process of maintaining employee qualifications and presents the results in the progress report on maintaining the staff qualification. VATESI reviews the documents related to the staff competence assurance, provides conclusions, approves key normative technical documents and carries out inspections. In 2022, VATESI inspected competence assurance of Ignalina NPP employees. No violations or non-compliances were found within the scope of the information on assuring employee competence.

Ignalina NPP emergency preparedness

The risk of incidents and accidents constantly changed during the decommissioning of Ignalina NPP units, as well as in preparation for the operation of new radioactive waste management and storage facilities. Thus Ignalina NPP must continuously assess potential threats and update the emergency preparedness plan together with the accompanying instructions and procedures accordingly. In 2022, the Emergency Preparedness Plan of Ignalina NPP was updated subject to the planned decommissioning activities and the updated safety analysis reports of the NF. The related Emergency Preparedness Instructions have been revised and updated together with the Emergency Preparedness Plan of Ignalina NPP.

To ensure the preparedness of the Emergency Response Centre of Ignalina NPP, the equipment of the Centre is regularly checked, malfunctions are repaired and documents are updated. During 2022, the Emergency Control Centre was upgraded: the stable mobile communication was ensured, the electronic dosimeters of the dosimetric control system were checked, the control mechanism of the ventilation system damper was repaired, the computer network was overhauled, the hardware was upgraded, and the software was updated.

The qualification of the staff of the Emergency Preparedness Organisation of Ignalina NPP and their preparedness to respond to emergency situations are

ensured through training and exercises. In 2022, 22 training courses and two exercises were organised for the staff of the Emergency Preparedness Organisation of Ignalina NPP.

On 12 December 2022, a table-top exercise, and on 14 December a functional exercise was organised on the subject of *Staff actions of the Emergency Preparedness Organisation of Ignalina NPP in the event of a potential accident when transporting nuclear fuel cycle, nuclear and fissile material*. The exercises aimed to check and test the adequacy of Ignalina NPP's Emergency Preparedness Plan and other related emergency preparedness documents to manage and improve the staff preparedness of the Emergency Preparedness Organisation of Ignalina NPP to respond to potential design basis accidents when transporting nuclear fuel cycle, nuclear and fissile material.

In 2022, Ignalina NPP kept implementing the Measure Plan for the Implementation of the Nuclear Safety Requirements BSR-1.8.10-2021 *Consequence analysis of potential nuclear and radiological emergencies at a nuclear facility* that Ignalina NPP had approved in 2021. In line with the Plan, Ignalina NPP reviewed the emergency preparedness documents related to the management of beyond-design basis accidents and mitigation of their consequences, as well as to accidents caused by postulated events that were examined when analysing the consequences of nuclear and radiological emergencies of NFs of Ignalina NPP. Moreover, Ignalina NPP developed the general rules of procedure for beyond-design basis accidents and accidents caused by postulated events at NFs of Ignalina NPP. The document was submitted to VATESI for review. The document established lists of potential beyond-design basis accidents and accidents caused by postulated events that can occur at NFs and their emergency response sites of Ignalina NPP, including transportation of radioactive waste and/or other nuclear fuel cycle material. Moreover, it described the worst-case accident scenario and the forecast of radiological consequences caused by it. It provided conclusions in order to assess the need for, and the scope of technical and organisational measures for managing such accidents, as well as for mitigating their consequences for drafting Ignalina NPP's Emergency Preparedness Plan and Emergency Preparedness Instructions. VATESI assessed the rules of procedure and provided suggestions and comments for their improvement. The rules of procedure are to be coordinated and approved in 2023. Furthermore, under other measures of the Measure Plan for the Implementation of the Nuclear Safety Requirements BSR-1.8.10-2021, in 2023 Ignalina NPP plans to review and revise the emergency preparedness categories of NFs currently in force at Ignalina NPP.

In 2022, VATESI inspected Ignalina NPP four times to check the emergency preparedness, as well as measures for managing emergency situations, and design and beyond-design basis accidents. VATESI found two minor violations that were rectified during the inspections. No other violations or non-compliances were found during the inspections.



In the reactor hall of the Ignalina NPP

Activities of radionuclides released to the environment from Ignalina NPP in 2022 and the population exposure doses caused by them

TYPE OF RELEASES	ACTIVITY, BQ/YEAR	PERCENT FROM THE DISCHARGE LIMIT	DOSE, SV	PERCENT FROM THE DOSE CONSTRAINT
To the atmosphere	$4,21 \cdot 10^{10}$	18,92	$9,61 \cdot 10^{-7}$	0,48
To the water	$5 \cdot 10^{10}$	0,33	$6,11 \cdot 10^{-7}$	0,31
Total			$1,57 \cdot 10^{-6}$	0,79

Limitation of releases of radionuclides to the environment

To protect the environment and the population, activities of radionuclides released from Ignalina NPP to the atmosphere and the lake Drūkšiai are limited. The 2022 radiological monitoring results of Ignalina NPP are provided in the table below.

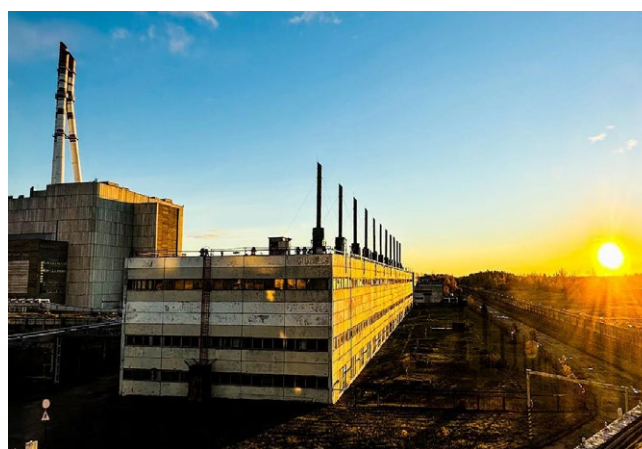
The radiological monitoring results show that the activities of released radionuclides were below the discharge limits. In 2022, the highest share of the activity of radionuclides released into the atmosphere represented the activity of C-14 radionuclide (2.41×10^{10} Bq/year). As the controlled nuclear reaction that had generated inert short-lived radioactive aerosols and radioactive iodine nuclides (I-131) had stopped in both reactors, they were no longer released into the atmosphere upon disintegration of the balance nuclides.

The Nuclear Safety Requirements BSR-1.9.1-2017 stipulate that the NF must be designed, commissioned, operated and decommissioned so that during the normal operation and in cases of anticipated operational occurrences, the annual effective dose to the population caused by the release of radionuclides from the NF would not exceed the dose constraint. Hygiene Standard HN73:2018 states that the annual effective dose constraint for the population is 0.2 mSv. Based on the activity measurements of radionuclides released from Ignalina NPP to the environment and on the assessment of their potential effects on the population, the exposure incurred

by population members of the reference group was found negligent and constituted only a very small portion of the dose constraint.

In 2022, VATESI inspected the use of clearance levels for material and waste removal from the controlled area of Ignalina NPP. VATESI also inspected how releases of radionuclides to the environment were controlled. The measurements of samples and material selected during the inspection demonstrated that activity concentrations of the samples did not exceed the clearance levels.

The results of activity control of radionuclides released into the environment showed that in 2022, the preparatory decommissioning works of Ignalina NPP and works of dismantling and decontamination projects of the units were performed safely.



Ignalina Nuclear Power Plant

Supervision of radioactive waste management



SUPERVISION OF RADIOACTIVE WASTE MANAGEMENT

Radioactive waste management includes the collection, sorting, processing, transportation, packing, storage and disposal of radioactive waste to repositories. The main objective of this activity is to manage radioactive waste so that it does not endanger people and the environment.

The highest amount of radioactive waste (more than 99%) is generated at the nuclear facilities operated by Ignalina NPP. This economic entity is a radioactive waste manager responsible for the final disposal of waste and the operation of radioactive waste repositories.

VATESI regulates the classification of radioactive waste and radioactive waste management safety at NFs. It licenses radioactive waste management facilities, and supervises compliance with legal requirements through inspections. General information on the inspection results of Ignalina NPP is provided in the section *Inspections*.

Supervision of radioactive waste management by Ignalina NPP

SPENT NUCLEAR FUEL MANAGEMENT AND STORAGE

Spent nuclear fuel is highly radioactive waste that generates heat and contains a relatively high amount of fissile material. Spent fuel is considered to be managed safely, if it is ensured that no chain fission reaction occurs under normal and emergency conditions, if spent fuel assemblies are sufficiently cooled, if appropriate barriers for radiation shielding are used, and if radionuclide containment barriers are preserved or new ones are developed to prevent radionuclide releases into the environment. The dry storage method has been selected for spent nuclear fuel storage in Lithuania (until the installation of the deep repository): the spent nuclear fuel is loaded into special containers that meet all the above safety requirements, and they are stored in storage facilities.

In Quarter 1 of 2022, the management of damaged spent fuel was completed. In April, the last three containers of damaged spent fuel were transferred from the spent fuel storage pools of Ignalina NPP Unit 2 to the second spent fuel storage facility (hereinafter referred to as SFSF-2). Both units of Ignalina NPP were defueled.

Furthermore, the search and collection of spent nuclear fuel residue continued in the storage pools of both units of Ignalina NPP. At the end of 2022, Ignalina NPP submitted a report stating that no spent fuel residue had been detected there.

Spent fuel storage facilities

The first spent fuel storage facility (SFSF-1)

The spent nuclear fuel dry storage facility (SFSF-1) operating in the territory of Ignalina NPP is completely full. 118 containers (20 CASTOR RBMK-1500 and 98 CONSTOR RBMK-1500 ones) with spent nuclear fuel are stored there. Each container contains 51 spent nuclear fuel assemblies. In total 6,016 spent nuclear fuel assemblies are stored in the storage facility. The facility stores spent fuel that initial enrichment of 2% (U-235). All CASTOR RBMK-1500 and CONSTOR RBMK-1500 protective containers are leak-tight.

In line with the procedures approved by Ignalina NPP and regulatory requirements, the stored containers were maintained and periodically inspected in the operated SFSF-1. Their surface radiation and surface temperatures were periodically checked.

The second spent fuel storage facility (SFSF-2)

190 CONSTOR® RBMK1500/M2 type containers containing spent nuclear fuel are stored in the storage facility (including 22 ones containing damaged fuel), plus one extra empty container for the transfer of spent fuel in the storage facility's hot cell in case a spent fuel container is no longer leak-tight.

During 2022, all fresh nuclear fuel from the former fresh fuel storage facility of Ignalina NPP was transferred to SFSF-2. These are fuel assemblies that were not used during the NPP operation. A total of 75 unused fuel assemblies were transported and stored in eight special metal containers. Ignalina NPP undertook the above actions after the safety justification had been approved by VATESI.















The last container of spent nuclear fuel arrives at SFSF-2

Radioactive waste in Lithuanian nuclear facilities

WHAT IS RADIOACTIVE WASTE?

Radioactive waste is spent nuclear fuel and other radioactive material that is contaminated with or contains radionuclides and is considered unsuitable for further use according to its purpose.

	SHORT-LIVED VERY LOW LEVEL RADIOACTIVE WASTE	SHORT-LIVED LOW AND INTERMEDIATE LEVEL RADIOACTIVE WASTE	SPENT NUCLEAR FUEL AND OTHER LONG-LIVED WASTE	DISUSED SEALED SOURCES
HOW IS IT GENERATED?	<p>It is generated during repairs of installations and cleaning premises of Ignalina NPP, and during decommissioning.</p> 	<p>It is generated during repairs, small-scale works in the central hall, spent fuel storage pools of Ignalina NPP, and during decommissioning.</p> 	<p>It has accumulated during Ignalina NPP operation, and is generated during decommissioning and dismantling.</p> 	<p>By Ignalina NPP and other industrial companies, medical and research institutions.</p> 
WHAT DOES IT LOOK LIKE?	<p>Paper and cotton waste, pieces of power cables, filters, metal parts of installations, rubber and heat insulation material, construction waste.</p> 	<p>Worn out or dismantled equipment, pipes, structural elements, construction waste.</p> 	<p>Spent nuclear fuel assemblies, their structural elements, fuel channels, parts of control and safety systems, graphite.</p> 	<p>For instance, devices not in use.</p> 
WHERE AND HOW IS IT STORED?	<p>It is placed in metal containers (after pressing some of it into bales and wrapping them into polyethylene film) and stored in a storage facility in the territory of Ignalina NPP.</p> <p>It will be shipped to the repository for very low level radioactive waste later, once it is installed.</p> 	<p>It is processed (incinerated, pressed, placed into reinforced concrete containers, cemented) and stored in storage facilities in the territory of Ignalina NPP.</p> <p>It will be shipped to the repository for low and intermediate level short-lived radioactive waste later, once it is installed.</p> 	<p>It is placed into containers and shipped for storage to the spent nuclear fuel and other storage facilities in the territory of Ignalina NPP.</p> <p>This waste will be stored in these facilities for up to 50 years, and later placed in a deep geological repository.</p> 	<p>They are stored in storage facilities in the territory of Ignalina NPP and in Maišiagala Radioactive Waste Storage Facility.</p> <p>In the future this waste will be sorted, packed into special packages and placed into a repository meant for these sources.</p> 
HOW LONG WILL IT BE DANGEROUS TO PEOPLE AND THE ENVIRONMENT?	<p>100 years</p>	<p>300 years</p>	<p>The waste will be radioactive for thousands of years, but if placed in a deep geological repository it will not be dangerous to people or the environment.</p> <p>> 1 000 years</p>	<p>From 100 to thousands of years.</p> <p>> 100 years</p>

SOLID RADIOACTIVE WASTE

During Ignalina NPP operation, high quantities of solid radioactive waste were generated. This waste is stored in solid radioactive waste storage facilities (buildings 155, 155/1, 157 and 157/1) located in the territory of Ignalina NPP. During the entire operation of Ignalina NPP, 27,178 m³ of untreated solid radioactive waste were generated. In the above-mentioned storage facilities, untreated solid radioactive waste is stored in bulk. Thus, the radioactive waste must be retrieved from the storage facilities and sorted, described and packaged in line with its radiological and other characteristics, and undergo further processing to prepare it for disposal in the repositories. This ensures that solid radioactive waste is managed safely and that the impact of its ionising radiation on the environment and people is kept at a minimum. Radioactive waste generated during decommissioning is not stored in the above-mentioned storage facilities: it is managed in the new radioactive waste management installations and subsequently stored in the newly built radioactive waste storage facilities.

The information diagram (p. 28) presents the quantities of radioactive waste generated during the waste treatment and management, as well as the planned quantities.

Short-lived very low level radioactive waste (Class A waste according to the classification provided for in the Nuclear Safety Requirements [BSR-3.1.2-2017](#)) must be disposed of in a very low level radioactive waste repository. This waste is stored in a very low level radioactive waste buffer storage facility, from where it will be transported to the repository at least every 2 years. The storage operated since 2013 was completely full by the beginning of 2019 and contained 4,351 m³ radioactive waste. Class A waste that does not fit into the buffer storage facility is also stored in the former turbine building (room 101/1 of building G1 and room 101/2 of building G2). After dismantling equipment of the buildings, special areas for waste storage were installed there.

Facilities of solid radioactive waste retrieval from buildings 155 and 155/1 and their pre-treatment facilities



Facilities for treatment and storage of solid radioactive waste

(project B2-1) have been in operation since 2017. Solid radioactive waste is retrieved, sorted, compressed and packaged in these facilities. In 2022, the remaining operational waste stored in building 155/1 was retrieved from there, totalling to 609.7 m³. After pre-treatment, it was packed into 51 compacted and 19 non-compacted waste packages. Preparations started to receive and store radioactive waste packages from Maišiagala Radioactive Storage Facility in this building. Since the start of operation of the retrieval facilities, 2,009.7 m³ of radioactive waste have been retrieved, pre-treated and packed into 496 compacted and into 63 non-compacted waste packages.

Facilities of solid radioactive waste retrieval from buildings 157 and 157/1 (project B2-2) have been in operation since 2020. During the operation, radioactive waste is retrieved from the storage facilities, placed in transportation containers and transported for sorting and treatment to the solid radioactive waste management facilities. In 2022, 322.7 m³ of short-lived very low, low and intermediate level radioactive waste were retrieved from the storage facilities, as well as 58.8 m³ of long-lived high level radioactive waste. In total, 495.7 m³ of short-lived very low, low and intermediate level radioactive waste, as well as 117.2 m³ of long-lived high level radioactive waste were retrieved during the entire period of radioactive waste retrieval.

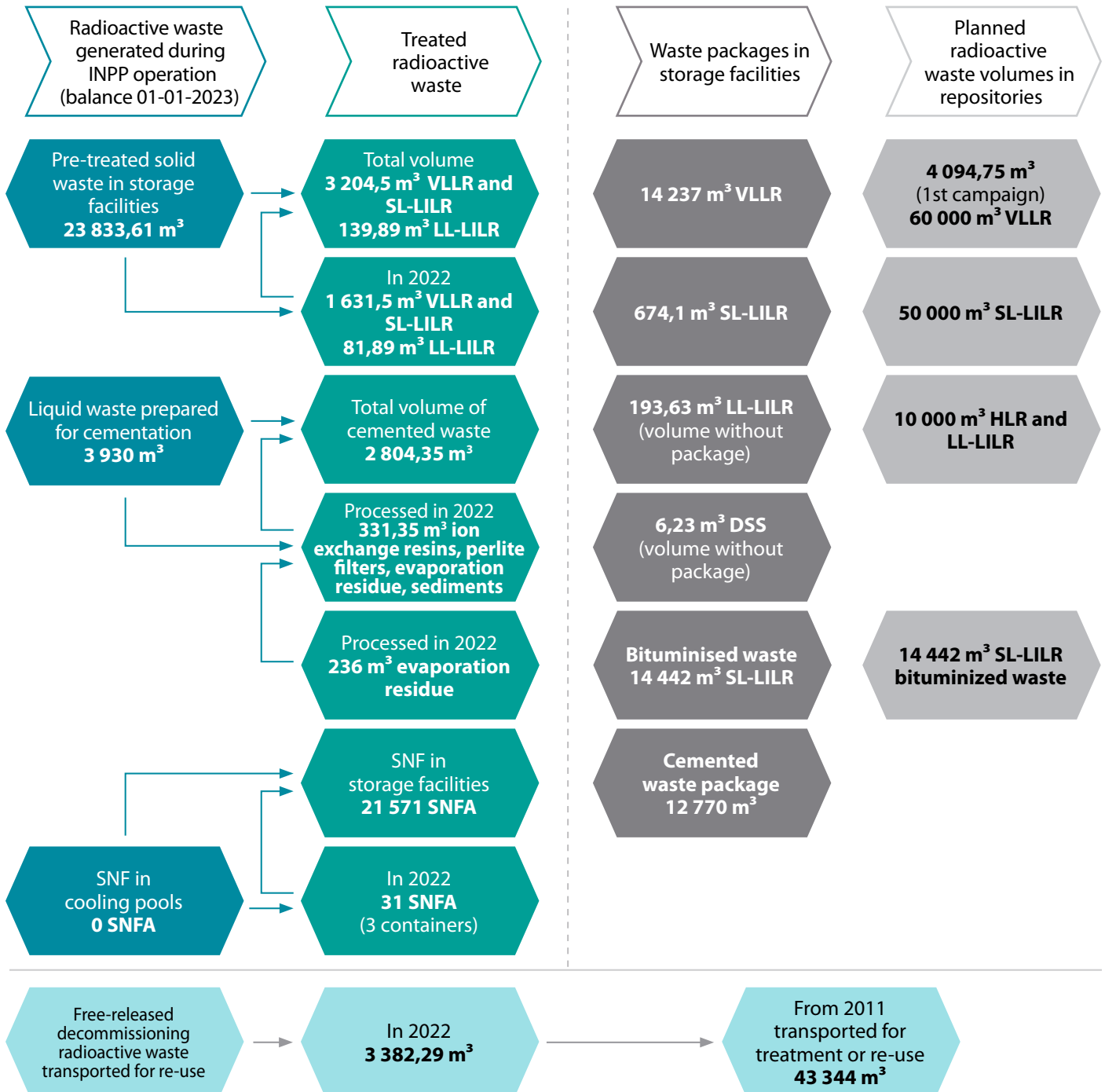
On 28 March 2022, VATESI issued two permits to Ignalina NPP: one for industrial operation of the radioactive waste management installation of the solid radioactive waste management and storage facilities (project B3/4), and one for industrial operation of the radioactive waste storage of the above facilities. All solid radioactive waste generated during the operation and decommissioning of Ignalina NPP is managed, and long-lived radioactive waste is stored for up to 50 years in the solid radioactive waste management and storage facilities, in line with modern international requirements.

In 2022, 46 packages of short-lived low and intermediate level waste (Class B and C), 34 packages of long-lived low and intermediate level waste (Class D and E) and 1 package of spent sealed sources (Class F radioactive waste) were generated at these facilities. As of the end of 2022, a total of 105 packages of Class B and C radioactive waste, 79 packages of Class D and E radioactive waste and 11 packages of Class F radioactive waste were stored in the facilities.

LIQUID RADIOACTIVE WASTE

The aqueous medium facilitates the release of radionuclides into the environment, thus to prevent it, liquid radioactive waste (contaminated NF process water, such as water used for reactor cooling or other NF purposes, or filtration substances used to treat contaminated water) is solidified by cementation, bituminization or other methods of binding residual water in this type of waste. Generally,

Radioactive waste volume 2022



VLLR – very low level radioactive waste;

LL-LILR – long-lived low and intermediate level radioactive waste;

SNFA – spent nuclear fuel assemblies

SL-LILR – short-lived low and intermediate level radioactive waste;

HLR – high level radioactive waste;

DSS – disused sealed sources.

prior to solidification, liquid radioactive waste is reduced in volume by evaporation and separation of clean water from the contaminated residue and filtering substances that are further treated as radioactive waste. Liquid radioactive waste generated at Ignalina NPP is evaporated in special evaporation facilities. The vapours generated by evaporation are filtered with special ion exchange and perlite filters that trap radionuclides. These filters are then cemented and stored as radioactive waste in the cemented radioactive waste storage facility.

Previously, the evaporation residue was solidified by bituminization, however in 2019, Ignalina NPP decided to cement it.

In 2022, 331.35 m³ of liquid waste were treated in the cementing installation, and 2,630 cemented waste packages (drums) were produced. At the end of 2022, 19,758 packages (drums) containing cemented liquid waste were stored in the containers of the cemented radioactive waste storage facility.

WASTE NOT EXCEEDING THE CLEARANCE LEVELS

Radioactive waste is defined as waste with levels of radionuclide contamination exceeding the clearance level values for radionuclide activity established by legislation. All the waste within the radiologically controlled area shall be considered radioactive until the level of contamination is measured and the values of radionuclide contamination are demonstrated not to exceed the clearance level ones. Disposing such waste in general landfills or using it as secondary raw materials is safe. For example, some equipment or metal parts may subsequently be used in industrial applications, or construction waste may be managed as standard waste. Whether waste complies with clearance levels, i.e., whether the potentially non-radioactive waste is indeed non-radioactive, is determined by special measuring devices. Such devices have been installed in Ignalina NPP buildings 159B and B10. During 2022, 3382.29 m³ of material and waste were measured at these facilities, determined to be non-radioactive based on the measurement results, and removed for reuse or disposal. VATESI evaluates the measurement results of each radioactive waste package, and allows its removal from the Ignalina NPP territory only when assured that the waste is non-radioactive based on these results.

Under the cooperation agreement between VATESI and the Radiation Protection Centre (RSC), VATESI collected samples of waste to be released from radiation control for analysis and handed them over to RSC. The test results showed that the measured activities were below the clearance level values, the radionuclide activity limits established in the Plan for Radionuclide Release to the Environment of Ignalina NPP, and that the values of the radionuclide analysis of the water samples were below the method coverage threshold.

Supervision of Maišiagala Radioactive Waste Storage Facility

Maišiagala Radioactive Waste Storage Facility (hereinafter Maišiagala RWSF) is a cast-in-situ vault of 200 m³ capacity installed at a depth of three metres and located in Bartkuškis Forest, in Širvintos District. This *Radon* type storage facility was closed in 1989. Radioactive waste generated at industrial, medical and scientific research facilities and collected in 1963–1989, is stored there. It is situated nine km away from the town of Maišiagala and 40 km away from Vilnius.

Although waste is no longer placed in this storage facility, the radiological monitoring of the storage environment is continuously performed since 1994. For this purpose, ten wells were drilled near the storage facility, and groundwater samples are systematically taken from them and assessed for the radionuclide leakage into the groundwater. One of the key indicators of the effectiveness of storage facility barriers is the volumetric activity of tritium, the most mobile radionuclide, in the well water. The results of the tritium concentration monitoring indicate that the potential impact on the population is negligible and not a threat.

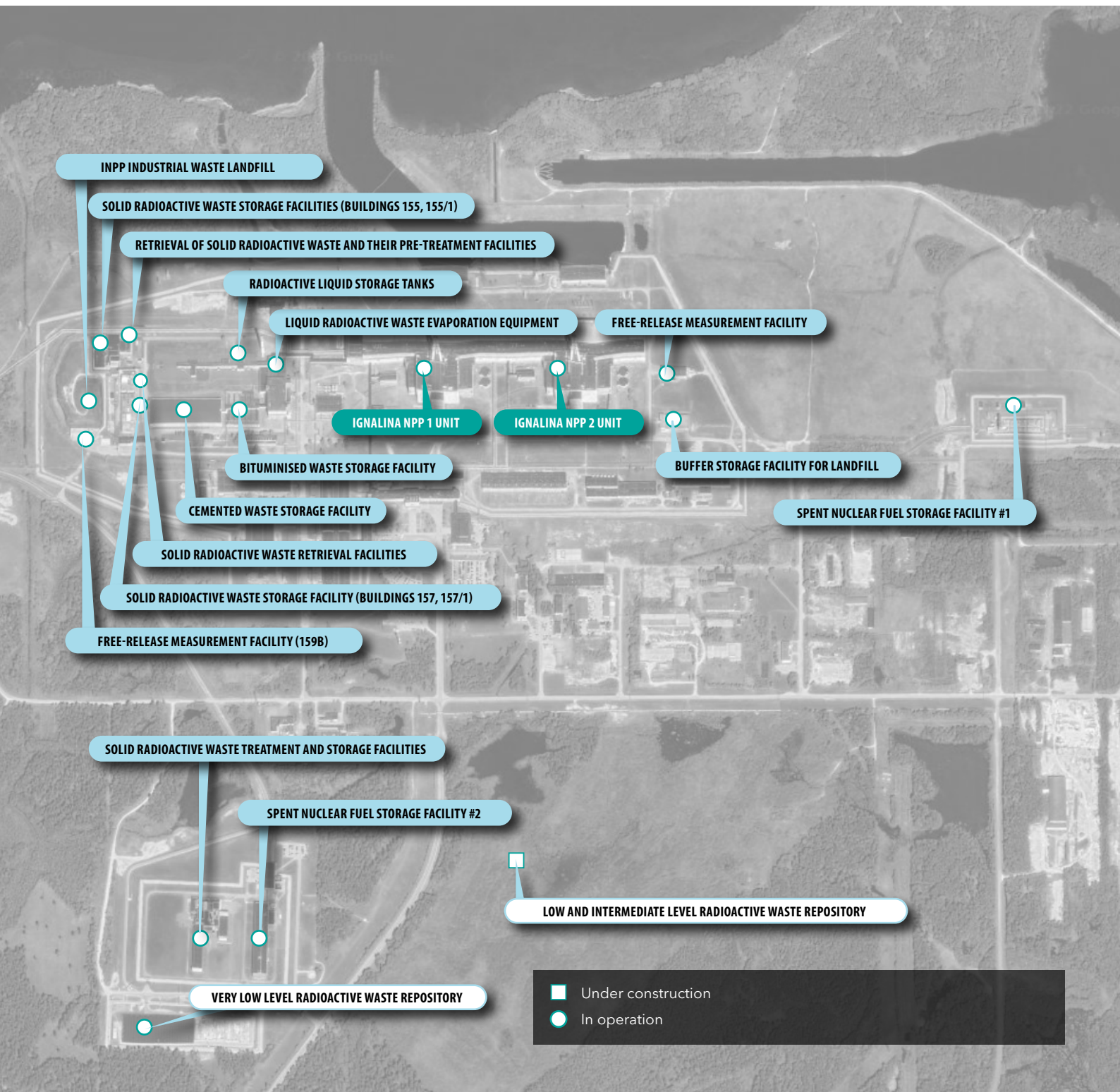
Taking into account expert conclusions drawn in 2006 and modern requirements for radioactive waste management, Maišiagala RWSF may not be the final disposal site of the waste stored there. Thus, the decision was made to decommission Maišiagala RWSF, retrieve the radioactive waste stored there, sort and pack it in special packages, transport it for storage at Ignalina NPP storage facilities, and afterwards dispose of it in waste repositories by waste types. The Final Decommissioning Plan for Maišiagala RWSF was approved by Order of the Minister of Energy of 5 October 2018. Maišiagala RWSF decommissioning is carried out by Ignalina NPP that in 2021 was licensed for this activity by VATESI.

In 2022, Ignalina NPP handed over the site of Maišiagala RWSF to a contractor that had won the tendering procedure for the preparatory works for demolition of the buildings.



Decommissioning works of Maišiagala Radioactive Waste Storage Facility

Radioactive waste storage facilities near Ignalina NPP territory



The contractor started building a temporary caisson structure on the site, aiming to ensure that radioactive material is contained within the structure and not released to the environment during radioactive waste retrieval.

In 2022, to supervise the decommissioning safety of Maišiagala RWSF, VATESI experts evaluated documents justifying safety of the Maišiagala RWSF decommissioning submitted by Ignalina NPP (e.g., the description of conducting measurements for the final radiological surveys of Maišiagala RWSF site, the cold trials programme, the initiated report of the historical assessment, and various technical solutions).

Moreover, VATESI experts started analysing documents justifying safety submitted by Ignalina NPP for a license to transport nuclear fuel cycle material and nuclear and fissile material listed in Annex 1 of the Law on Nuclear Safety, in the quantities set out therein. The license is required for the transportation of radioactive waste generated during Maišiagala RWSF decommissioning to the radioactive waste management facilities of Ignalina NPP. When analysing the documents justifying the transportation safety, VATESI assessed whether the employee qualifications and the planned activities (such as the proper selection of transportation packages, activities when transporting and loading such packages, vehicles and routes, emergency preparedness) complied with the requirements of nuclear safety, radiation protection and physical security for transporting radioactive waste by public roads.

Based on the Final Decommissioning Plan of Maišiagala RWSF, radioactive waste, structures and soil contaminated with radionuclides will be retrieved from Maišiagala RWSF. The retrieved waste will be sorted and transported to radioactive waste management facilities at Ignalina NPP, where it will be treated and stored in suitable storage facilities next to Ignalina NPP. There are plans to remediate the storage facility area and cease its radiation control in 2025. The remediated site of Maišiagala RWSF will be available for other activities without any restrictions.

VERY LOW LEVEL WASTE REPOSITORY

The very low level waste repository (hereinafter referred to as the Repository) was built in the area of Ignalina NPP, on a site south of SFSF-2 and the solid waste management and storage facilities. The Repository modules are designed to contain very low level waste in line with safety requirements ensuring adequate protection of population and the environment from the potential harmful effects of radiation. The Repository will consist of 3 modules, each



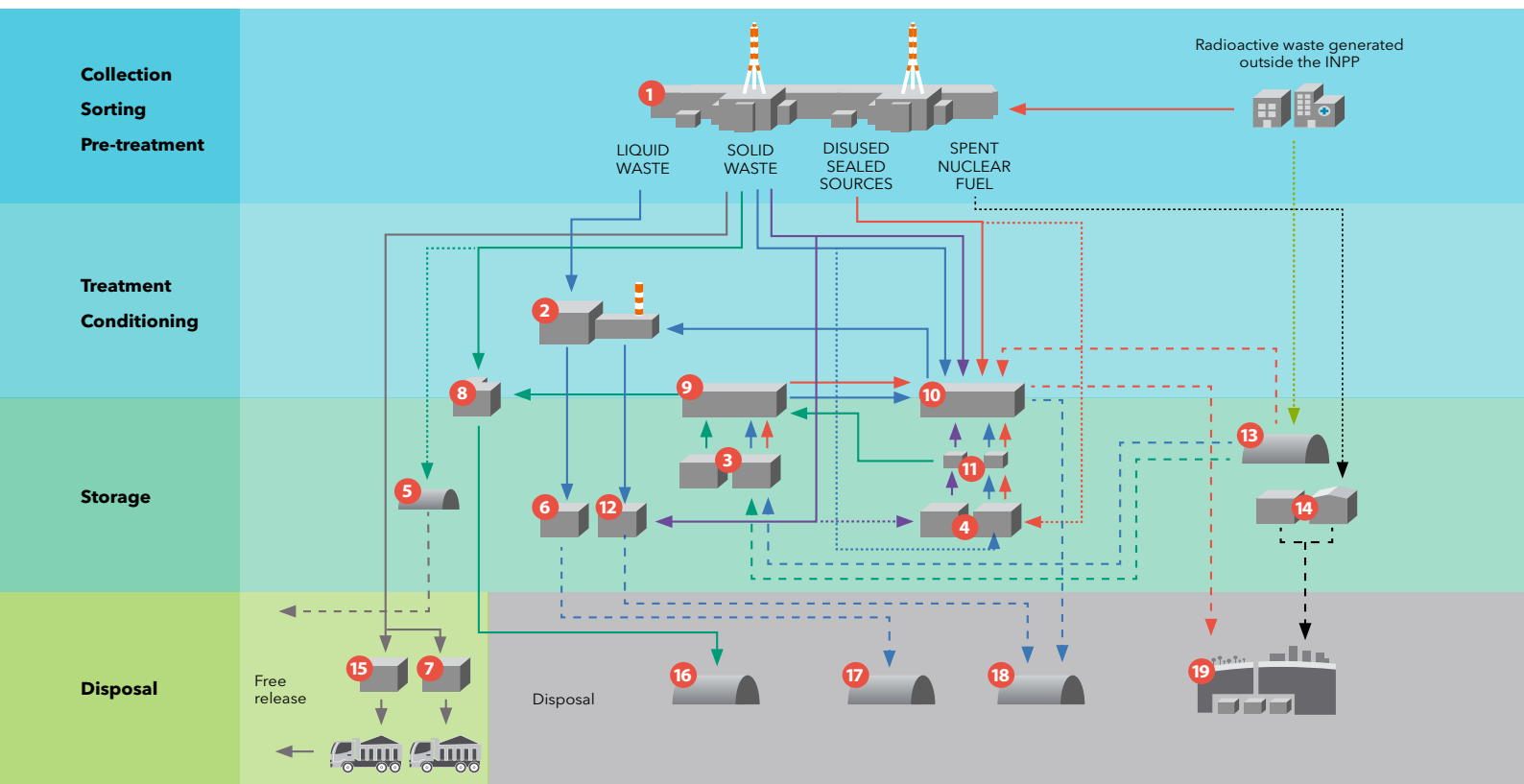
Very low level radioactive waste repository (under construction).

storing approximately 20,000 m³ of radioactive waste. The disposal of radioactive waste to the Repository will be carried out in campaigns at least once every two years. The Repository is to be full by 2038, when Ignalina NPP decommissioning is completed.

In 2022, VATESI issued a permit to Ignalina NPP for transportation of radioactive waste to the Repository and for conducting first tests of the Repository systems using radioactive waste. Before issuing the permit, VATESI was ensured that the planned activities, as described and justified in the documents justifying safety, met the applicable nuclear safety, radiation protection and physical security requirements, and that the activities provided adequate protection of staff, population and the environment against the effects of radiation.

During the first campaign of placing radioactive waste to the Repository, which started in 2022, 4,094.75 m³ of very low level waste was placed there. Gaps between the radioactive waste packages were filled with absorbent (sand), and a levelling layer was installed, as well as a waterproof layer of bentonite carpet and a HDPE (high density polyethylene) geomembrane. Moreover, a protective wall made of reinforced concrete blocks and a partial gravel drainage layer were installed. The engineered barriers installed in the Repository have ensured the isolation of the radioactive waste from the environment, while the waterproof layer of bentonite carpet and a HDPE geomembrane reliably protects the Repository module from water penetration into the radioactive waste packages. The remaining works of the Repository module installation planned for the first campaign of placing radioactive waste to the Repository will be carried out in 2023 under favourable temperature, wind and other environmental conditions.

Radioactive waste management scheme



EXPLANATIONS

The different color of the arrows indicates a specific flow of radioactive waste. Arrows in the chart indicate the planned, ongoing or no longer performed radioactive waste management activities. Numbers denote nuclear facilities.

- Free-released waste (class 0)
- Short-lived very low level radioactive waste (class A)
- Short-lived low and intermediate level radioactive waste (class B and C)
- Long-lived low and intermediate level radioactive waste (class D and E)
- Disused sealed sources (class F)
- Spent nuclear fuel (class G)
- Unsorted radioactive waste (until 1989)

Radioactive waste management activities:

- - - Planned
- In progress
- No longer in place

1. Ignalina Nuclear Power Plant (INPP)
2. Liquid radioactive waste evaporation equipment
3. Solid radioactive waste storage facility (155, 155/1)
4. Solid radioactive waste storage facility (157, 157/1)
5. INPP industrial waste landfill
6. Bituminised radioactive waste storage facility
7. Free-release measurement facility (159B)

8. Very low level radioactive waste storage facility (characterization, storage)
9. Retrieval of solid radioactive waste and their pre-treatment facilities (Project B2-2) (sorting, packaging)
10. Solid radioactive waste management and storage facilities (B 3/4) (sorting, cutting, compaction, incineration, grouting, packaging, characterization, storage)

11. Retrieval of solid radioactive waste and their pre-treatment facilities (Project B2-2)
12. Cemented radioactive waste storage facility
13. Maišiagala Radioactive Waste Storage Facility
14. Spent nuclear fuel storage facilities
15. Free-release measurement facility (B10)
16. Very low level radioactive waste repository
17. Bituminised radioactive waste storage facility
18. Low and intermediate level radioactive waste repository
19. Deep geological repository

Non-proliferation control



NON-PROLIFERATION CONTROL

The implementation of non-proliferation commitments is a complex activity including the implementation of IAEA and European Atomic Energy Community (Euratom) safeguards, the control of nuclear dual-use items or the prohibition of nuclear testing.

Implementation of IAEA and Euratom safeguards

IAEA and Euratom Safeguards are the control measures (inspections, remote monitoring and control systems) applied by IAEA and the European Commission to verify the compliance with non-proliferation commitments under the Treaty on the Non-Proliferation of Nuclear Weapons in order to prevent non-peaceful uses of nuclear energy. Lithuania acceded to the Treaty on the Non-Proliferation of Nuclear Weapons, thus declaring that all the activities related to nuclear material in Lithuania would be used only for peaceful purposes. Pursuant to the Treaty and by signing the Comprehensive Safeguards Agreement with IAEA on the application of safeguards and its Additional Protocol, Lithuania committed to accept international inspectors to carry out inspections, and to provide full information on the national activities in nuclear energy use. After joining the European Union (EU), Lithuania also became a member of Euratom, and together with IAEA, the European Commission started controlling the nuclear material.

To properly control nuclear material, the European Commission assigns individual material balance area (MBA) codes to companies, organizations or agencies that hold nuclear material. In 2022, Lithuania had 15 active MBA codes in total, six of which were assigned to Ignalina NPP. The remaining nine codes indicated the material balance zones of economic entities holding low amounts of nuclear material, and one MBA was assigned to VATESI. The VATESI-owned MBA (WLTC) accounted for nuclear material temporarily held by economic entities thus making it inexpedient for them to apply to the European Commission for an individual MBA code, as well as nuclear material held by holders of nuclear material with pending decisions on MBA granting. In 2022, nuclear material held by two economic entities was accounted for in the VATESI-owned MBA.

All the entities having MBAs assigned must regularly provide information to VATESI and the European Commission on changes in nuclear material in the MBAs, and update various relevant technical information accordingly. Therefore, in 2022, VATESI supervised and

if needed, advised economic entities to enable them to timely provide all the required information to the European Commission.

In 2022, to control the international nuclear non-proliferation commitments undertaken by Lithuania, inspectors of IAEA, the European Commission and VATESI visited selected companies or organizations that had declared activities with nuclear material. During the visits, the inspectors checked if the companies and organizations were engaged in peaceful activities only, if all the nuclear material was properly accounted for, and if no other undeclared activities with nuclear or nuclear fuel cycle material were undertaken. Moreover, in 2022, IAEA and the European Commission inspectors visited two companies that had declared the termination of all activities with nuclear material and had applied or the closure of MBAs assigned to them.

In late May/early June of 2022, a planned inspection of the physical inventory by IAEA, the European Commission and VATESI experts took place in Ignalina NPP site and in the dry type storage facilities for spent nuclear fuel. They inspected the sealed and fresh (unused) nuclear fuel that was stacked in containers and ready for transportation to SFSF-2, as well as spent fuel stored in SFSF-1 and SFSF-2. Furthermore, they checked the fuel storage pools of Unit 1 and Unit 2, and replaced seals selected by probabilistic statistical methodology. VATESI experts found no violations during the inspection, and the international experts are to report their findings in 2023. Moreover, IAEA experts conducted an unannounced inspection (in this case the operator is informed of the inspection when the inspectors arrive at the site) at Ignalina NPP site in August 2022.

Furthermore, in 2022, VATESI experts inspected how economic entities accounting for their nuclear material in the VATESI-owned MBA conducted a physical inventory of



Example of nuclear materials

their nuclear material. No violations were found during the inspections.

Inspections carried out by international inspectors and information provided by Lithuania on nuclear energy activities enabled IAEA to conclude that all nuclear material and the related activities declared by the country were used only for peaceful purposes, and there was no evidence of undeclared nuclear material and activities. In 2022, IAEA in its Safeguards Implementation Report made a positive conclusion that all the nuclear material used and activities that took place in Lithuania in 2021 were used only for peaceful purposes. The report for 2022 is to be submitted in the middle of 2023.

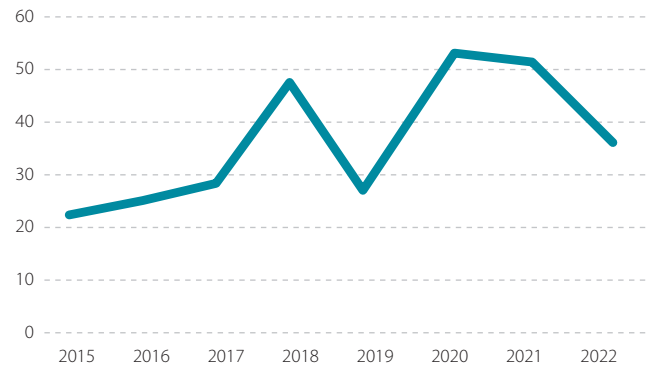
Control of nuclear dual-use items

To contribute to the non-proliferation regime, the Nuclear Suppliers Group (NSG) was established in 1974 that brought together countries with nuclear technologies and set the terms under which nuclear and dual-use material, equipment and technology may be transferred from one country to another. Lithuania became a member of the group in 2004.

Under these terms and in line with the Lithuanian and EU law, and together with other agencies VATESI exercises control over the export, import, transit, brokering and transfer of strategic goods in the EU, and participates in providing conclusions on export and import of dual-use items. In 2022, VATESI provided conclusions on 36

applications submitted for export licenses for dual-use items. Lithuanian economic entities producing laser systems and components were the key exporters of such items.

VATESI conclusions on export and import of dual-use items in 2015–2022



In case of imported nuclear dual-use items, together with the Ministry of Economy and Innovation of the Republic of Lithuania, VATESI issues state guarantees (a letter confirming the end use) to the supplier country of the imported items regarding the peaceful use of such items. The only importer of such items in Lithuania is Ignalina NPP. In 2022, no such nuclear dual-use items were imported. The results of the VATESI inspections have demonstrated that previously imported nuclear dual-use items with end-use certificates were used in line with their guarantee obligations and were properly controlled.

Nuclear security



NUCLEAR SECURITY

Nuclear security is the prevention, detection of and response to any illegal activity (theft of nuclear or other radioactive material, diversion, illegal movement of such material, unauthorized access to facilities where such material is stored and used, or other related criminal acts).

The physical security of NFs, nuclear and other radioactive material is among the components of nuclear security.

Physical security of nuclear material and nuclear facilities

Physical security of nuclear, nuclear fuel cycle material and NFs consists of the totality of competencies and measures to protect NFs, nuclear, nuclear fuel cycle material and radioactive sources from unlawful possession or seizure and other unlawful acts that would pose a risk to human health and safety due to radiation exposure.

In line with international best practice, the physical security of nuclear facilities is designed to protect the facility and the material from intruders whose characteristics are described in the design basis threat documents. The design basis threat is the initial step in the development and maintenance of a physical security system to help answer the question of what the NF or activities with nuclear material need to be protected against. IAEA defines a design basis threat as a set of information about a potential intruder that includes their characteristics, such as motivation, intention, knowledge, tools, vehicles, capabilities and capacities, and other information that describes the potential intruder.

In May 2022, the extraordinary meeting of the Commission for Assessing of the Design Basis Threats discussed the military aggression of the Russian Federation against Ukraine, as well as military actions in the area of Chernobyl NPP. The impact of the above on the design basis threats of the Lithuanian NFs was discussed. Moreover, following an application by Ignalina NPP, the meeting approved a draft document on the design basis threats to the units of Ignalina NPP and to other NFs related to their decommissioning. Furthermore, the meeting approved a draft document on the design basis threats to the fresh (unused) nuclear fuel storage facility of Ignalina NPP. By Order of 22 June 2022, the Head of VATESI approved new and revised design basis threats to Lithuanian NFs and activities with nuclear material.

In October 2022, under the annual assessment of the design basis threats, the institutions engaged in the assessment of the design basis threats were once again requested to provide information and their position on

the circumstances that could affect the modification of the existing design basis threats. Having assessed the information received, the Head of VATESI kept in force the design basis threats to nuclear facilities and activities with nuclear material as adopted on 22 June 2022.

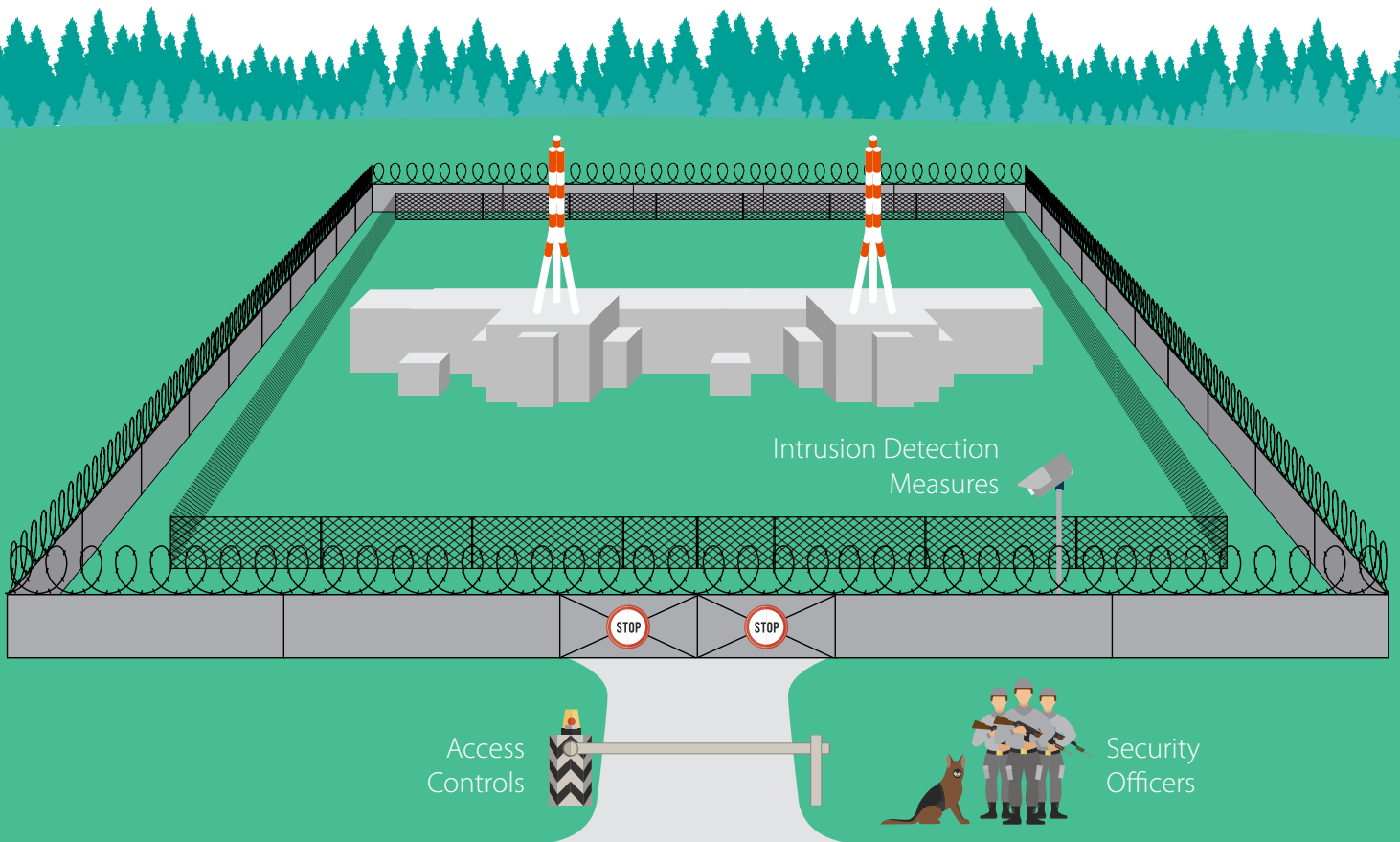
In view of the constant threat due to the war in Ukraine, the members of the Commission for Assessing of the Design Basis Threats were regularly informed about the situation at the nuclear facilities in Ukraine and other nuclear security developments worldwide.

On 1 July 2022, amendments to the Law on Nuclear Energy of the Republic of Lithuania entered into force, providing for additional obligations in the field of physical security for licensees operating NFs (i.e. Ignalina NPP), which include additional protection zones. Under the new legal provisions in force, the licensee is obliged to control additional NF protection zones. Previously, that was the function of the Public Security Service, an institution authorised by the Ministry of the Interior. Following the entry into force of the legal amendments, the Public Security Service remained responsible for the control of the perimeter of the main site (the secured zone).

In 2022, to properly implement the new obligations, Ignalina NPP drafted a technical solution for the redesign (modification) of the physical security system of its nuclear facilities and submitted it for VATESI's approval. After VATESI's approval, Ignalina NPP redesigned the existing, and introduced additional technical measures of the physical security system. With respect to the above, in 2022, VATESI approved the updated Physical Security Plan and the Rules of Procedure of Technical Measures of Ignalina NPP site, as well as the Physical Security Plan for the second spent nuclear fuel storage facility (SFSF-2) and for the solid radioactive waste treatment and storage facilities submitted by Ignalina NPP.

Moreover, together with Visaginas Unit of the Public Security Service under the Lithuanian Ministry of the Interior, Ignalina NPP carried out unscheduled effectiveness assessments of the physical security systems (technical and organisational measures, including the actions taken by the security and response forces) in order to assess the capability of the modified physical security systems of the NF of meeting their goals. The assessments were in line with the Effectiveness Assessment Programme updated in 2022 and approved by VATESI, as well as the approved scenarios for intruder actions, developed by taking into account the design basis threat documents of the NF. In 2022, the effectiveness of the physical security system was assessed for the second spent nuclear fuel storage facility (SFSF-2), the solid radioactive waste treatment and storage facilities, the short-lived very low level waste storage facility, the solid waste retrieval facilities and Ignalina NPP (Buildings 101/1,2).

Physical security system



The assessments concluded that the physical protection systems in place at these NFs, together with the response forces, are capable of protecting the nuclear and nuclear fuel cycle material contained therein from unauthorised acts that could pose a risk to human health and safety.

As every year, VATESI experts inspected the physical area at the NFs controlled by Ignalina NPP. General information on the inspection results is provided in the section *Inspections*.

Prevention of illicit trafficking in nuclear and other radioactive material

To encourage member states to share information on incidents or illicit acts with nuclear or other radioactive material, and on cases of their smuggling, illicit transportation or disposal, IAEA created the Incident and Trafficking Database (ITDB) in 1995. It is a voluntary initiative which Lithuania is a party to. VATESI is responsible for providing such information to IAEA and its dissemination to Lithuanian agencies. In 2022, the Republic of the Union of Myanmar joined the ITDB, and now 143 member states are parties to the ITDB.

Since joining ITDB in 1996 to the end of 2022, VATESI submitted a total of 94 information reports on events in Lithuania.

In 2022, two events related to illicit material transportation were recorded in Lithuania. VATESI provided information on them to the IAEA database as follows:



- ◆ Metal products contaminated with uranium (U-238) and radium (Ra-226) were found in a scrap metal company;
- ◆ A shipment with uranite was intercepted at Vilnius International Airport.

In 2022, IAEA member states submitted 148 information reports on incidents or illicit acts with nuclear or other radioactive material, and updates to five previous reports. Having received the information reports from IAEA, VATESI forwarded them to the Police Department, RSC and the Nuclear Security Centre of Excellence. Information on lost or stolen radioactive sources in Lithuania's neighbouring countries and on other events that may have affected national nuclear security was additionally forwarded to State Border Guard Service and the Customs Department. Information on events related to attempts to sell nuclear or radioactive material and cases of theft was also passed on to the members of the Commission for Assessing of the Design Basis Threats.

International cooperation



INTERNATIONAL COOPERATION

International cooperation of VATESI is based on Lithuania's international obligations, membership in international organizations and bilateral agreements.

VATESI experts represent the national interests and participate in the activities of international organizations: they work in various working groups aimed at continuously improving the level of nuclear safety, physical security, and radiation protection in Lithuania and Europe, and share experience and best practice in nuclear activity regulation and supervision.

Convention on Nuclear Safety

Lithuania became a Contracting Party to the Convention on Nuclear Safety (CNS) in 1996. All the Contracting Parties to CNS must respect the principles of nuclear safety assurance laid down therein.

CNS objectives:

- ♦ To achieve and maintain a high level of nuclear safety worldwide;
- ♦ To develop and maintain effective measures against potential radiological hazards in nuclear facilities in order to protect people and the environment from the harmful effects of radiation resulting from the operation of such facilities;
- ♦ To prevent accidents with potential radiological consequences and to mitigate the consequences, if any.

Every three years, each Contracting Party shall submit a regular report on the measures taken to implement obligations under CNS. The reports are discussed at CNS review meetings of the Contracting Parties. The meetings take place at least once per three years.

VATESI is responsible for compliance with Lithuania's obligations under CNS. In 2022, as part of its coordination functions to implement the CNS provisions, VATESI carried out activities related to preparations for the Joint 8th and 9th CNS Review Meetings scheduled for 2023. The 9th Lithuanian National Report under CNS on compliance with its obligations under the Convention was developed and submitted to the CNS Contracting Parties for review. Moreover, two meetings of the special Working Group of the Contracting Parties to the Convention on Nuclear Safety were held, and attended by a representative of VATESI. They discussed the Parties' proposals on contingency planning and continuity of activities, as well as others aimed at improving the CNS review process.

Moreover, as a coordinator of implementing of CNS in Lithuania, VATESI corresponded with the Ministry of Emergency Situations of Belarus (MoES) on the provision

of information under Article 17 of CNS, and examined relevant information to assess the radiological impact of Belarusian NPP on Lithuania. Detailed information on potential releases of radioactive substances in the event of a potential severe nuclear accident is needed in order for the Lithuanian authorities to better assess the potential radiological impact of Belarusian NPP on the population and the environment, and to revise the emergency preparedness plans if necessary. Although VATESI has been corresponding with MoES since the end of 2019, Belarus has not provided the necessary information for emergency preparedness planning.

Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (hereinafter the Convention) entered into force in Lithuania on June 14, 2004.

In line with the Convention provisions, Lithuania, like the other Contracting Parties, is required to draw up a report, containing information intended for other Contracting Parties, on compliance with its obligations.

Since 26 June to 8 July, 2022, at the 7th Review Meeting in Vienna, the Lithuanian delegation presented the sixth Lithuanian report under the Convention developed by VATESI together with other authorities. During the presentation, the following information was provided: the Lithuanian legislation on radioactive waste and spent nuclear fuel management, licensing of management



facilities, decommissioning of Ignalina NPP and Maišiagala RWSF, licensing of management of spent radioactive sources, and their management practices, as well as the existing and planned safety improvement measures for radioactive waste and spent nuclear fuel management. Moreover, VATESI answered additional questions.

The conclusions of the meeting were favourable for Lithuania – our country complied with its obligations under all the Convention provisions. To sum up the outcomes of the Joint Convention meeting, it was stated that the increasing number of countries were joining the Joint Convention, thereby assuming liability for the responsible management of spent fuel and radioactive waste. Moreover, the meeting noted that progress had been made in many safety areas in the management of spent fuel and radioactive waste. To implement safety improvement measures, countries often faced challenges, and the Joint Convention provided an opportunity to share knowledge and experience on how to overcome them.

The Convention on Early Notification and implementing obligations under the Arrangements of Early Exchange of Information in the Event of a Radiological Emergency 87/600/EURATOM

The Convention on Early Notification of a Nuclear Accident, Council Decision 87/600/Euratom on Community arrangements for the early exchange of information in the event of a radiological emergency, and bilateral agreements with the neighbouring states obligate Lithuania to timely and properly receive and provide information to IAEA, the European Commission and the neighbouring states on radiological and nuclear incidents and accidents that have occurred. VATESI has been appointed as the competent Lithuanian authority responsible for meeting the above commitments.

VATESI continuously operates an Early Notification System (24/7). The designated and trained early warning officers are ready to respond to radiological and nuclear accidents, incidents or other unusual events and activate the Emergency Operations Centre of VATESI. The early warning officers regularly participate in unannounced communication testing exercises organised by IAEA and the European Commission. To comply with international commitments to exchange information with IAEA and the European Commission, VATESI uses USIE and WebECURIE information exchange systems. These systems are the main tool for national competent authorities to exchange information on various unusual events, exercises and in the event of a nuclear or radiological accident.

In 2022, the IAEA's USIE system disseminated information on 91 incidents, and the European Commission's WebECURIE system – on 9 ones.

Most of the reports in the IAEA's USIE system were related to events at the nuclear facilities in Ukraine. Other notifications published by the European Commission and the IAEA relate to missing, stolen or found radioactive sources or nuclear material, workers exposed excessive exposure limits, and minor incidents at nuclear power plants or nuclear installations.

VATESI, as the responsible competent authority under the above conventions and agreements, regularly participates in various IAEA and European Commission exercises. In addition to the above-mentioned communication verification exercises, in 2022, VATESI officers participated in two other exercises, the IAEA's ConvEx-2a and the European Commission's ECUREX-2022. These exercises tested the ability of the Centre's officers to use the IAEA and European Commission's information systems, provide information, fill in forms and take decisions depending on the simulated emergency situation.

Participation in the environmental impact assessment activities to implement ESPOO Convention

The design, construction and operation of new nuclear power plants must comply with all international requirements on nuclear safety, radiation and environmental protection. During the assessment of their impact on other countries, the Convention on Environmental Impact Assessment in a Transboundary Context (the Espoo Convention) must be complied with.

VATESI is among Lithuanian authorities participating in the NF environmental impact assessment activities, and examining submitted documents related to the environmental impact assessment. The Lithuanian Ministry of the Environment is the authority responsible for implementing the Convention provisions in Lithuania.

In September 2022, the Ministry of the Environment forwarded the Environmental Impact Assessment Report on the construction and operation of the first nuclear power plant to be built in Poland that had been received from Poland. The Ministry of the Environment forwarded the comments submitted by VATESI to the responsible Polish authority.

Nuclear Safety Regulation in the European Union – ENSREG

Each EU country is responsible for the nuclear safety and radioactive waste management of the NFs on its territory. To this end, countries have national nuclear safety regulatory frameworks based on three EU directives: the Nuclear Safety Directive, the Directive on the Responsible

and Safe Management of Spent Fuel and Radioactive Waste, and the Basic Safety Standards Directive to ensure protection against the dangers arising from exposure to ionising radiation.

In line with these EU directives and the principle of continuous improvement of nuclear safety, the European Nuclear Safety Regulators Group (ENSREG) consisting of the European Commission and high-level representatives from EU nuclear regulators, addresses the assurance and continuous improvement of safety of NFs through regulation and supervision, including decommissioning and spent nuclear fuel and radioactive waste management. ENSREG has three working groups to address specific subjects: Nuclear Safety Improvement, Radioactive Waste Management, Spent Nuclear Fuel and Decommissioning, and Public Information and Transparency.

In 2022, the key points on ENSREG's agenda included the problems of ensuring the safety of Ukrainian NFs, having resulted from Russia's military aggression against the country. In three extraordinary meetings in late February and early March, ENSREG members, in their statements, called on Russia to immediately cease its illegal activities in order to allow the Ukrainian NF operators and the Nuclear Safety Regulator (SNRIU) to properly enforce the control of all Ukrainian NFs and nuclear material throughout the internationally recognised territory of Ukraine and in line with internationally accepted safety standards and guidelines. At its extraordinary meeting in early October, ENSREG stressed that Russia's illegal seizure of Zaporizhzhya NPP and its actions on and around the site was a major threat to nuclear safety, and that the risk of nuclear incidents would remain high as long as Russian forces were present at the Zaporizhzhya NPP site. ENSREG called for the withdrawal of Russian forces and their military equipment from the Zaporizhzhya NPP site and the immediate return of the NPP to the rightful owner, and to the supervision of Ukraine's nuclear safety regulator. Moreover, ENSREG strongly supported the efforts of the Director General of IAEA to ensure nuclear safety and security at Ukrainian NFs.

Under the Nuclear Safety Directive, Topical Peer Reviews of nuclear safety must be held every six years,



ENSREG conference



Zaporizhzhya Nuclear Power Plant

starting with 2016. The first Topical Peer Review took place in 2016-2017 and analysed ageing management of nuclear power plants and research reactors. In June, ENSREG approved the technical specification developed by WENRA. The documents detailed requirements of the Topical Peer Review. The second Topical Peer Review would address fire safety assurance in operating and permanently shut-down NPPs under decommissioning, as well as radioactive waste management in the facilities. Countries participating in this review, including Lithuania, have to develop their national safety assessment reports by the end of October 2023.

Western European Nuclear Regulators Association (WENRA)

The Western European Nuclear Regulators' Association (WENRA) was established in 1999. The main goal of the organisation is to develop a common approach towards nuclear safety. At WENRA events, country-delegated regulator representatives discuss nuclear safety regulation and supervision, share experience and important safety-related information, and plan nuclear safety improvement areas. Moreover, in 2022, the safety of Ukrainian NFs was a major focus.

Although the Association was founded by representatives of European countries, it now includes countries from other parts of the world (USA, Canada, Japan). Since 2004, Lithuania has been participating in the Association and its Reactor Safety Harmonisation Working Group (RHWG) and the Working Group on Decommissioning and Radioactive Waste Management (WGWD).

In 2022, RHWG continued to develop the specification for the Second Topical Peer Review on fire safety assessment of EU countries under the EU Nuclear Safety Directive, and discussed it with the nuclear safety regulators of the countries concerned. Activities continued in the member countries on the implementation, review and updating of the reactor safety levels approved in 2014. Their safety regulations were benchmarked against these

levels. Moreover, discussions continued regarding safety aspects of the use of other types of nuclear fuel (by other manufacturers) and small modular reactors (SMRs).

In late 2001, WGWD started harmonising the requirements for decommissioning and operation of radioactive waste repositories in the WENRA countries. The activities aim at developing recommended safety levels to be followed by WENRA countries. The recommended safety levels are developed taking into account the existing legal frameworks and international guidance. Each year, WGWD meets to discuss the review and self-assessment of legislation on nuclear safety supervision in the EU countries against the relevant safety reference levels.

In 2022, a meeting of WGWD discussed the review and updating of the safety reference levels. The safety reference levels for radioactive waste storage, decommissioning and disposal to repositories are to be updated by the end of 2023, and for radioactive waste treatment – by 2024. Moreover, the WGWD meeting discussed the ensuring of the possibility to reload spent fuel in case of an unusual event during the operation of a dry type SFSF, and the relevant experience of the EU member states. During the meeting, VATESI presented the self-assessment on radioactive waste management for WGWD's review.

European Nuclear Security Regulators Association (ENSRA)

The European Nuclear Security Regulators Association (ENSRA) was established in 2004 to provide a platform for the Association members to share best practice cases and experience in nuclear security regulation, and thus contribute to building and maintaining effective nuclear security in Europe. VATESI joined this association in 2013. The participation in the Association activities allows it to adopt best practice of other countries and thus strengthen the nuclear security regime of Lithuania.

In 2022, VATESI representatives participated in the plenary meeting of ENSRA in Germany that discussed the ongoing ENSRA activities and future prospects. Each attending ENSRA member country presented information on major nuclear security events and the related activities in their countries. Moreover, the situation in Ukraine was discussed and experiences were shared on the measures taken by ENSRA member countries to strengthen the protection of nuclear facilities. Furthermore, in view of the constantly high number of discussion points, it was decided to have two ENSRA meetings per year, including a virtual one.

In December 2022, a representative of VATESI participated in the first virtual meeting of the newly established Decommissioning Working Group. The task of the Working Group is to assess country practices and to make proposals related to nuclear safety during the decommissioning of nuclear facilities.



European Safeguards Research and Development Association (ESARDA)

The aim of the European Safeguards Research and Development Association (ESARDA) is to encourage organizations to exchange information related to nuclear material control and experience, through the use of state-of-the-art safeguard application technologies. It brings together national nuclear safety regulators, nuclear facility operators, research and development centres and universities operating in the area of safeguards application. The Association consists of members from European countries, Japan, the USA and the European Commission. Lithuania is represented by VATESI in this association. VATESI has become a member in 2005, and a VATESI representative is also a member of the Steering Committee.

A virtual, annual meeting of ESARDA was held in 2022. During the annual meeting, as well as during the concurrent Implementation of Safeguards Working Group meetings, the focus was on future technologies and their application to implement the safeguards, as well as the related challenges. Discussions focused on the safeguards application to small modular reactors (SMRs), methods for selecting and evaluating the chosen technologies, and the use of robots in inspector activities. The meeting also focused on final waste disposal and the debate on when safeguards should stop applying in this case.

Two new working groups were established during the meeting, the Material Balance Evaluation Working Group and the Final Disposal Working Group. The development of the ESARDA organisation and its activities were also taken into account. During the annual meeting, the Steering Committee further discussed amendments to the ESARDA Agreement, as well as the rules and procedures. A new version of the ESARDA Agreement, as well as the rules and procedures was approved by the next ESARDA Steering Committee meeting at the end of 2022.



Specialists from Lithuanian institutions enhance their knowledge at the workshop under the IAEA project

IAEA technical cooperation projects

Under the IAEA European Regional Programme for Technical Cooperation 2022-2023, and together with the Lithuanian Ministry of Energy and RSC, VATESI coordinated the participation of Lithuanian experts in the following regional technical cooperation projects on nuclear safety and energy:

- ♦ RER0048 – Enhancing National Legal Frameworks;
- ♦ RER0049 – Enhancing the Capacities of Educational Institutions for the Sustainable use of Nuclear Technologies;
- ♦ RER9146 – Enhancing Capacities in Member States for the Planning and Implementation of Decommissioning Projects;
- ♦ RER9148 – Strengthening the Regulatory Infrastructure for Radiation Safety;
- ♦ RER9149 – Improving the Radiation Protection of Workers Occupationally Exposed to Ionizing Radiation;
- ♦ RER9150 – Improving Capabilities to Efficiently Implement Large Ongoing Decommissioning Projects and Waste Management with Minimization of Risks Based on Initiatives and Potential Synergies;
- ♦ RER9151 – Updating and Harmonizing Emergency Preparedness and Response Plans;
- ♦ RER9154 – Enhancing the Implementation of Integrated Programmes for the Safe Management of Radioactive Waste;
- ♦ RER9156 – Establishing Education and Training Infrastructure in Radiation Protection;
- ♦ RER9158 – Strengthening the Regulatory Infrastructure for Radiation Safety;
- ♦ RER9160 – Strengthening Capabilities on Safety Assessment and Risk Informed Decision Making for Severe Accidents and Off Site Consequences.

In 2022, VATESI employees attended 56 events under IAEA international and regional projects: workshops, conferences, technical meetings and training courses. In these events, the experts had the opportunity to know the regulatory requirements in nuclear safety, radiation protection and physical security, to learn of the best practice and to share their experience.

The implementation of the 2022-2025 IAEA National Technical Cooperation Project LIT9020, *Enhancing National Capabilities for Decommissioning and Radioactive Waste Management, Safety Assessment, Oversight, Licensing and Emergency Preparedness*, was started. In 2022, 12 VATESI employees improved their expertise by attending events under the IAEA national project. 24 attendees from five Lithuanian authorities participated in the workshop *Developing and Reviewing a Protection Strategy for a Nuclear or Radiological Emergency* that was held in Vilnius. The project funding allowed for the procurement of surface contamination monitoring equipment and satellite communication equipment. The IAEA support through national projects helps Lithuanian nuclear safety professionals to improve their technical knowledge on decommissioning and radioactive waste management, emergency preparedness, and to know the most up-to-date international nuclear safety requirements and the best practice of other countries.

PARTICIPATION IN INTERNATIONAL IAEA ASSESSMENT MISSIONS

To assess the effectiveness of Member States' regulatory frameworks and their compliance with international IAEA standards, and to implement the provisions of the European Commission directives on the regulation of nuclear safety and on the sustainable management of radioactive waste and spent fuel, IAEA offers expert missions consisting of experienced expert teams from the Member States.

In 2022, VATESI experts participated in two International Regulatory Review Service (IRRS) missions in Slovakia and Sweden, and two Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (ARTEMIS) missions in Denmark and Hungary.

During the missions, after reviewing the self-assessment reports submitted by the Member States, as well as a range of other relevant documents, the experts provided conclusions, recommendations and proposals for improving nuclear safety regulation and the infrastructure for spent fuel and radioactive waste management in the countries.



VATESI specialists at the Bohunice V1 nuclear power plant

Public communication



PUBLIC COMMUNICATION

VATESI public communication activities are based on the principles of transparency and openness. Their key goal is to provide the public and other stakeholders with relevant information on the regulation and supervision of compliance with nuclear safety, radiation protection, physical security and the international non-proliferation commitments undertaken by Lithuania.

VATESI responds to incoming inquiries, provides annual reports on the level of nuclear safety in Lithuania, and regularly informs the public about results of supervision of economic entity activities. VATESI provides information to Lithuanian and foreign media on nuclear safety and radiation protection, and VATESI experts organise and attend various events and meetings with representatives of various scientific projects.

The publication *Nuclear Power Safety in Lithuania* is published annually. The main VATESI channel for information dissemination is the website www.vatesi.lt.

In 2022, the main subjects on which VATESI had to provide information were the safety status of Ukrainian nuclear power plants and other nuclear facilities during the Russian military aggression in Ukraine, the operation and safety issues of Belarusian NPP, and the management of radioactive waste at Ignalina NPP.

MEETINGS WITH THE PUBLIC

In autumn 2022, meetings were held with the residents of the municipalities of Ignalina and Zarasai districts and Visaginas, during which experts from VATESI and the Radiation Protection Centre (RSC) covered the radiological impact of nuclear facilities on the population and the environment.

During the meetings, VATESI explained how the safety of Ignalina NPP decommissioning is ensured: how Ignalina



Meeting with local residents at Ignalina District Municipality



In the LRT TV studio

NPP decommissioning is implemented, how the state regulation of NF safety and radioactive waste management is carried out, and how the NF safety is assessed. Moreover, VATESI presented the results of their inspections carried out, the occupational exposure assessment at Ignalina NPP, and the control of radionuclide emissions to the environment.

The meeting attendees were mainly interested in the final clean-up status of the Ignalina NPP area after dismantling, the repository maintenance timing, the NF risk assessment in case of war, whether the companies operating at Ignalina NPP were assessed in national security terms, emergency preparedness and the planned distances of the protection zones, radiation exposure monitoring, and if any changes in the monitoring results were noticed between the time of Ignalina NPP's operation and now. They also asked if the impact on the lake Drūkšiai's ecosystem was monitored during Ignalina NPP operation, if the environmental monitoring results indicate the operation and impact of Belarusian NPP, and how the people who had remediated Chernobyl NPP after the accident had their health status monitored.

The aim of such meetings is to regularly inform residents of the municipalities closest to Lithuanian NFs about the NF impact on the population safety and the environment, as well as measures in place to ensure that such radiological impact is kept to a minimum and within the established limits.

Public participation in the decision-making process

The public may participate in the making of the most important decisions on nuclear power: *approval of an assessment report of the nuclear facility construction location (site), licenses for construction and operation of nuclear*

facilities, nuclear facility decommissioning, supervision of closed radioactive waste repositories, and some *permits*, for instance, on delivery of nuclear or nuclear fuel cycle material to the nuclear facility site, and the first tests using such material (a.k.a. hot tests).

Please note that the Lithuanian Government makes key decisions on the decommissioning of nuclear energy facilities and the design and construction of radioactive waste management facilities (repositories, storage facilities). Together with other government agencies, VATESI implements these decisions within its remit, i.e. by assessing the nuclear safety of the planned activities.

Public participation in VATESI decision-making is regulated by the Law on Nuclear Safety, and the Nuclear Safety Requirements BSR-1.1.5-2017 *Rules of Procedure for Public Participation in Decision-Making in the Area of Nuclear Energy* developed by VATESI.

Full information on how the public may participate and which decisions are open to public participation, as well as information on applications, draft decisions and decisions taken by VATESI is published on the VATESI website in the section [Public participation in decision-making](#). Municipal administrations and local residents in the vicinity of nuclear facilities are informed about specific draft decisions and the opportunity to participate in their adoption. Furthermore, reports are developed and shared with the national and regional media.

In 2022, the permitting process for the transportation of radioactive waste to the very low level waste repository and for the first testing of the repository systems using radioactive waste was completed. It was open to the public and stakeholder participation and to providing proposals regarding the documents developed. One proposal was received within the monthly period for consultation and submitting proposals provided for in the Law on Nuclear Safety, and VATESI replied to the

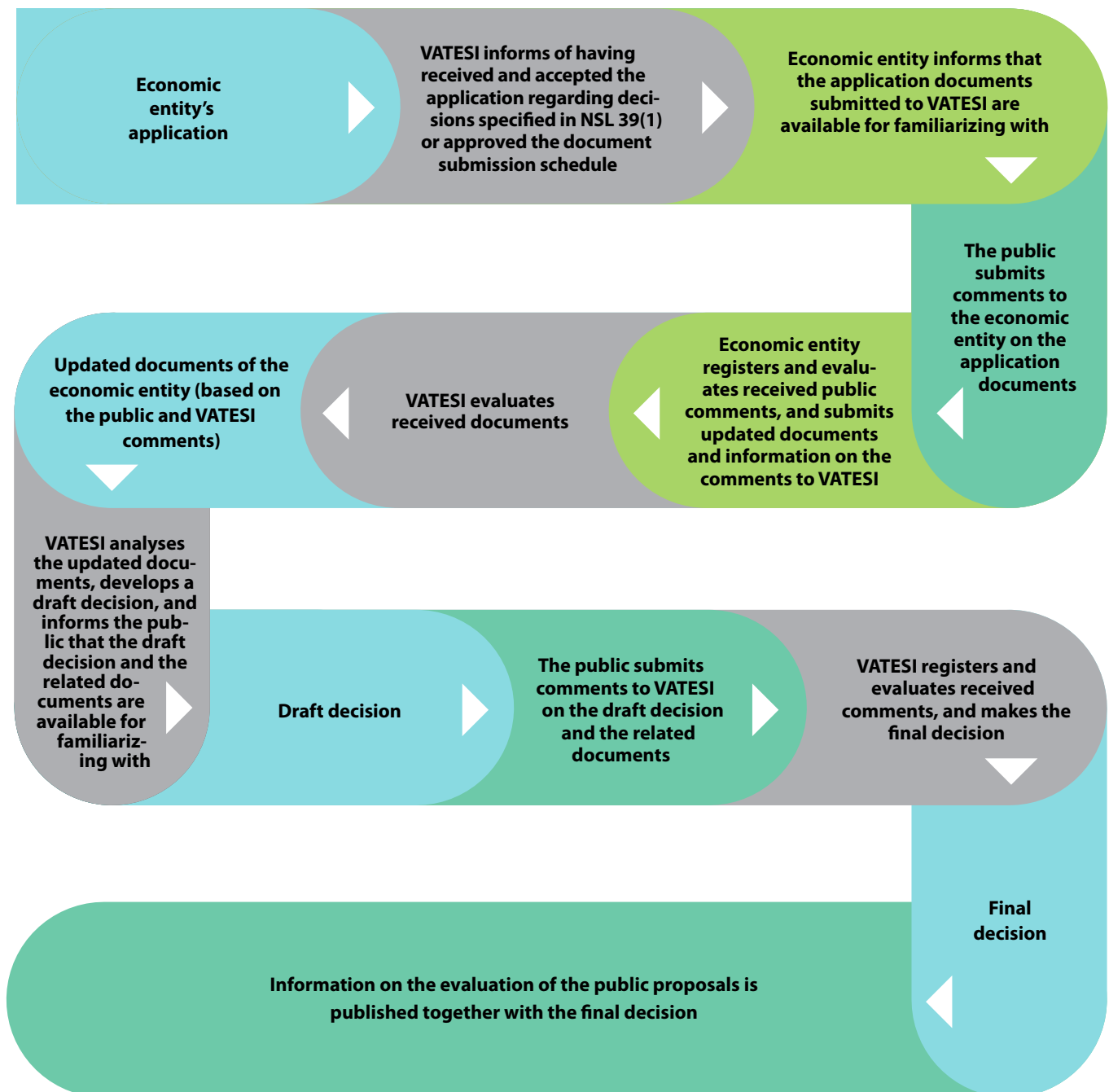


Radioactive waste brought for disposal in very low radioactive waste repository

proposal. VATESI took the final decision and issued Ignalina NPP the permit for the transportation of radioactive waste to the very low level waste repository and for the first testing of the repository systems using radioactive waste.

VATESI is currently evaluating documents justifying safety of an application for a NF decommissioning license submitted by Ignalina NPP. The public may have access to the submitted application documents on the website of Ignalina NPP or otherwise, and submit their written comments, information, analysis or proposals regarding these documents. Ignalina NPP must evaluate the provided information and, if needed, amend the documents submitted to VATESI. When the draft decision of VATESI is published, it is also accessible and available for submitting written proposals to VATESI. All the stages are presented in the flowchart of public participation in the decision-making process on page 49.

Flowchart of the public participation in decision making



Operating and under construction nuclear power plants in the neighbouring countries (distance from the border of Lithuania, km)



LIST OF ABBREVIATIONS

ARTEMIS	Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation	Maišiagala RWSF	Maišiagala Radioactive Waste Storage Facility
NPP	Nuclear power plant	MBA	Material balance area
NF	Nuclear facility	mSv	Millisievert (exposure measurement unit)
CNS	Convention on Nuclear Safety	SFSF-1	the first dry type Spent Fuel Storage Facility
Bq	Becquerel, the international measurement unit used to measure activity of radioactive material	SFSF-2	the second Spent Fuel Storage Facility
ENSRA	European Nuclear Security Regulators Association	RSC	Radiation Protection Centre
ENSREG	European Nuclear Safety Regulators Group	VATESI	State Nuclear Power Safety Inspectorate
EU	European Union	IAEA	International Atomic Energy Agency
ESARDA	European Safeguards Research and Development Association	USIE	IAEA Unified System for Information Exchange
EURATOM	European Atomic Energy Community	WebECURIE	European Community Urgent Radiological Information Exchange
Ignalina NPP	Ignalina Nuclear Power Plant	WENRA	Western European Nuclear Regulators Association
INES	International Nuclear and Radiological Event Scale	WGWD	WENRA Working Group on Waste and Decommissioning
IRRS	International Regulatory Review Service mission	RHWG	WENRA Reactor Harmonisation Working Group
ITDB	IAEA Incident and Trafficking Database	WLTC	Material balance zone accounting for material of the nuclear material holders that have no zones attributed by the European Commission

Nuclear Power Safety in Lithuania

ANNUAL REPORT 2022

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Photos are used from VATESI, INPP, IAEA, Ukraine Energoatom imagebanks

ISSN 2345-0169

An electronic version of the report has been prepared by

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V. Pietario str. 5-3, LT-03122 Vilnius, Lithuania

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