VATESI · 30

NUCLEAR POWER SAFETY IN LITHUANIA

ANNUAL REPORT 2021

CONTENTS

FOREWORD BY THE HEAD OF VATESI

Head of VATESI Michail Demčenko

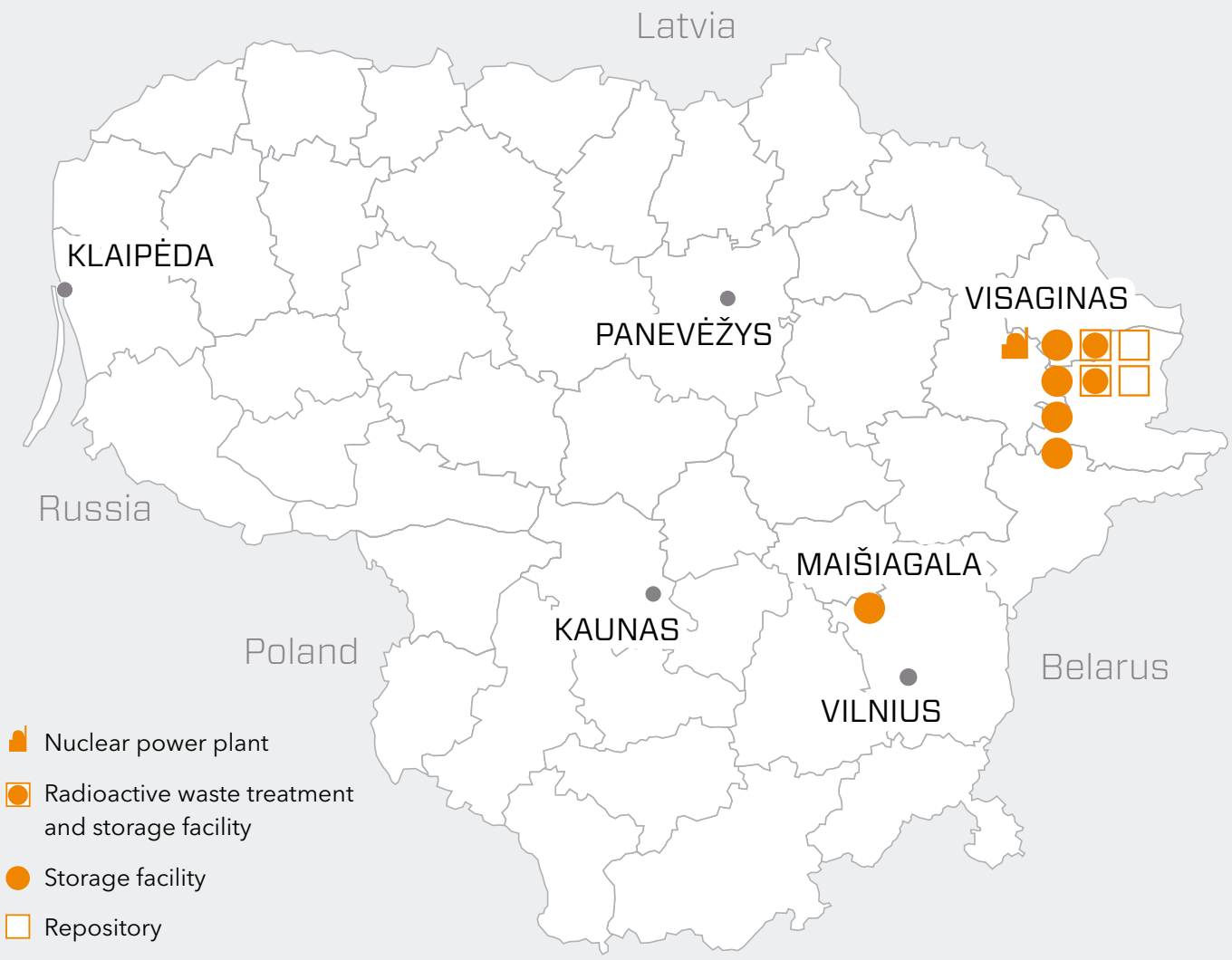
In 2021, the State Nuclear Safety Inspectorate celebrated its 30th anniversary. Over three decades of experience in safety regulation and the knowledge of its competent experts have helped VATESI to successfully address decommissioning of nuclear facilities, radioactive waste management, emergency preparedness, nuclear material control, nuclear security and other subjects related to the regulation and supervision of nuclear power safety, thus protecting the public and the environment from the harmful effects of ionising radiation. These subjects will remain relevant for a long time to come, because the decommissioning of the permanently shut-down Ignalina Nuclear Power Plant (Ignalina NPP) must be completed, the spent fuel and radioactive waste must be disposed of, and because we have Belarusian Nuclear Power Plant (Belarusian NPP) under operation close to our borders.

In 2021, 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 2021, Ignalina NPP recorded eight 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 barriers 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.

Declared a threat to Lithuania's national security, Belarusian NPP has started operating, however its erratic operation, equipment failures and the resulting unplanned outages show that the construction focus was on speeding up scheduled works rather than addressing safety issues. In order to respond to the information needs of the Lithuanian population and to protect it adequately, we assess information we get on unplanned outages of Belarusian NPP, verify facts, provide information to the public, reinforce our level of emergency preparedness, as well as strengthen our interaction with the other responsible authorities. Together with other authorities, we participate in international support projects which will shortly enable us to acquire the necessary tools for forecasting unusual radiological situations. We participated in Belarus National Action Plan Peer Review arranged by ENSREG on the implementation of the stress test recommendations at Belarusian NPP.

The priorities of VATESI activity remain the same in the near future: to supervise the safety of the permanently shut-down Ignalina NPP and its decommissioning activities, the safety during construction and operation of the radioactive waste management facilities, the compliance with international non-proliferation commitments undertaken by Lithuania, as well as to consistently upgrade the framework of nuclear safety regulation and supervision, and 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.

PROJECTED (UNDER CONSTRUCTION) NUCLEAR FACILITIES:

1. Very low level radioactive waste repository – Drūkšiniai, Visaginas m.
2. Low and intermediate level radioactive waste repository – Stabatiškės, Visaginas m.

STATE NUCLEAR POWER SAFETY INSPECTORATE (VATESI)

STATE NUCLEAR POWER SAFETY INSPECTORATE (VATESI)

State Nuclear Power Safety Inspectorate (VATESI) is a state authority that regulates and supervises nuclear safety and activities with sources of ionising radiation in this area. VATESI sets safety regulations and requirements, supervises compliance with them, issues licenses and permits, inspects and assesses performs nuclear facilities for safety, 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 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 ionising 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 activities,
- 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 points regarding the solution of 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 2021

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

To achieve the strategic goal, two effect criteria were set and achieved in 2021:

- In 2021, no unusual events of Level 2 and higher levels according to the International Nuclear Event Scale (INES) occurred in Lithuanian nuclear facilities (target value – 0),
- In 2021, there were no cases of use of nuclear material, nuclear dual-use items and ongoing research and development related to the nuclear fuel cycle in Lithuania for non-peaceful purposes (target value – 0).

STATE NUCLEAR POWER SAFETY INSPECTORATE (VATESI)

VATESI VISION

Public and the environment
reliably protected in accordance with the highest and modern safety standards

Nuclear safety regulation
explicit and prudent

Work at VATESI
highly respected, valued and motivating

VALUES

Responsibility

Cooperation

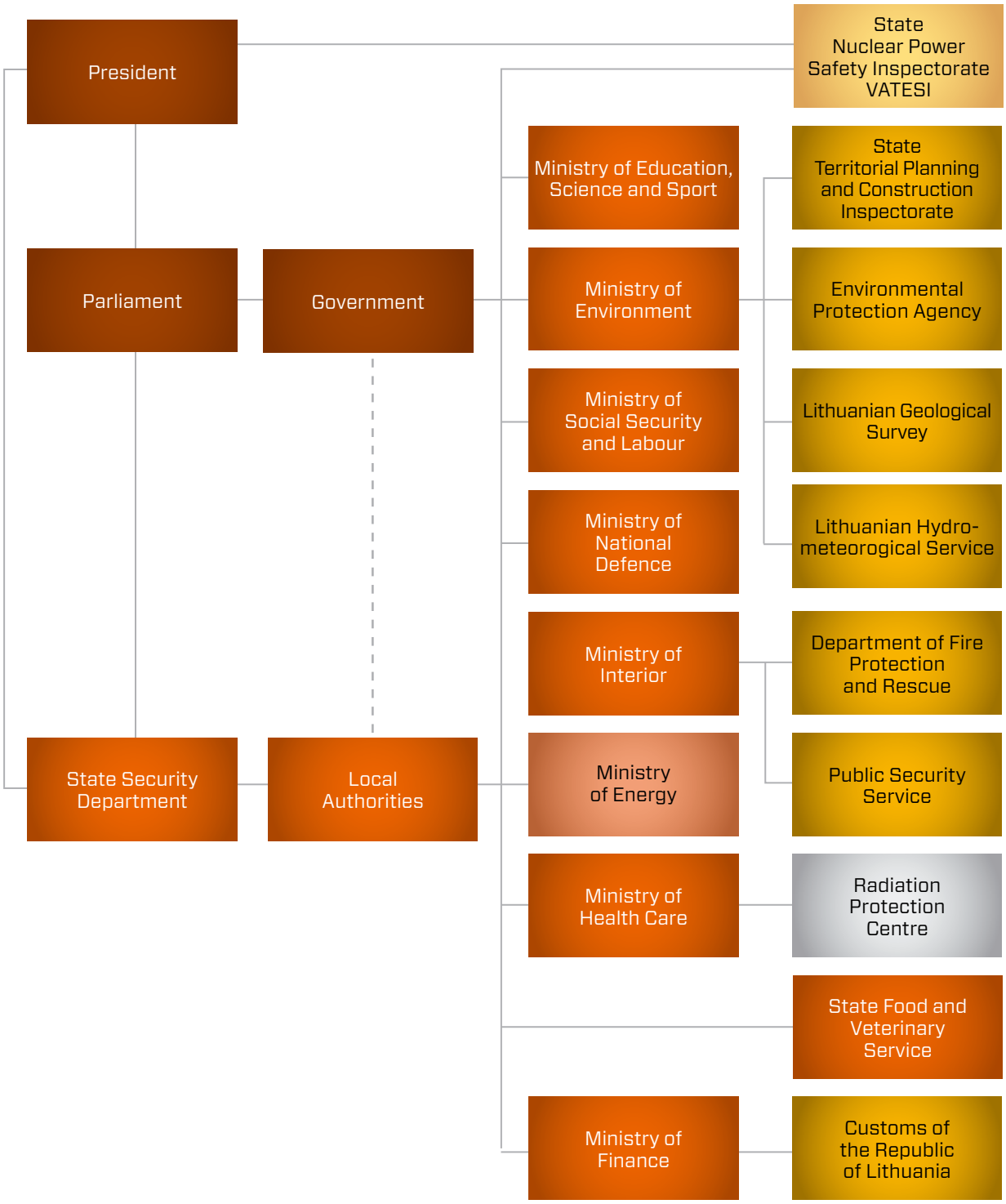
Competence

Openness to change

Integrity and impartiality

Transparency

NUCLEAR AND RADIATION SAFETY REGULATORY INFRASTRUCTURE IN LITHUANIA



To accomplish the mission and strategic goal of VATESI, the Programme of Nuclear Safety Regulation and Supervision (hereinafter referred to as the Programme) was implemented in 2021. The Programme had two objectives:

- To ensure effective state supervision of nuclear safety,
- To ensure proper state regulation of nuclear safety.

To accomplish the Programme objectives, two tasks were pursued and seven measures were provided to implement them.

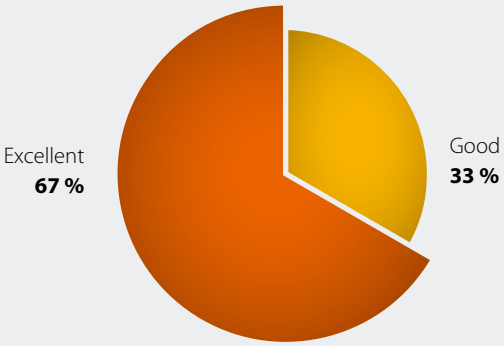
In 2021, to carry out the functions of state supervision and regulation of nuclear safety, and to implement the measures provided for in the Programme, VATESI:

- 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,
- Supervised the implementation of international nuclear non-proliferation obligations undertaken by Lithuania,
- Carried out licensing in the field of nuclear energy activities and made decisions on granting or amending licenses,
- Drafted legal acts regulating nuclear safety,
- Inspected activities of economic entities,
- Consulted economic entities,
- Participated in the analysis of the implementation of nuclear safety requirements in Belarusian NPP under operation.

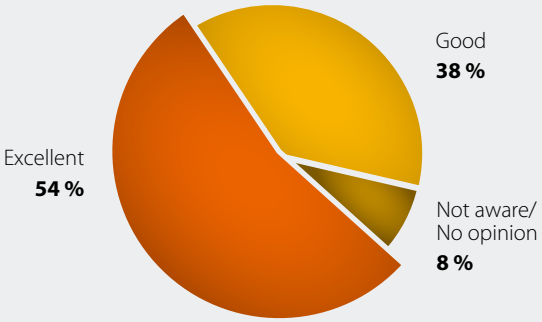
In 2021, stakeholders rated VATESI activities, the quality of administrative services and inter-agency cooperation as excellent and good. Moreover, economic entities noted that the services (licenses, permits, temporary permits or other services) were provided to them within the time period set by legislation, and that they were satisfied with the quality of information provided by consulting VATESI experts.

In 2021, all the Programme evaluation criteria were essentially achieved or exceeded. Thus, the achieved strategic goal demonstrates that VATESI properly performed the assigned functions of nuclear safety regulation and supervision, ensured a high level of nuclear safety in Lithuania and protected the public from the harmful effects of ionising radiation.

How do you rate VATESI performance?



How do you rate VATESI cooperation quality (please rate our partnership)?



KEY EVENTS IN 2021

- **24 February:** VATESI signed a tripartite cooperation agreement with the Fire and Rescue Department (FRD) under the Ministry of the Interior and the Norwegian Radiation and Nuclear Safety Regulatory Authority (DSA) on the implementation of the project *Development of an early warning system on nuclear emergency of Lithuania*.

- **1 March:** The International Atomic Energy Agency (IAEA) has submitted the report of the *Integrated Regulatory Review Service follow-up mission* (IRRS follow-up mission) to Lithuania.
- **29 March:** VATESI and the United States Nuclear Regulatory Commission (US NRC) signed another five-year *Arrangement for the Exchange of Technical Information and Cooperation in Nuclear Safety Matters*.
- **12 May,** VATESI participated in a national functional exercise on civil protection organised by the Ministry of the Interior and the Fire and Rescue Department.
- **13 May:** VATESI issued a licence to the State Enterprise Ignalina NPP for decommissioning of Maišiagala Radioactive Waste Storage Facility.
- **21 July:** VATESI submitted National Report on the implementation of the Council Directive 2011/70/EURATOM of 19 July 2011, establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste in Lithuania to the European Commission.
- **22 October:** VATESI issued a permit to Ignalina NPP to dismantle and decontaminate turbine hall box structures (turbine bases, floor structures, heat exchangers and turbine metal structures) of Ignalina NPP's Unit 1.
- **26-27 October:** VATESI experts took part in the ConvEx-3 international emergency preparedness exercise organised by the IAEA.
- **19 November:** A delegation of nuclear safety, radiation protection and radioactive waste management experts from the Republic of Moldova visited VATESI.
- **24 November:** The final peer review report on the implementation of the stress test recommendations of the Belarusian NPP was discussed and approved at the meeting of the European Nuclear Safety Regulators Group (ENSREG). VATESI urged Belarus to implement all the recommendations of the stress test report without delay.
- **9 December:** VATESI organised a remote conference "Challenges of Nuclear Safety Regulation" to celebrate the 30th anniversary.

During functional exercise

VATESI 2021 IN NUMBERS

11
Holders of supervised nuclear material

18
Violations detected and eliminated

62
Inspections of economic entities

58
VATESI employees

72
Consultations provided

0
Level 1 and higher events according to INES

17
Licenses and permits in the supervised area of nuclear safety

41
Licenses or temporary permits for activities with ionising radiation sources

100 %
VATESI performance evaluation by economic entities (excellent and good)

87 %
Quality of consultations (excellent and good)

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 reasonably by constantly monitoring, measuring and evaluating performance, and to make appropriate management decisions in a timely manner to improve performance.

Performance indicators of supervision carried out by VATESI in 2021 are presented in the table below.

Performance indicators of supervising economic entity activities	2021	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 2021 was acceptable.
Radiation protection: The number of Level 1 events under INES scale, related to radionuclide emissions and exposure to ionising radiation – no more than 1.	0	The level of radiation protection in 2021 was acceptable.
Physical security: 1. The number of events related to the loss of control of nuclear and nuclear fuel cycle material, sources of ionising radiation used in the activities in the field of nuclear energy with sources of ionising radiation (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 2021 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 2021 was acceptable.

In 2021, 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 in 2021 it was not exceeded. The inspection burden on other economic entities is small and proportionate to their activities, therefore no inspection burden indicator has been set for them.

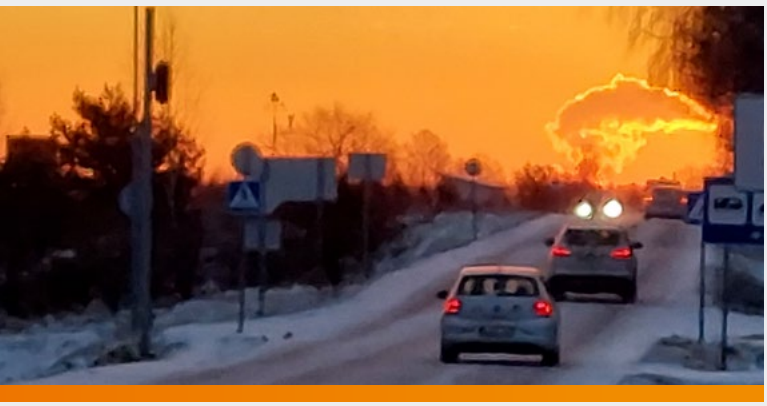
VATESI ROLE IN THE CIVIL PROTECTION SYSTEM

Civil protection is an activity that covers the preparation of government and local agencies, authorities, economic entities and population for emergencies, actions taken when they are at risk of occurring or have occurred, response to emergencies and mitigation of their consequences. Civil protection in Lithuania is regulated by the Law on Civil Protection and other legal acts implementing the law. 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 accordance with the *National Plan for Protection of Population in Case of Nuclear of Radiological Accident* (hereinafter referred to as the Plan). 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 (NFs), and informs interested international and Government institutions or authorities on the technical accident circumstances and forecasts of the accident course, on the mitigation measures undertaken, on 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 on the NF status, on the hazard level of a nuclear or radiological accident at the NF, on 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 put into practice the skills of the entities 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 2021, members of the Centre attended three international level emergency preparedness exercises, and four international communication drills. They improved their qualifications during emergency preparedness and civil protection trainings organised by the Civil Protection Training Centre of the Fire Fighters Training School, and during the IAEA trainings.

In May 2021, members 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 Belarusian NPP*, organised by the Fire and Rescue Department under the Ministry of the Interior. The exercise purpose was to assess the readiness of the 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 Belarusian NPP. All Lithuanian municipal administrations and 17 Government authorities attended the exercise.

In October 2021, together with the Fire and Rescue Department, the Radiation Protection Centre and the Ministry of the Interior, VATESI Emergency Operations Centre, participated in the ConvEx-3 exercise organised by IAEA. The purpose of this exercise is



Belarusian NPP steam rising from cooling tower observed in vicinity of Vilnius region

to test the feasibility of implementing the provisions of the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency in the event of a radiological or nuclear accident. IAEA organises such exercises every three years. The exercise simulated a nuclear accident at Barakah NPP (United Arab Emirates) which released radioactive material into the environment. The exercise scenario tested the ability of the experts of VATESI Emergency Operations Centre to exchange information remotely in line with the procedures of the Convention on Early Notification of a Nuclear Accident, and with the legislation regulating information exchange in case of a nuclear or radiological accident.

In 2021, VATESI implemented measures included into VATESI Emergency Prevention Plan 2019–2021, to prevent the risk of fire, of communicable diseases, of disruption and/or failures of electronic communications and/or communication systems, including the ones caused by cyber attacks, of heat supply disruptions and/or failures during the heating season. Moreover, VATESI implemented measures to prepare for the national level management of emergencies related to nuclear accidents. At least once a week throughout 2021, the Centre organised the Centre briefings on the threat of a State-level emergency due to the spread of COVID-19 to ensure the safety of VATESI staff and the continuity of the authority's activities, as well as to implement the decisions of the State Commander of National Emergency Operations and the Lithuanian Government.

Belarus NPP, which started operating in 2021 in the neighbouring country, exhibited erratic operation, equipment failures and unplanned shutdowns. 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, and the authority's level of emergency preparedness was reinforced, and the interaction with other responsible authorities was strengthened.

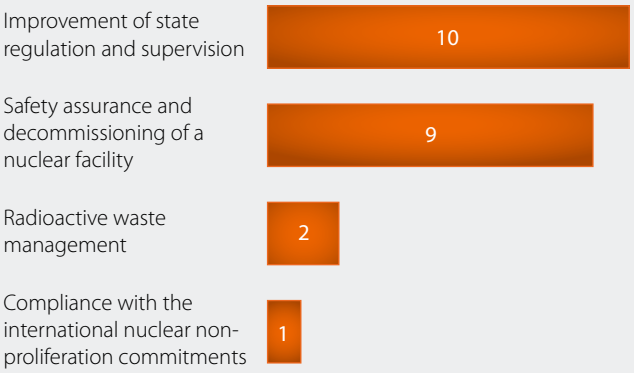
To assess the possible radiological impact of Belarusian NPP on Lithuania, information on the design of Belarusian NPP has been examined in line with Article 17 of the Convention on Nuclear Safety, and conclusions that most of the information requested by Lithuania had not been provided were submitted to the Ministry of Emergency Situations of Belarus.

VATESI kept corresponding with the Ministry, to reiterate the earlier safety issues and to focus on the new safety issues raised during the peer review of the stress test report on Belarusian NPP. The incomplete answers provided by the Ministry were analysed and used to provide conclusions and information for Lithuanian stakeholder authorities and the public at large.

CHANGES IN NUCLEAR SAFETY REGULATION

Proper legal regulation is an essential precondition for an adequate nuclear safety assurance system. VATESI aims to make it clear and consistent, timely responsive to changes in the nuclear energy activities and the changes in the threat profile posed by such activities.

Number of legal acts adopted and amended in 2021 by the area of supervision




LITHUANIA
BELARUS
CONSTRUCTION SITE
Molėtai
Vilnius region has more than 900 thou. residents
Ignalina
Švenčionys
Pabradė
Construction site was not selected under international treaties and IAEA safety standards
Consultation with neighbouring states is not closed
Rises potential risk for 1/3 of population in Lithuania and crucial to government authorities
Not properly investigated
Full scope IAEA SEED mission is not accomplished
NUCLEAR POWER PLANT
Resistance to the impact of a heavy aircraft crash is not secured
Stress tests recommendations are not implemented
Probabilistic safety analysis is not properly accomplished
International practices and recommendations concerning designs of new nuclear power plants and
Elektrėnai
VILNIUS
40 km
Lithuania border – 23 km
Belarus NPP in Ostrovets
Lentvaris
100 km
30 km
Smurgainys
Šalčininkai
Eišiškės
Unit 1 was put into operation without the preparation of all the operating procedures
The commercial operation of Unit 1 started without the preparation of the final safety analysis report
Compliance with technical documents is not being ensured
Construction works quality is not properly controlled
Low level of safety culture
Construction works are performed violating principles of transparency and openness, information on incidents is not being presented
156 km
CONSTRUCTION AND OPERATION
MINSK

Progress in reducing the burden on economic entities

VATESI seeks to reduce unnecessary administrative burden on economic entities, although in some cases this goal is difficult to achieve due to new activities and the need to implement EU legislation, international treaties and IAEA documents. In 2021, the administrative burden on economic entities decreased by EUR 421.66.

ISSUED LICENSES AND PERMITS

In 2021, VATESI analysed six applications for licences and permits for the nuclear energy activities related to nuclear facilities and nuclear fuel cycle, and nuclear and fissile materials referred to in Articles 22.1 and 22.2.1-22.2.5 of the Lithuanian Law on Nuclear Safety. Two licences and one permit were issued. Moreover, two licences were amended, and the lists of documents justifying the safety of licensed activities were updated and approved.

In 2021, VATESI issued six licenses in the area of nuclear energy activities with sources of ionising radiation, and one temporary permit for activities in the ionising radiation environment at a nuclear facility. Moreover, VATESI revoked one licence and lifted suspension of another license based on the requests of license holders.

The goals of VATESI's activities include ensuring the safety of transportation of nuclear fuel cycle, nuclear and fissile material. The transportation entities are licensed following an assessment of their readiness to carry out such activities as required. Before issuing permits to transport such material, the holders of the nuclear fuel cycle material are assessed for their readiness to transport nuclear fuel cycle, nuclear and fissile material in the required packages in line with the safety documents and recommendations.

To get a transportation permit for radioactive material and radioactive waste classified as nuclear material, VATESI must approve applications for transportation permits that are later issued by the Radiation Protection Centre (RSC). The same procedure applies in case a permit is requested by an entity operating or decommissioning a nuclear facility, or by an entity engaged in activities with radioactive sources in a nuclear facility or at its site. In 2021, VATESI analysed and approved nine applications for transportation permits of radioactive material classified as nuclear material. Of these, seven were related to transportation of radioactive material and two were related to transportation of radioactive waste. The applications specified transportation of calibration and sealed sources, as well as dosimeters containing plutonium, americium, thorium and depleted uranium.

In 2021, no violations were found during the processes of supervising licensed activities and activities regulated by permits and temporary permits, which would have led to the suspension of a license, permit or temporary permit or revocation of an issued license, permit or temporary permit.

The constantly updated lists of licenses, permits or temporary permits 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 not to increase the unjustified burden on the economic entities. 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 2020, to consistently plan inspections of economic entities and the allocated resources, VATESI developed the Inspection Programme for 2021-2025. The Programme was developed after evaluating the supervision experience of previous years and taking into account the planned needs of economic entities regarding licenses or permits and planned activities: equipment dismantling and modifications, recognition of nuclear facilities as suitable for operation, etc.

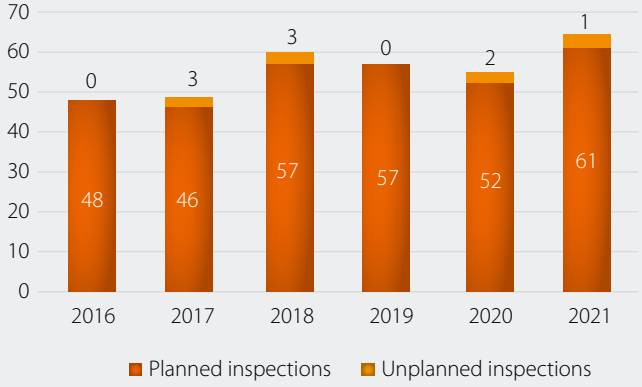
Inspections

VATESI inspects economic entities in the areas of nuclear safety, radiation protection and physical security, and in areas related to the compliance with requirements arising from the international non-proliferation commitments of Lithuania.

According to the planning aspects, VATESI inspections are grouped into planned inspections carried out under a pre-approved schedule, and unplanned inspections.

In 2021, a total of 62 inspections were carried out (54 in 2020), including 61 planned, and one unplanned inspection.

Number of inspections completed by VATESI employees in 2016-2021



Inspection

The highest number of inspections, namely 49 (in 2020 – 46), was performed at Ignalina NPP. These inspections focused on examining the following: the maintenance of structures, systems and components of permanently shut-down units of Ignalina NPP important to safety; the implementation of safety requirements during dismantling and decontamination of equipment redundant in terms of safety, during spent nuclear fuel and other radioactive waste management and during the transportation of nuclear material; the assurance of physical security and radiation protection, fire safety and cybersecurity of nuclear facilities and nuclear material, emergency preparedness and non-proliferation control; and Ignalina NPP employee training and ensuring their competencies.

In 2021, VATESI employees carried out three technical checks of Ignalina NPP's maintenance of pressure components important to safety, and the assessment of the technical condition of the inspected equipment. These cases included inspections of the external and internal visual checks and hydraulic tests of evaporators. The technical checks carried out in 2021 did not reveal any violations or non-compliance with best practice.

In 2021, VATESI employees twice inspected Dekra Industrial, UAB, where they verified the implementation of nuclear material accounting and control, as well as compliance with radiation protection requirements for the use and storage of ionising radiation sources. The following were inspected once: SMT Group, UAB, to check the

Inspection

inventories of nuclear material stored there, as well as Kranų Technika, UAB, Svertas Group, UAB, Neonaksa, UAB, Elklita, UAB, NOVATEX, UAB, the public institution Central Project Management Agency, Techpromas, UAB, Montuotojas, UAB, Corpus A, UAB, and Monrema, UAB, to check compliance with radiation protection requirements when engaging in activities in radioactive environment;

37 VATESI employees participated in the inspection activities, with the average duration of four hours per inspection (four hours in 2020).

In 2021, inspections identified seven violations and 11 minor violations of legal requirements (hereinafter – minor violations) (nine were identified in 2020). All the violations were rectified at the time of inspections or 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, lifting equipment important to safety, decommissioning, and emergency preparedness. These violations had no direct harmful effect on people and the environment, but were related to the prevention of such effect and therefore they needed to be timely rectified in line with the measure plan approved by VATESI. The violations were rectified by Ignalina NPP in a timely and proper manner.

Assessment of supervision of economic entity activities

Since 2018, VATESI has participated in the progress (scoreboard) assessment of the agencies supervising economic entity activities, with the main goal to improve the business supervision system in Lithuania in order to ensure the prevention of unreasonable burden on economic entities resulting from supervision.

In 2021, the progress index of VATESI was rated at 8.53 points (No. 8 of 47) in the *Progress Report on Institutions Supervising Economic Entities (Business Supervision Scoreboard)*, developed by the Ministry of Economy and Innovation. Taking into account the peculiarities of nuclear energy activities, VATESI will keep striving to apply progressive measures for supervising economic entities.

SUPERVISION OF ACTIVITIES OF PERMANENTLY SHUT-DOWN IGNALINA NUCLEAR POWER PLANT AND OTHER NUCLEAR FACILITIES

SUPERVISION OF ACTIVITIES OF PERMANENTLY SHUT-DOWN IGNALINA NUCLEAR POWER PLANT AND OTHER NUCLEAR FACILITIES

CONFIGURATION, CONDITION AND MAINTENANCE OF OPERATING STRUCTURES, SYSTEMS AND COMPONENTS IMPORTANT TO SAFETY

In 2021, in line with the decommissioning project and the technical solutions, modifications and their safety justification approved by VATESI, Ignalina NPP continued the isolation, decontamination and dismantling some structures, systems and components which did not perform safety functions and were no longer needed. The unloading of spent nuclear fuel from fuel storage pools and transportation to the spent fuel storage facility (SFSF-2) was continued in both Ignalina NPP units. On 11 May 2021, the last container with damaged spent fuel was transported from Ignalina NPP Unit 1 to the SFSF-2, having left Unit 1 free from spent fuel assemblies. Until all the spent nuclear fuel is removed from fuel storage pools of Unit 2 to the storage facility, ensuring the functionality of the systems that transfer heat from spent fuel and ensuring the proper technical condition specified in their design will further be required.

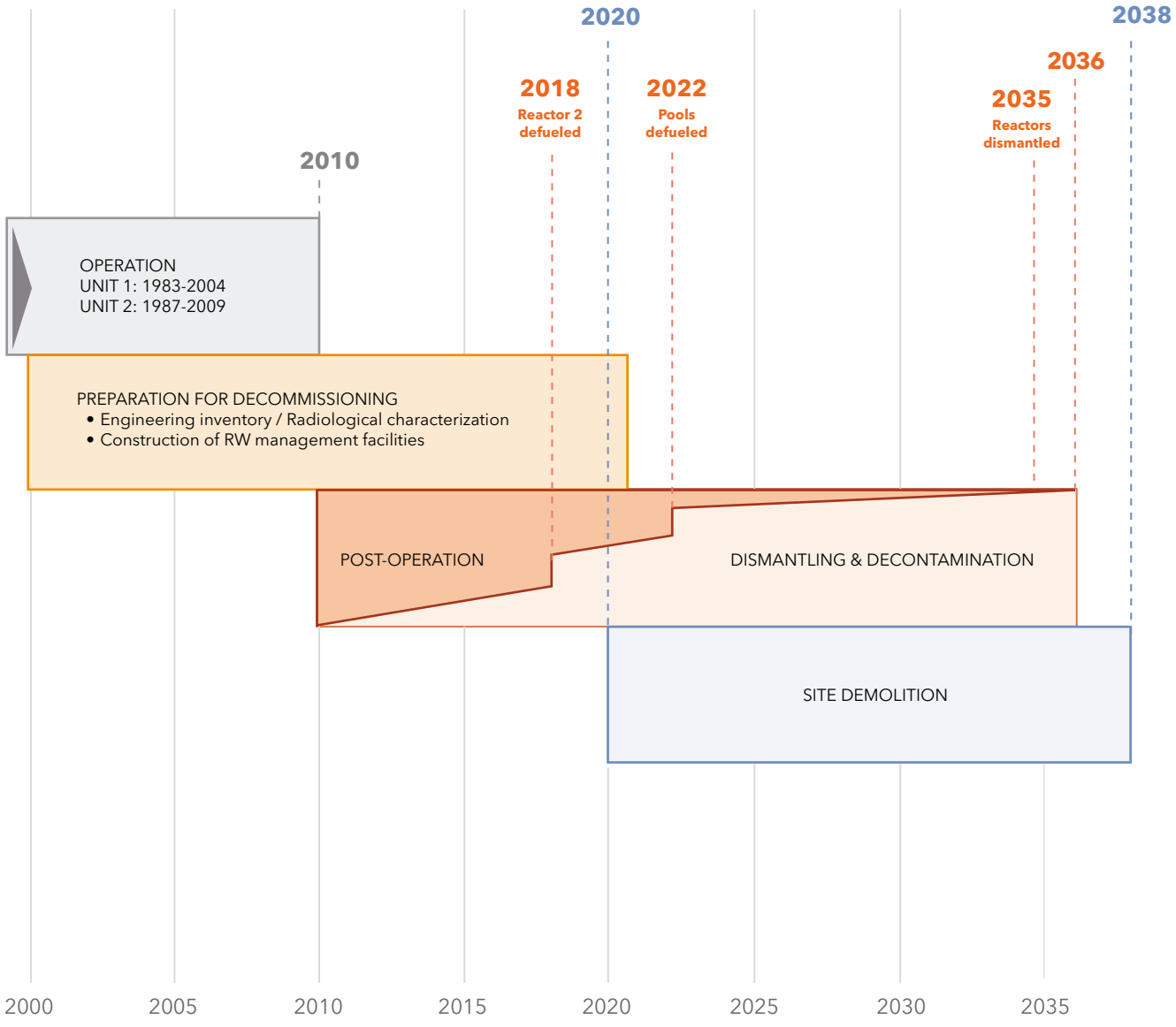
In 2021, VATESI developed additional provisions for nuclear safety requirements to reduce the potential for fires at radioactive waste management sites, so that adequate preparations were made to extinguish them and reduce their potential radiological consequences. These provisions were added to the Nuclear Safety Requirements BSR-3.1.2-2017: *Pre-disposal management of radioactive waste at nuclear installations*.

In 2021, in line with the Nuclear Safety Requirements BSR-1.8.8.8-2020: *Lifting devices and their equipment important to safety of the nuclear facility*, VATESI assessed and approved the certification instruction and requalification programmes for Ignalina NPP employees performing lifting works, and supervised the certification of employees using lifting equipment and the related devices important to safety. In line with BSR-1.8.8-2020, VATESI reviewed the updated instructions for the operation of lifting equipment and the related devices important to safety, undertook planned inspections of the operation and maintenance of lifting equipment, the related devices and lifting accessories important to safety at Ignalina NPP units, as well as at the Solid Radioactive Waste Retrieval Facility (project B2).

In 2021, VATESI analysed and approved the revised *Operating Regulations for the Solid Radioactive Waste Retrieval Facility* (project B2-1 and project B2-2) and the *Operating Regulations for the Solid Radioactive Waste Management Facility*, as well as the lists of systems important to safety for Unit 1, for Unit 2 and for the common facilities of Ignalina NPP.

Ignalina NPP

IGNALINA NPP
DECOMMISSIONING SCHEDULE



In 2021, VATESI focused on inspections of the maintenance and functionality of spent fuel storage pools, structures important to safety, ventilation, fire protection, lifting equipment and systems, as well as fire safety of systems, structures and components important to safety. To assess fire safety, the experts analysed and evaluated the safety justification reports for the dismantling of the radioactive equipment of Ignalina NPP, which substantiated that fire safety and containment of radionuclides would be ensured during the dismantling works.

As in previous years, VATESI supervised the compliance with ageing management requirements at Ignalina NPP, the maintenance and repair of systems and components important to safety, if worn-out components were replaced with new ones, the condition assessment of the operated equipment, and the remaining service life of its systems and components (how long they would be maintained). In 2021, VATESI analysed and evaluated the list of Ignalina NPP nuclear facilities, structures, systems and components the ageing of which needed management. They further evaluated the initial assessment reports of the technical condition and remaining service life of the systems and components of the Solid Radioactive Waste Management and Storage Facility, the aging of which must be managed. Moreover, VATESI analysed and evaluated the list of physical security structures, systems and components the ageing of which needed management, and evaluated the reports on the initial assessment of the technical condition and remaining lifetime of physical security structures, systems and components that needed ageing management.

Having analysed the documents submitted by Ignalina NPP in 2021 that justified safety of structures, systems and components important to safety, and having carried out inspections and evaluated the information collected during them, VATESI noted that in 2021, the condition of structures, systems and components important to safety of Ignalina NPP was acceptable.

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, 155/1, 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.

In 2021, 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. Moreover, VATESI commented on the Periodic Safety Assessment Report for Ignalina NPP Unit 2 that described the status of the operated equipment, justified the proper performance of its functions until the next periodic safety assessment and provided for safety improvement measures, if necessary.

In 2021 an agreement was reached that remote equipment would be used to dismantle heavily contaminated equipment, and that the B class radioactive waste pre-treatment site in Unit A1 could be used only after their safety justification. After that, dismantling and decontamination projects for the equipment in Unit 1 (water lines below and above the reactor, reactor coolant cleaning system,

forced circulation circuit, main circulation pumps, steam separators, fuel reloading complex and other equipment highly contaminated with radionuclides) were approved, as well as their safety analysis reports.

To prepare Building 117/1 (which housed the emergency cooling system for the Unit 1 reactor) for demolition, the project for the dismantling and decontamination of the engineering systems and remaining equipment was approved in 2021, as well as its safety analysis report.

Before the start of operation of Short-Lived Very Low Level Radioactive Waste Repository of Ignalina NPP in 2021, with the full buffer storage facility and with filled up temporary waste storage areas installed in the units, the safety justification for the operations in the units was approved in 2021 for the installation of new interim waste storage areas.

In 2021, VATESI analysed and approved the historical assessment and the final radiological survey programmes of the redundant and disused storage facility for household materials on the Ignalina NPP site together with its associated gallery, as well as the reports on the works completed under these programmes that justified that these structures were free from radiation exposure.

In 2021, after inspecting the equipment in the unit in line with the above project and after being satisfied that the organisational, radiation protection and technical measures were in place and that the staff carrying out the works were trained and ready, VATESI authorised the start of the project works.

Moreover, consultations continued on the decommissioning of Maišiagala Radioactive Waste Storage Facility, where radioactive waste from the medical, scientific and industrial sectors was stored.

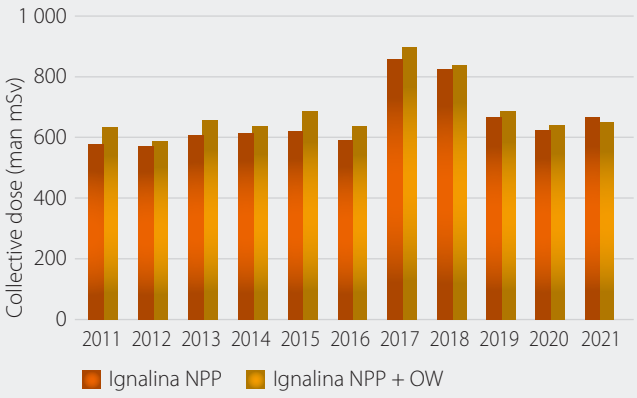
Other dismantling and decontamination works were carried out according to separately developed and approved projects, and their outcomes were checked.

OCCUPATIONAL RADIATION PROTECTION

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

In 2021, the collective dose of Ignalina NPP staff and outside workers was 654.74 man mSv (Ignalina NPP staff – 643.78 man mSv, outside workers – 10.96 man mSv). Compared to 2011-2020, in 2021, the collective occupational dose did not change significantly and is on the similar level. As in the last few years, the highest exposure of workers was caused by the works performed by the operational workers of the Spent Nuclear Fuel Department in the spent nuclear fuel storage pool hall, hot cell repair works, 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 2011-2021



In 2021, 2,096 Ignalina NPP and outside workers were monitored for individual exposure. The highest individual annual dose of an Ignalina NPP worker was 14.12 mSv, the highest individual annual dose of an outside worker was 1.0 mSv. The annual exposure doses of Ignalina NPP staff and outside workers did not exceed the annual effective dose limit of 20 mSv, established in Lithuanian Hygiene Standard HN 73: 2018.

IMPLEMENTATION OF NUCLEAR SAFETY IMPROVEMENT MEASURES

In 2021, VATESI supervised the implementation of safety improvement measures specified in the Safety Improvement Programme of Ignalina NPP.

To extend the operation of the structures, systems and equipment of the liquid radioactive waste processing complex, Ignalina NPP has developed an operation extension plan. It was a document to be used for assessing the supporting structure condition of the structures, systems and equipment of the liquid radioactive waste processing complex. Moreover, Ignalina NPP both justified the decision to stop, and stopped using the measures for the bituminisation of residual liquid radioactive waste, and implemented measures for radiochemical analyses and spectrometric measurements to evaluate new methodologies for the determination of radionuclide activities, as well as modified the SFSF-2 hot cell to handle three types of containers. In order to improve the control of radioactive staff contamination, whole-body contamination monitoring devices were approved and put into operation in 2021.

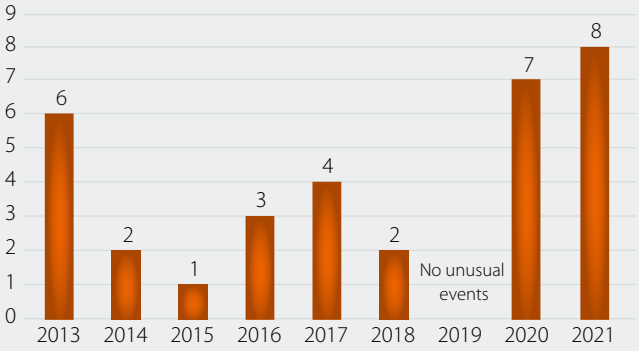
OPERATIONAL EXPERIENCE FEEDBACK

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 nuclear facilities is continuously analysed. In 2021, 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 2021, eight unusual events were registered at Ignalina NPP, which had to be reported to VATESI based on the requirements set by VATESI. During the registered unusual events, neither the barriers stopping radionuclides and/or inhibiting ionising radiation were breached, nor the level of occupational exposure and indoor contamination with radionuclides exceeded the established permissible limits, nor radionuclides were released into the environment, nor these events affected nuclear safety. According to the International Nuclear and Radiological Event Scale (INES), the unusual events that occurred in 2021 were classified as *Below Scale Level / Level 0*. The low number of unusual events and the fact that they did not affect safety demonstrated that an adequate level of nuclear safety was ensured at Ignalina NPP.

In 2021, VATESI Standing Commission for the Analysis of Unusual Events and Operational Experience had 11 meetings. During the meetings, the Commission analysed reports on unusual events at Ignalina NPP and other Lithuanian nuclear facilities. 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 the improvement and assurance of safety at the nuclear facilities of Ignalina NPP.

Unusual events to be reported that occurred at Ignalina NPP in 2012–2020



IGNALINA NPP MANAGEMENT SYSTEM, 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 build

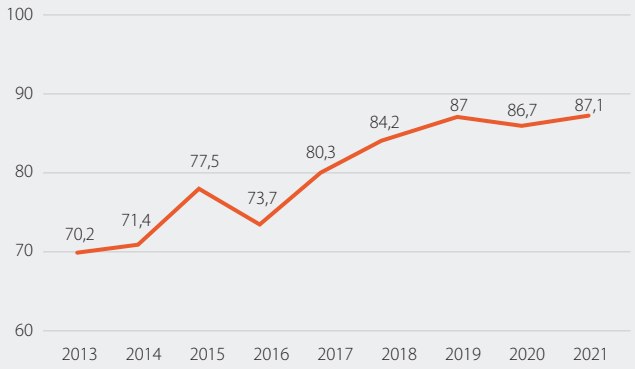
the organization culture. When it comes to the organization's safety and security culture, the aim is to focus all the factors on the main priority of the organization, namely the safe operation.

In 2021, a plan of development measures for safety and security culture was drawn up and implemented. Under the plan, the employees were anonymously surveyed on safety culture, indicators of safety and security culture and their changes were analysed on a quarterly basis and the results were discussed at management meetings; 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 2021, 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 2021, the target safety culture indicator was minimum 84%. This objective was achieved, as in 2021, the safety culture status indicator exceeded 86%.

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 the nuclear power 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 2021, 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 2021, 1,550 staff were trained and certified, including 163 managers, 776 specialists, 593 workers, and 10 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 2021, VATESI inspected competence assurance of Ignalina NPP employees. No violations or non-compliances were found within the scope of the information analysed in the area of employee competence assurance.

IGNALINA NPP EMERGENCY PREPAREDNESS

The risk of incidents and accidents constantly changes during the decommissioning of Ignalina NPP power units, as well as in preparation for the operation of new radioactive waste management and storage facilities. To ensure the preparedness and capabilities

to respond to potential accidents and incidents, Ignalina NPP must continuously assess potential threats and update the emergency preparedness plan together with the accompanying instructions and procedures accordingly. In 2021, the emergency preparedness plan of Ignalina NPP and its instructions were reviewed and updated subject to Lithuanian laws and other implementing legal acts regulating emergency preparedness and civil protection, taking into account the readiness to operate new nuclear facilities, the organisational changes implemented at Ignalina NPP, as well as the experience gained from the emergency preparedness exercises.

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.

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. During 2021, 21 training courses and two exercises were organised for the staff of the Emergency Preparedness Organisation of Ignalina NPP. On 29 January 2021, the table-top exercise *Detection of an unshielded radioactive capsule of STEBEL 3M in Section 6 of Maišiagala Radioactive Waste Storage Facility during radioactive waste disposal operations* was held. The functional exercise *Actions taken by the Emergency Preparedness Organisation of Ignalina NPP in case of a simultaneous occurrence of a beyond-design and design basis accidents at different nuclear facilities: Unit 2 and the Short-Lived Very Low Level Radioactive Waste Disposal Facility (B19/2)* was conducted in November 2021.

To implement the provisions of the Law on Nuclear Energy, which oblige licensees to analyse the consequences of nuclear and radiological emergencies of NFs, Ignalina NPP developed a consequence analysis report on the nuclear and radiological emergencies at all of the nuclear and radiological facilities it owns, and submitted it to VATESI for evaluation in 2021. VATESI reviewed and approved it. In 2021, Ignalina NPP developed and started 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 entered into force on 1 November 2021. Having taken into account the results of the consequence analysis of nuclear and radiological emergencies at the NFs of Ignalina NPP, and in line with the Plan, Ignalina NPP will review the current emergency preparedness categories of the NFs of Ignalina NPP and assess their updating needs. In line with the other measures of this Plan, Ignalina NPP will review and revise the emergency preparedness documents related to management of beyond-design basis accidents and the mitigation of their consequences. The works under the Measure Plan are to be completed in 2022. The consequence analysis of the potential nuclear and radiological emergencies at the NFs of Ignalina NPP was aimed at assessing the risk to the national population posed by the Lithuanian NFs in operation and under construction in the event of potential nuclear and radiological emergencies. The analysis results were used to establish emergency preparedness categories of the NFs of Ignalina NPP that would allow the state and municipal authorities and institutions to plan for specific measures related to population protection activities in the event of possible nuclear and radiological emergencies at the NFs of Ignalina NPP.

In 2021, 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 one minor violation that was rectified during the inspections. No other violations or non-compliances were found during the inspections.

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 2021 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 2021, the highest share of the activity of radionuclides released into the atmosphere represented the activity of C-14 radionuclide ($2.242 \cdot 10^{10}$ Bq/year). Compared to 2020, ($1.050 \cdot 10^{11}$ Bq/year), the activity of this radionuclide reduced. As the controlled nuclear reaction that had generated inert short-lived radioactive aerosols and radioactive iodine nuclides (I-131) had stopped in both reactors, thus upon disintegration of the balance nuclides they were no longer released into the atmosphere.

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 facility 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 insignificant and constituted only a very small portion of the dose constraint.

In 2021, 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 materials 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 2021 the preparatory decommissioning works of Ignalina NPP and works of dismantling and decontamination projects of the units were performed safely.

Activities of radionuclides released to the environment from Ignalina NPP 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	$2.732 \cdot 10^{10}$	17.71	$1.374 \cdot 10^{-6}$	0.69
To the water	$3.10 \cdot 10^{10}$	0.21	$4.931 \cdot 10^{-7}$	0.25
Total	**$5.83 \cdot 10^{10}$**	**17.92**	**$1.87 \cdot 10^{-6}$**	**0.94**

SUPERVISION OF RADIOACTIVE WASTE MANAGEMENT

SUPERVISION OF RADIOACTIVE WASTE MANAGEMENT

Radioactive waste management includes the processing, transportation, 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 company is a radioactive waste manager responsible for the final disposal of waste and the operation of radioactive waste repositories.

VATESI is the key authority regulating radioactive waste management safety that sets requirements governing the classification of radioactive waste and waste management safety at NFs. It licenses radioactive waste management facilities, and supervises compliance with legal requirements through 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 2021, damaged spent fuel was treated that was stored in the spent fuel storage pools of both Ignalina NPP units. CONSTOR RBMK1500/M2 containers with spent fuel were further delivered to the Second Spent Fuel Storage Facility (hereinafter referred to as SFSF-2). The last containers of damaged spent fuel were removed from the Unit 1 storage pool and placed in SFSF-2. The fuel handling equipment was moved from the Unit 1 storage pool and installed in the storage pool of Unit 2. In June 2021, management of the damaged spent fuel and its transfer to SFSF-2 started.

Container with spent fuel is transported to the storage facility

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

The First Spent Fuel Storage Facility (SFSF-1)

The spent nuclear fuel dry storage facility (SFSF-1) operated in the territory of Ignalina NPP is completely full. 118 containers (20 CASTOR RBMK-1500 and 98 CONSTOR RBMK-1500 containers) 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.

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. Taking into account the documents and records on the operation of the storage facility, as well as the results of inspections conducted by VATESI in 2021, protective containers with spent nuclear fuel were leak tight.

The Second Spent Fuel Storage Facility (SFSF-2)

In 2021, in line with SFSF-2 modification approved by VATESI, Ignalina NPP upgraded the CONSTOR RBMK-1500/M2 container handling equipment in the hot cell of SFSF-2. Additional equipment for the CASTOR RBMK1500 and CONSTOR RBMK1500 containers in SFSF-1 was manufactured to enable their transfer from SFSF-1 to the hot cell in SFSF-2 for fuel transfer and other remedial work. At the end of 2021, the equipment in the SFSF-2 hot cell and the additionally manufactured equipment was tested to demonstrate the capability to handle three types of containers in the SFSF-2 hot cell: CASTOR RBMK1500, CONSTOR RBMK1500, and CONSTOR RBMK1500/M2 containing spent fuel. This ensured the possibility to transfer the spent fuel to another container in the case of an unusual event, and to perform other remedial work.

Solid radioactive waste retrieval facilities

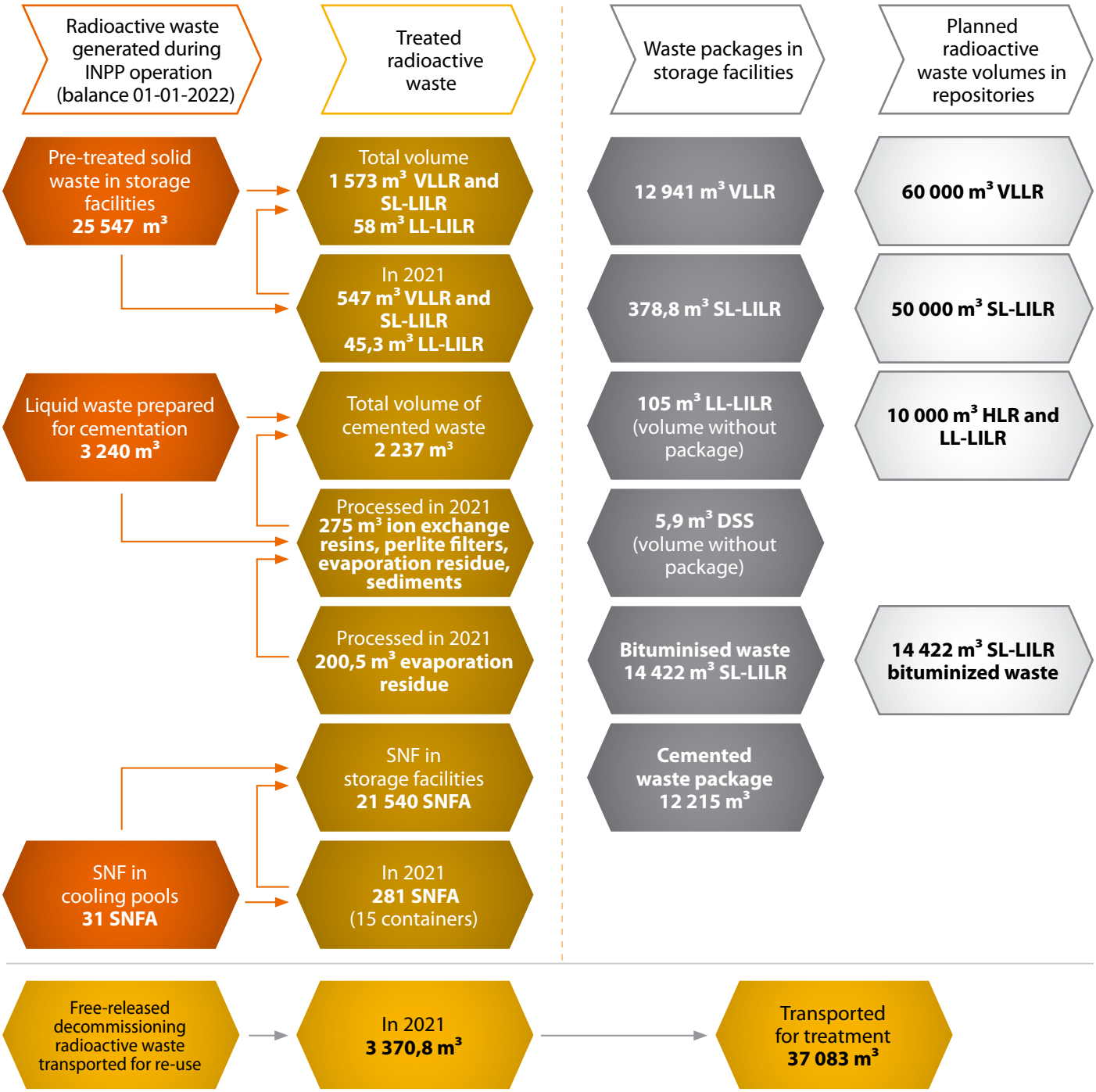
During 2021, 15 containers with spent fuel from both Ignalina NPP power units were delivered to SFSF-2, 14 of which contained damaged spent fuel. At the end of 2021, a total of 187 containers were stored in the SFSF-2. Based on the estimated amount of spent fuel at Ignalina NPP, including the spent fuel residue in the storage pools, 190 spent fuel containers shall be stored in SFSF-2, plus one extra empty container for the transfer of spent fuel in the storage facility's hot cell in case the leak-tightness of a spent fuel container is lost.

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 m^3 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. 32) presents the quantities of radioactive waste generated during the waste treatment and management, as well as the planned quantities.

RADIOACTIVE WASTE VOLUME 2021



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.

Short-lived very low 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 radioactive waste repository. This waste is stored in a very low 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 m^3 radioactive waste. Class A waste that does not fit into the buffer storage facility may also be safely stored in the former turbine building (rooms 101/1 and 101/2 of building G1). After dismantling their equipment, special areas for waste storage were installed there, and 8,700 m^3 of Class A radioactive waste were delivered and stored there in 2021. Up to 15,500 m^3 of Class A radioactive waste may be stored in the turbine building, including the newly installed areas.

Facilities of solid radioactive waste retrieval from buildings 155 and 155/1 and their pre-treatment facilities (project B2-1) have been in operation since 2017. In 2021, solid radioactive waste was retrieved, sorted, compressed and packaged in these facilities. Within 2021, 439 m^3 of radioactive waste were retrieved from building 155/1 and after pre-treatment were packed into 85 compacted and 20 non-compacted waste packages. Since the start of operation of the retrieval facilities, 1,400 m^3 of radioactive waste have been retrieved, treated and packed into 445 compacted and into 44 non-compacted waste ones after pre-treatment.

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 was retrieved from the storage facilities, placed in transport containers and transported for sorting and treatment to the solid radioactive waste management facilities. In 2021, 547 m^3 of short-lived very low, low and intermediate radioactive waste were retrieved from the storage facilities, as well as 45.3 m^3 of long-lived high radioactive waste. In total, 1573 m^3 of short-lived very low, low and intermediate radioactive waste and 58 m^3 of long-lived high radioactive waste were retrieved during the entire period radioactive waste retrieval.

Sorted waste

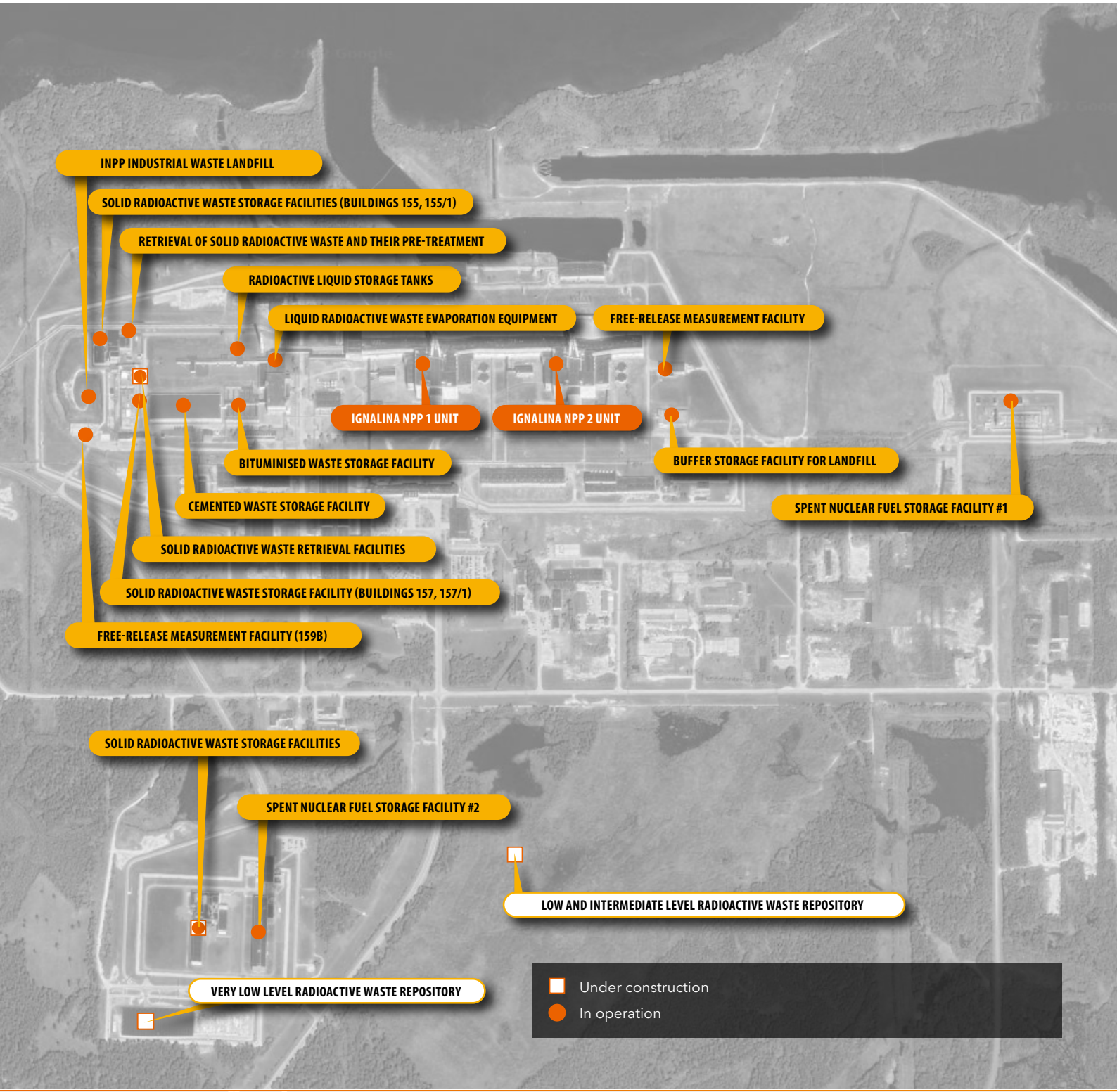
In 2021, VATESI inspected the operation of the solid radioactive waste retrieval facilities (Projects B2-1, B2-2) of Ignalina NPP and determined that the solid radioactive waste at Ignalina NPP was managed in line with safety requirements. No violations were found there.

To ensure that the built NFs complied with the design and safety analysis report, safety requirements, as well as the safe treatment of radioactive waste, Ignalina NPP performed hot tests (tests with radioactive waste). VATESI evaluated the tests results and, being assured of their compliance with the design and safety analysis report and safety legislation, made decisions on the industrial operation of the NFs.

In 2021, Ignalina NPP continued the hot trials of the solid radioactive waste processing and storage facilities (project B3/4) commenced back in 2017. Radioactive waste was transported to these facilities from various locations of Ignalina NPP, including the above-mentioned old storage facilities of Ignalina NPP: buildings 155 and 155/1, 157 and 157/1. It was sorted and treated (burned, compressed, packaged, cemented) in the facilities. During the entire hot testing period, 45 packages of short-lived and 20 packages of long-lived radioactive waste were generated.

In line with modern international requirements, all the solid radioactive waste generated during Ignalina NPP operation and decommissioning will be processed in the solid radioactive waste management and storage facilities, and long-lived radioactive waste will be stored there for up to 50 years.

RADIOACTIVE WASTE STORAGE FACILITIES NEAR IGNALINA NPP TERRITORY



The decommissioning of Ignalina NPP and the increase in the number of dismantled equipment creates a need for additional radioactive waste pre-treatment sites. In addition to the existing pre-treatment areas for Class A waste in the turbine building and the repair shop, additional areas are under installation in the reactor buildings of Unit 1 and Unit 2 for the pre-treatment of short-lived very low, low and intermediate (Class A, B and C) radioactive waste.

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, 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 formed 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.

Cemented waste package (drum)

In 2021, 275 m^3 of liquid waste and 200.5 m^3 evaporation residue were treated in the cementing installation, and 2.162 cemented waste packages (drums) were produced. At the end of 2021, 17.128 cemented waste packages (drums) with cemented liquid waste were stored in the cemented radioactive waste storage facility.

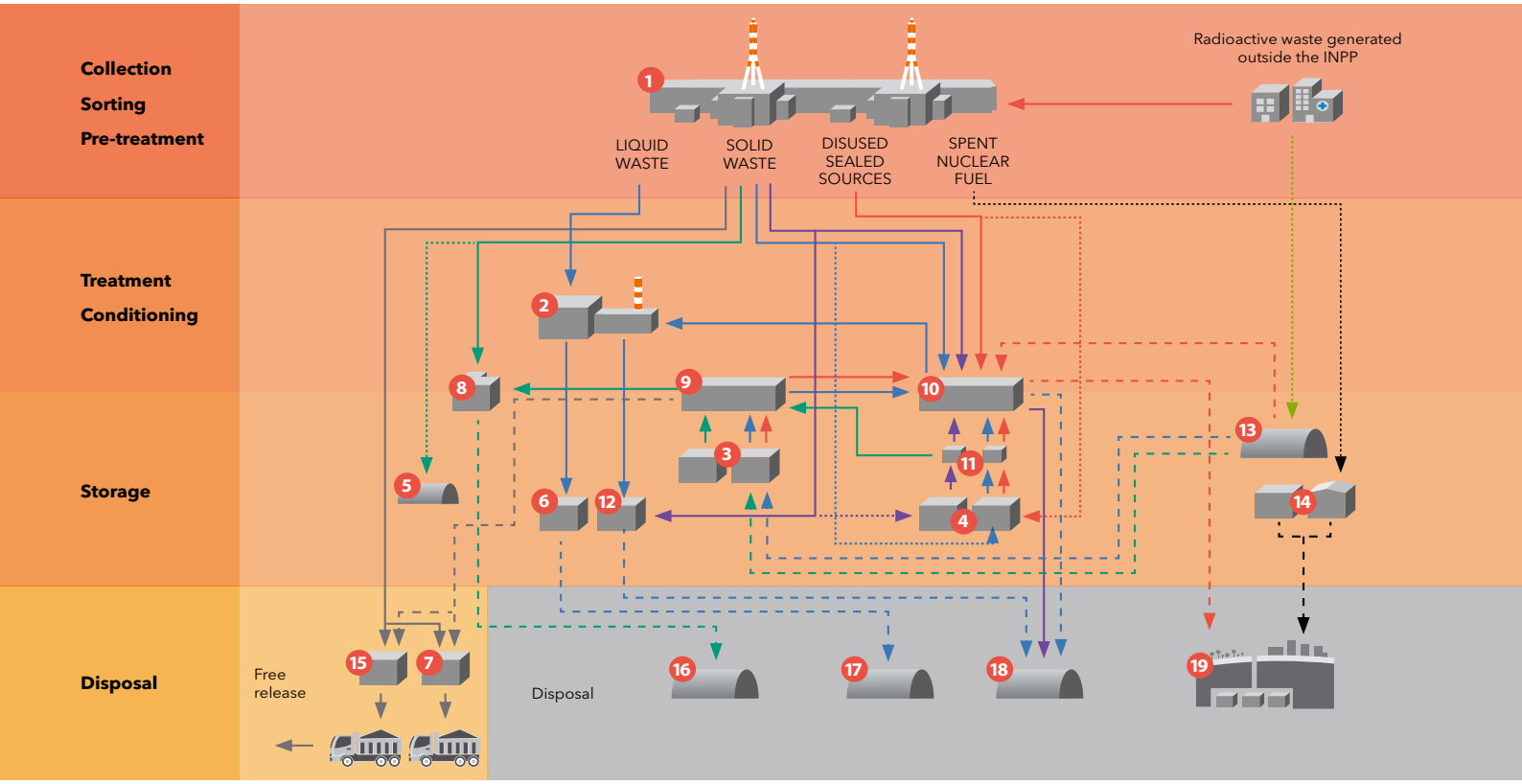
In 2021, during an inspection VATESI ascertained that at Ignalina NPP, liquid radioactive waste was treated in line with safety requirements and found no violations.

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 2021, 3370.8 m^3 of material and waste were measured at these facilities, was 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 gamma-radionuclide analysis of the water samples were below the method coverage threshold.

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 B2-1) (sorting, packaging)
10. Solid radioactive waste management and storage facilities (B 3/4) (sorting, cutting, compaction, inceneration, grounting, 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

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.

Taking into account the experts conclusions 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.

In 2021, VATESI completed the evaluation of the safety justifying documents of the Ignalina NPP application to decommission Maišiagala RWSF. VATESI experts ascertained that the planned decommissioning activities of Maišiagala RWSF, which are described and justified in the updated safety justifying documents, complies with the nuclear safety, radiation protection and physical security requirements and that workers, the public and the environment will be adequately protected against the effects of ionising radiation. On 13 May 2021, based on the above results VATESI issued a license to Ignalina NPP to decommission Maišiagala Radioactive Waste Storage Facility.

In 2021, when supervising the assurance of physical security of Maišiagala RWSF, VATESI experts inspected the intrusion detection, video surveillance, access control and delay measures (active and passive engineering barriers). Five violations were found during the inspection, including three minor ones. All the violations were eliminated.

HOW WILL MAIŠIAGALA RADIOACTIVE WASTE STORAGE FACILITY BE DECOMMISSIONED?

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 near Ignalina NPP. Based on expert assessment, during the decommissioning of Maišiagala RWSF, approximately 700 m³ of radioactive waste, including secondary waste will be generated, which represents approximately 0.5% of all the radioactive waste to be generated during Ignalina NPP decommissioning. There are plans to remediate the storage facility area and cease its radiation control. The remediated site of Maišiagala RWSF will be available for other activities without any restrictions.

The radiological environmental monitoring of Maišiagala RWSF will be continued until all the radioactive material is removed from it and the storage facility area is confirmed to be free from structures and soil contaminated with radionuclides.

Maišiagala radioactive waste storage facility

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 2021, Lithuania had 13 active MBA codes in total, five of which were assigned to Ignalina NPP. The remaining seven 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 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 2021, nuclear material held by four 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 2021, VATESI supervised and if needed, advised economic entities to enable them to timely provide all the required information to the European Commission.

Disused sealed sources

In 2021, 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 or termination of them. 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 2021, VATESI experts inspected how economic entities accounting for their nuclear material in the VATESI-owned MBA conducted a physical inventory of their nuclear material. No violations were found during the inspections.

In May 2021, 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. Fresh and used nuclear fuel was inspected, and seals selected by probabilistic statistical methodology were replaced. No violations were found during the inspection.

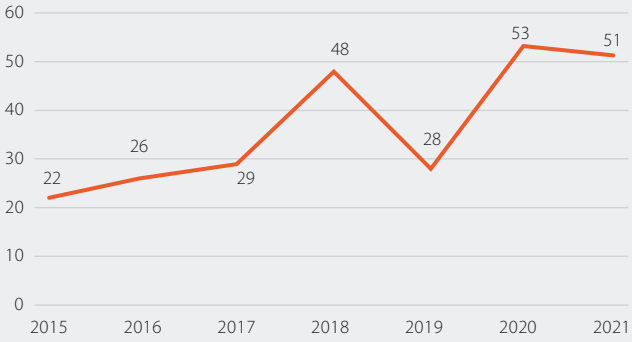
Inspections carried out by international inspectors and information provided by Lithuania on nuclear energy activities enabled IAEA to conclude that all nuclear material and activities declared by the country were used only for peaceful purposes, and there was no evidence of undeclared nuclear material and activities. In 2021, IAEA in its Safeguards Implementation Report made a positive conclusion that all the nuclear material used and activities that took place in Lithuania in 2020 were used only for peaceful purposes.

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 2021, VATESI provided conclusions on 51 applications submitted for export licences 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 2015–2021



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 2021, no such nuclear dual-use items were imported.

In June 2021, to ensure the proper use and storage of the nuclear dual-use items held by Ignalina NPP, VATESI inspected the latter. The inspectors verified if previously imported nuclear dual-use items for which end-use certificates had been issued were used in line with the safeguard commitments and if they were properly controlled. Ignalina NPP eliminated a minor violation that was found without administrative sanctions imposed against it.

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

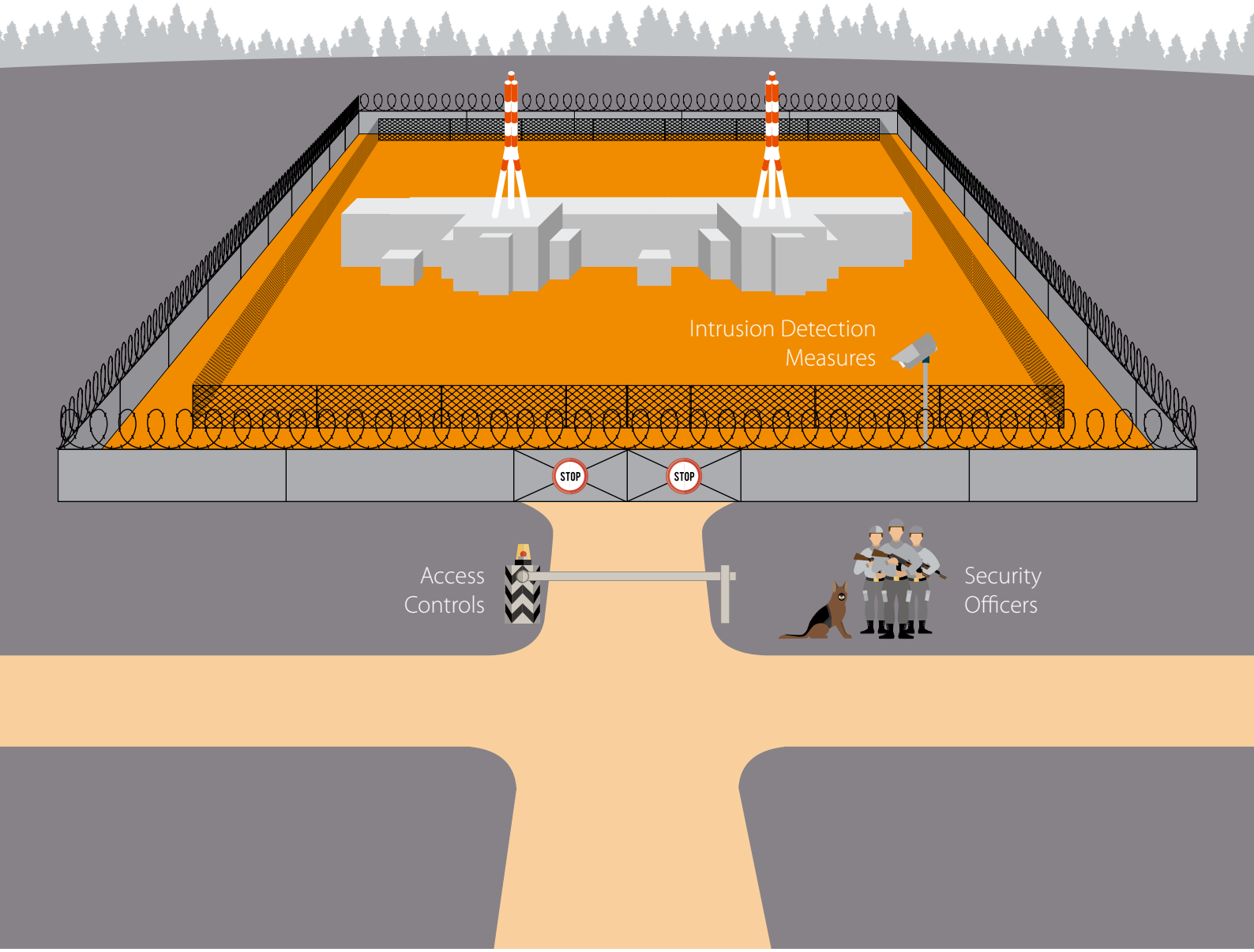
Physical security of nuclear, nuclear fuel cycle material and NFs consists of the totality of competencies and measures to protect NFs, nuclear, nuclear fuel cycle material and radioactive sources from unlawful possession or seizure and other unlawful acts that would pose a risk to human health and safety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

In May 2021, to constantly assess the nuclear security situation in Lithuania and the world and to timely and adequately respond to potential changes, together with institutions engaged in the design basis threat assessment, VATESI assessed new circumstances related to nuclear security that may have affected the safe operation of the NFs and the ongoing activities with nuclear materials, including air defence of nuclear facilities. No new threats were identified.

In 2021, to implement the physical security requirements, Ignalina NPP assessed the effectiveness of the physical security systems of the operated NFs that were protected by the Public Security Service under the Ministry of the Interior of the Republic of Lithuania. Physical security systems of the Very Low-Level Radioactive Waste Disposal Facility (VLLWDF), Spent Nuclear Fuel Storage Facility (SFSF-1) and Solid Radioactive Waste Treatment and Storage Facilities were assessed. According to the VATESI-approved Programme of Effectiveness Assessment of the Physical Security System and specific scenarios of the perpetrator actions, the table-top exercise simulated perpetrator actions against the NFs, and assessed actions of security and response officers, as well as the technical functionality of the physical security systems installed. The assessment found that together with the response force, the physical security systems installed in these NFs were generally capable of protecting the nuclear and nuclear fuel cycle material contained there from illegal acts that could pose a risk to human health and safety.

In 2021, VATESI experts conducted four regular planned inspections of physical security in the NFs managed by Ignalina NPP. They inspected intrusion detection, video surveillance, access control and delay measures (active and passive engineering barriers) of Ignalina NPP NFs at the site, spent nuclear fuel storage facilities (SFSF-1 and SFSF-2) and Solid Radioactive Waste Treatment and Storage Facilities. They also inspected delay measures (active and passive engineering barriers) of Maišiagala RWSF, as well as cyber security measures for nuclear safety, radiation protection and physical security purposes.

PHYSICAL SECURITY SYSTEM



The inspections found nine violations, including seven minor legal ones. An administrative sanction, a mandatory instruction to eliminate the violations was applied against Ignalina NPP. The violations found were eliminated within the deadline set in the elimination instruction.

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.

Since joining ITDB in 1996 to the end of 2021, VATESI submitted a total of 91 information reports on events in Lithuania.

In 2021, VATESI provided information on six events recorded in Lithuania to the IAEA database:

- Fission chambers containing highly enriched uranium not accounted for as nuclear material, found at Ignalina NPP;
- Smoke detectors containing radioactive sources with americium and plutonium found in the possession of an individual;
- Various radioactive sources found in the possession of a legal entity;
- Missing detection sets for drugs and explosives containing radioactive sources;
- A thorium source found at Ignalina NPP not accounted for as a radioactive one;
- Americium sources found at Ignalina NPP not accounted for as radioactive ones;
- Unaccounted sources with increased radiation levels found in a medical facility.

In 2021, IAEA member states submitted 115 information reports on illicit trafficking of nuclear and other radioactive material, and updates to 12 previous reports. Having received the information reports, 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 SBGS and the Customs Department. Information on incidents 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 ionising 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 the designated competent authority responsible for the fulfilment of Lithuania's obligations under this Convention.

In October 2021, a representative of VATESI was included in the Lithuanian delegation and attended a preparatory meeting on organising the Joint 8th and 9th CNS Review Meetings scheduled for 2023. The meeting approved the officers of the CNS Review Meeting, the members of the Country Groups, the provisional agenda, and the timelines for the development of the CNS National Reports, as well as the related questions and answers. Furthermore, a decision was made to set up a special working group with a mandate to discuss proposals for continuity of activities in case of contingencies and other proposals aimed at improving the CNS review process. VATESI has delegated a representative to this working group.

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 the 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 the Belarusian NPP on the population and the environment, and to revise the emergency preparedness plans if necessary. Although correspondence with MoES has been ongoing since the end of 2019, Belarus has not provided the necessary information for emergency preparedness planning.

VATESI INTERNATIONAL COOPERATION

European organisations

EU, European Commission, Euratom, ENSRA, ENSREG, WENRA

World organisations

IAEA, ESARDA, CTBTO

Conventions and Agreements

Convention on Nuclear Safety, Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, Convention on Early Notification, ESPOO, Physical Security of Nuclear Material, Nuclear Non-Proliferation Treaty

Bilateral Agreements

Cooperation in the nuclear safety, communication and information exchange during nuclear or radiological emergencies

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 EC and the neighbouring states on radiological and nuclear incidents and accidents that have occurred. VATESI has been appointed as the competent 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 2021, the IAEA's USIE and the European Commission's WebECURIE systems have disseminated information on 29 incidents related to missing, stolen or found radioactive sources or nuclear material, workers exposed to excessive exposure limits, minor incidents at nuclear power plants or nuclear installations, and automatic shutdowns of nuclear power plants in the event of an earthquake.

In October 2021, the Emergency Operations Centre of VATESI attended the ConvEx-3 exercise organised by IAEA. The exercise scenario tested the ability of the Centre's officers to exchange information remotely in line with the procedures of the Convention on Early Notification of a Nuclear Accident and the legislation governing information exchange in the event of a nuclear or radiological accident.

PARTICIPATION IN THE ENVIRONMENTAL IMPACT ASSESSMENT TO IMPLEMENT ESPOO CONVENTION

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

VATESI is among the Lithuanian authorities that participate in the NF environmental impact assessment, and examine the related submissions. The Lithuanian Ministry of Environment is the authority responsible for the implementation of the Convention in Lithuania.

In line with Article 7 of the Espoo Convention, Ignalina NPP developed a Report on the partial environmental impact assessment of the monitored operation of the Interim Spent Fuel Storage Facility (SFSF-2) and the Solid Radioactive Waste Retrieval Facilities. In October 2021, the Lithuanian Ministry of Environment submitted the Report for VATESI

Spent Nuclear Fuel Storage Facility (SNFSF-2)

assessment. The Report was revised in line with VATESI proposals, and was submitted to the Ministry of Natural Resources and Environmental Protection of the Republic of Belarus and the Ministry of Environmental Protection and Regional Development of the Republic of Latvia.

In December 2021, the Ministry of Environment forwarded VATESI the Environmental Impact Assessment Report on the life-time extension of Loviisa Nuclear Power Plant received from Finland. The Ministry of Environment forwarded VATESI's comments to the responsible Finnish authority. VATESI received and analysed the responses from Finland. Having taken into account the relatively long distance from Loviisa NPP to Lithuania, Finland's extensive experience in the nuclear power development, the safety improvement works performed and the advanced state regulation of nuclear safety in Finland, VATESI provided its opinion to the Ministry of Environment that Lithuania would not be significantly affected by Loviisa NPP operation or by any nuclear or radiological incidents or accidents that occur at Loviisa NPP

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 of ionising radiation exposure.

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 working groups to address specific subjects: Nuclear Safety Improvement, Radioactive Waste Management, Spent Nuclear Fuel and Decommissioning, and Public Information and Transparency.

Under the Nuclear Safety Directive, Topical Peer Reviews of nuclear safety must be held every six years, 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 2021, preparations continued for the second Topical Peer Review of nuclear safety. The development of a technical specification to detail the scope and requirements of the Topical Peer Review, which ENSREG requested from WENRA, was among the key preparation milestones. WENRA expects to complete this work in mid-2022. However it is already clear that the second Topical Peer Review will address fire safety in operating and finally shut-down NPPs under decommissioning, as well as in radioactive waste management facilities. Lithuania will also participate in the Peer Review.

At the end of 2021, the final review report on the implementation of the stress test recommendations at the Belarusian NPP was discussed and approved by the ENSREG meeting. The purpose of the ENSREG review was to assess the action plan on the implementation of the recommendations developed by Belarus in August 2019, as well as on the

implementation of the recommendations presented in the ENSREG review report regarding stress tests in July 2018. At the meeting, representatives of ENSREG member countries underlined the importance of all safety recommendations and encouraged Belarus to continue its work in a timely manner to improve and ensure the safety of the Belarusian NPP. Belarus was also invited to update its Action Plan to include the new, additional safety improvement measures proposed in this final report. In the view of the experts, resistance to the design earthquake of some fire-fighting systems and of the buildings housing the fire-fighting vehicles was not substantiated. Furthermore, no permanent seismic monitoring stations were installed, and not all structures and safety-critical equipment therein were adequately protected from external water ingress. The final report also made two important additional recommendations: to strengthen accident management by seeking additional reactor cooling options when the reactor is shut down and the upper part of the reactor vessel is removed, and to prevent overheating of the fuel assemblies in case of an accident. Experts also suggested improvements to the containment ventilation system. The improved system would significantly reduce the amount of radionuclides emitted in the event of a severe reactor accident. Since the beginning of the development of the Belarusian NPP project, Lithuania has taken the position that the recommendations of the stress tests and other contemporary safety requirements must be unconditionally implemented. At this stage, this means that the commissioning and operation of Units 1 and 2 of the Belarusian NPP must be suspended until the safety issues have been fully resolved.

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 safety-related information, and plan nuclear safety

improvement areas. Since 2004, Lithuania participates in the activities of the WENRA Reactor Harmonisation Working Group (RHWG) and the Working Group on Waste and Decommissioning (WGWD).

In 2021, the RHWG continued to develop the specification for the Second Topical Peer Review of safety assessment of EU countries under the EU Nuclear Safety Directive and discussed it with the nuclear safety regulators of the countries concerned. Work continued on the implementation, review and updating of the reactor safety levels approved in 2014 in the member countries. Discussions were held on the follow-up of the RHWG activities related to the safety of Small Modular Reactors (SMRs).

The WGWD working group kept analysing how the WENRA countries transposed into their national legislation the safety reference levels in radioactive waste treatment and storage established by WENRA. Two WGWD remote meetings were held in 2021 to discuss the review and updating of the developed safety reference levels. A benchmarking review of the transposition of safety reference levels for radioactive waste storage of the Hungarian and Czech regulators was completed, and the one for the German regulator was initiated. Furthermore, benchmarking reviews of the transposition of safety reference levels for radioactive waste treatment of the Czech and Slovak regulators were initiated. As a WGWD country, Lithuania presented the developments implemented over the year and related to the national radioactive waste management and regulation.

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 2021, VATESI representatives participated in the remote plenary meeting of ENSRA that discussed activity prospects of the upcoming three years. The new ENSRA leadership and logo were approved subject to the modified Terms of Reference of the Association. The meeting decided to establish a new working group to assess national practices and provide proposals related to nuclear security of NFs under decommissioning. VATESI delegated a representative to the working group.

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.

In 2021, VATESI representatives participated in the first joint, virtual, annual meeting of ESARDA and the Institute of Nuclear Material Management (INMM). The meeting focused on the key challenges facing the organisation, the cooperation between the responsible national authorities, the importance of new technologies and remote data transmission, and the implementation of safeguards in the light of the restrictions related to the COVID-19 pandemic. Furthermore, it focused on the planned ESARDA expansion, the continuity and sharing of knowledge and experience, cooperation with other organisations and the advantages and disadvantages of virtual meetings.

IAEA TECHNICAL COOPERATION PROJECTS

Under the IAEA European Regional Programme for Technical Cooperation 2020-2021, 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:

- RER0043 – Enhancing Capacity Building Activities in the European Nuclear and Radiation Safety Organizations for the Safe Operation of Facilities;
- RER0046 – Enhancing National legal Frameworks in European Member States;
- RER2015 – Strengthening Nuclear Power Plant Lifetime Management for Long Term Operation;
- 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.

In 2021, VATESI employees attended 41 events under IAEA international and regional projects: workshops, conferences, technical meetings and training courses. In these events, the experts had the opportunity to familiarize themselves with the regulatory requirements in nuclear, radiation protection and physical security, to learn of best practice and to share their experience.

Moreover, in 2021, the implementation of the 2020–2021 IAEA National Technical Cooperation Project LIT9018, Enhancing the efficiency and transparency of the nuclear waste management system, was continued. The project funding allowed for the necessary optimisation of the hand-held radionuclide identification device in an authorised manufacturing facility and the procurement of video conferencing equipment. Furthermore, two Lithuanian employees improved their expertise by attending events funded by the IAEA national project. The IAEA support through national projects helps Lithuanian nuclear safety professionals to improve their knowledge, and to familiarise with the most up-to-date international nuclear safety requirements and the best practice of other national regulators and supervisors in nuclear waste management and in construction and operation of new nuclear facilities.

PUBLIC COMMUNICATION

PUBLIC COMMUNICATION

VATESI public communication activities are based on the principles of transparency and openness. The key objective of this activity is to provide the public and other stakeholders with relevant information on the regulation and supervision of compliance with nuclear safety, radiation protection, physical safety 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.

On 9 December 2021, VATESI held a remote conference Challenges in Nuclear Safety Regulation to celebrate its 30th anniversary. VATESI presented current and future challenges in addressing the nuclear facility decommissioning, radioactive waste management, emergency preparedness, as well as control of nuclear materials, nuclear security and other safety-related issues.

In VATESI conference „Challenges in Nuclear Safety Regulation“

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

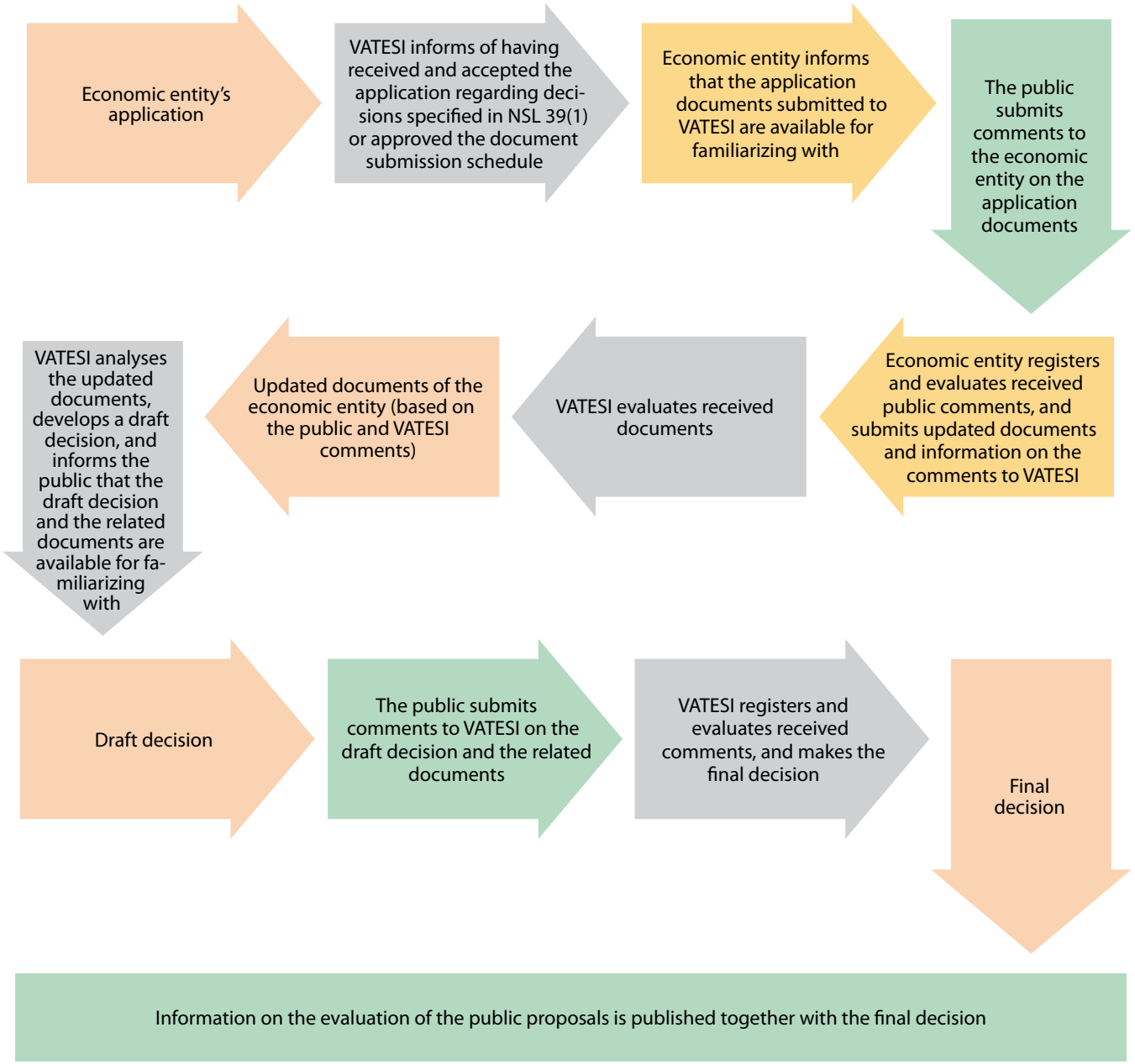
PUBLIC PARTICIPATION IN THE DECISION-MAKING PROCESS

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), licences* 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, disposal 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

FLOWCHART OF THE PUBLIC PARTICIPATION IN DECISION MAKING



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 inhabitants 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 2021, the decommissioning licensing process for Maišiagala RWSF took place, under which the public and stakeholders were invited to participate and to provide proposals regarding the documents developed. VATESI made the final decision to issue a license to Ignalina NPP to decommission Maišiagala RWSF. No proposals were received from the public or stakeholders within the two-month period for consultations and submitting proposals provided for in the Law on Nuclear Safety.

VATESI is currently evaluating the documents of other applications submitted by Ignalina NPP.

Interview for „Mokslo sriuba“

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.

OPERATING AND UNDER CONSTRUCTION NUCLEAR POWER PLANTS IN THE NEIGHBOURING COUNTRIES

(distance from the border of Lithuania, km)

LIST OF ABBREVIATIONS

Bq	Becquerel (the international measurement unit used to measure activity of radioactive material)
CNS	Convention on Nuclear Safety
CONVEX-3	IAEA international emergency preparedness exercise
COVID-19	Coronavirus infection
ENSRA	European Nuclear Security Regulators Association
ENSREG	European Nuclear Safety Regulators Group
ESARDA	European Safeguards Research and Development Association
EU	European Union
EURATOM	European Atomic Energy Community
IAEA	International Atomic Energy Agency
Ignalina NPP	Ignalina Nuclear Power Plant
INES	International Nuclear and Radiological Event Scale
ITDB	IAEA Incident and Trafficking Database
Maišiagala RWSF	Maišiagala Radioactive Waste Storage Facility
MBA	Material balance area
mSv	Millisievert (exposure measurement unit)
NF	Nuclear facility
NPP	Nuclear power plant
SFSF-1	the first dry type Spent Fuel Storage Facility
SFSF-2	the second Spent Fuel Storage Facility
RHWG	WENRA Reactor Harmonisation Working Group
RSC	Radiation Protection Centre
USIE	IAEA Unified System for Information Exchange
VATESI	State Nuclear Power Safety Inspectorate
Web-ECURIE	European Community Urgent Radiological Information Exchange
WENRA	Western European Nuclear Regulators Association
WGWD	WENRA Working Group on Waste and Decommissioning
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 2021

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