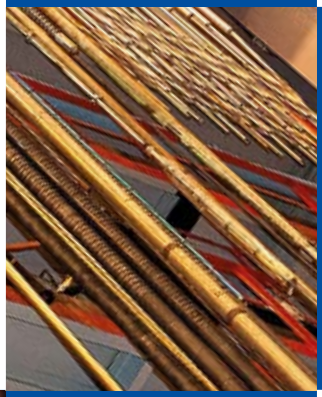


DECOMMISSIONING OF IGNALINA NUCLEAR POWER PLANT

DECOMMISSIONING OF IGNALINA NUCLEAR POWER PLANT

FACTS AND HISTORY

Ignalina Nuclear Power Plant (Ignalina NPP, INPP) had two largest and most advanced water-cooled graphite-moderated channel-type power reactors RBMK-1500.

It was planned to build 4 reactors, but only 2 RBMK-1500 graphite nuclear reactors were built and launched. Unit 1 was launched in 1983 and Unit 2 – in 1987. These were the most powerful nuclear reactors in the world: the thermal capacity of a single unit was 4,800 megawatts (MW) and the electricity generating capacity – 1,500 MW.

In total there were 17 of this type of reactors, built in 5 nuclear plants in the world: 4 in Leningrad, 4 in Kursk, 3 in Smolensk, 4 in Chernobyl and 2 in Ignalina NPP. All NPPs had smaller – RBMK-1000 reactors and only the ones in Ignalina were more powerful – RBMK-1500.

1974 marked the commencement of the preparatory works for the construction of Ignalina Nuclear Power Plant (Ignalina NPP, INPP). Being the most powerful NPP in the world, Ignalina NPP was built to satisfy the needs of both Lithuania and the North-West energy system of the former Soviet Union.

A year later, a memorial stone was placed to mark the site of the would-be Sniečkus (currently Visaginas) town. The earth-moving works for the first energy unit of INPP began in March 1978 and were completed in September. At the end of the year, 5067 employees were working at the construction.

On 17 April 1979, the Council of Ministers of the USSR adopted a resolution, giving 'green light' for the construction of the INPP. At the same time, stage zero of the construction of the first block was completed (building the 7-metre-deep foundation). On 12 December, by the order of the Minister of Medium-Machine Building Ministry of the USSR, 10 ministries of the USSR and 45 factories had to ensure that Unit 1 was put into operation in 1982.

At the same time, the construction of Unit 2 was already underway – the earth-moving works were completed in September 1980. The works were fast and the number of employees, constantly working on the project, kept increasing. In 1982, the number of people, working in the construction of INPP, was 11,286. Unit 1 was commissioned on 31 December 1983.

The construction of Unit 3 began. 13,573 people were employed in the operation of the Unit 1 and the construction of other units. The con-

struction works of Unit 2 were completed in 1986 and it was supposed to be commissioned in the same year. However, the commissioning was postponed due to the accident at Chernobyl NPP on 26 April 1986, where RBMK-type reactors were also used. The unit was launched on 31 August 1987. Approximately 60 % of Unit 3 was completed by that time, but after the Chernobyl accident the government of the LSSR requested USSR authorities to stop the construction of Unit 3 and the construction was suspended and discontinued in 1989.

Ignalina NPP became even more important to the national energy system after the restoration of Lithuania's independence. Due to a price surge in fossil fuels, mainly imported from Russia, electricity production costs at the nuclear power plant were almost twice lower than in other plants. In 1991, Ignalina NPP produced 60 % of the entire country's electricity, while 1993 became the record-breaking year for the Lithuanian nuclear energy sector when INPP produced 12.26 billion kWh or 88.1 per cent of the electricity, needed for the entire state.

After Lithuania took INPP into its jurisdiction in 1991, it became the 31st state in the world using nuclear energy to produce electricity.

Due to the Chernobyl accident, INPP has undergone a number of international studies and extensive safety analyses. It could be argued that the probability of an accident at Ignalina NPP and the overall level of safety were similar to Western nuclear safety standards. However, unlike in other types of modern NPPs, RBMK-type reactors have no protective shield to detain radioactive substances in case of an accident. For this reason, the risk of operating RBMK-type reactors cannot be reduced to the extent that would make them safe to operate in a long-term.

Implementing the provisions of the agreement for its accession to the EU, Lithuania discontinued the production of electricity at Ignalina NPP. Unit 1 was shut down on 31 December 2004 and Unit 2 – on 31 December 2009.

In the 26 years of operation, Ignalina NPP produced 307.9 billion kWh of electricity: 136.9 billion kWh in Unit 1 and 170.2 billion kWh in Unit 2. The total amount of electricity sold was 279.8 billion kWh.

The construction of Ignalina NPP required constructing 142 km of roads, 50 km of railways, 390 km of communication lines, 334 km of electricity lines, 133 km of sewerage lines, and 164 km of thermal lines. 3,544,000 m³ of concrete and reinforced concrete and 76,480 tonnes of reinforcement was used for the construction.

Decommissioning these reactors is a particularly difficult task. The steam, turning the turbines is created by light water, flowing through the reactor, resulting in a much larger share of the equipment affected by the radionuclides and larger amounts of radioactive substances that we have to handle appropriately and safe way.

« Fuel bundles

VISION, MISSION, VALUES

VISION

To become an expert on safe and efficient nuclear facility decommissioning and radioactive waste management.

MISSION

Safe and timely implementation of a globally unprecedented project – decommissioning of the nuclear power plant, which operated two RBMK-type reactors, and handling radioactive waste to ensure that the future generations do not have to carry the unreasonable burden of radioactive waste management.

VALUES

Safety culture

The enterprise dedicates special attention to the qualifications and psychological preparation of its employees – prerequisites for ensuring that the safety of the INPP is a top priority and an underlying objective that fosters one's sense of responsibility and self-control in the performance of all safety-related tasks.

Transparency

The enterprise applies and maintains internal quality assurance control, strengthens the supervision of public procurement procedures, prepares and announces detailed and up-to-date activity reports as prescribed by the laws of the Republic of Lithuania.

Efficiency

The enterprise responsibly manages its own and allocated funds, as well as looks for new ways to reduce costs and increase the efficiency of operations.

Professional attitude

The enterprise is seeking to employ and maintain highly experienced staff members, whose knowledge and expertise contributes to the enterprise's high results, while cooperation and sharing experience create a positive working atmosphere.

Social responsibility

As part of planning and implementing its activity, the enterprise foresees possible negative outcomes on the natural and social environment, actively participating in a social dialogue with its staff members and taking into the account both the opinion of interested parties and public expectations.

CURRENT ACTIVITY – DECOMISSIONING

Following the shut-down of both of the units, the enterprise's major activities revolve around safe and timely decommissioning of Ignalina Nuclear Power Plant, which operated two RBMK-type reactors, and handling radioactive waste to ensure that future generations do not have to carry the unreasonable burden of radioactive waste management.

Ignalina NPP is implementing decommissioning works, which include operation of systems to ensure nuclear, radiation, fire and physical safety of INPP, transferring of the spent nuclear fuel to temporary storage, dismantling and deactivation of the equipment and buildings, radioactive waste treatment and storage. The decommissioning works at Ignalina NPP are expected to be completed in 2038.

Ignalina NPP is implementing a unique decommissioning project, which involves new emerging challenges and tasks, unprecedented in the entire global practice. Lithuania is the first in the world to dismantle RBMK-type reactors and related systems after the spent nuclear fuel is removed.

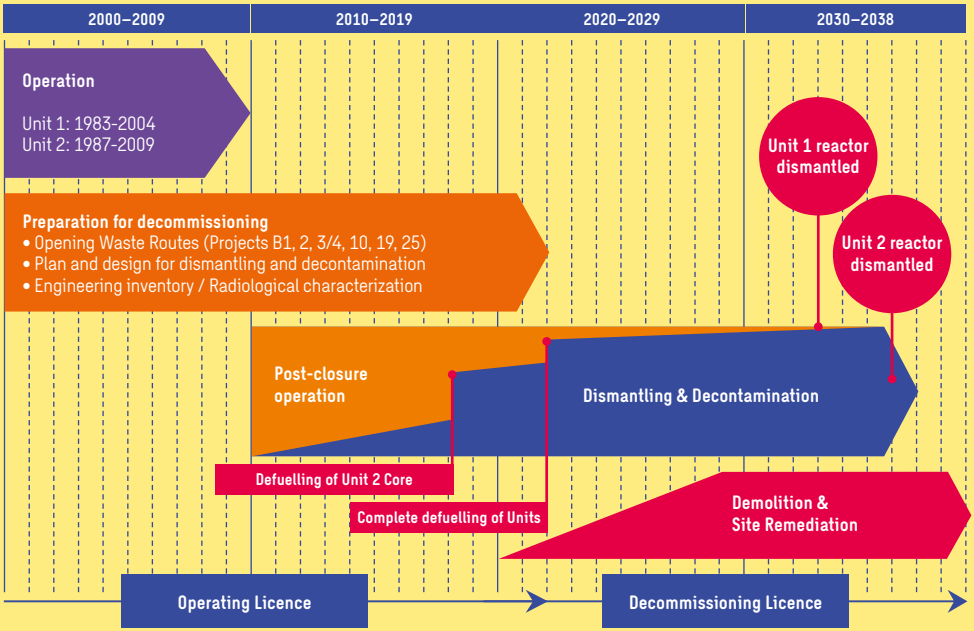
Lithuania considered various strategies for dismantling Ignalina NPP reactors. A strategy of delayed dismantling was one of them. In that case, the reactors and the rest of the plant's equipment would be kept until, due to radioactive decay, the level of radiation is reduced enough for safe industrial dismantling.

Nevertheless, advised by the International Atomic Energy Agency's (IAEA), Lithuania chose the option of immediate dismantling, when the equipment is dismantled practically immediately after the closure of reactor's operation.

This choice was influenced by various factors. One of the major ones was the opportunity to receive European Union support in order not to put the burden of Ignalina NPP decommissioning on the future generations.

Representatives of Ignalina NPP were also in favour of immediate dismantling, because in this case the complex works, which require special expertise, would be done by the enterprise's experts, who worked with the plant's equipment for years and some of them have even built it. Their experience is particularly important. One of the priorities of INPP decommissioning was taking an in-house approach – to do as much work as possible using INPP staff.

INPP Decommissioning Plan



The decommissioning works at Ignalina NPP are done according to the Final Decommissioning Plan. That is the key document, which describes the decommissioning of a nuclear facility. It includes the entire timeline of Ignalina NPP decommissioning and describes the objects that constitute INPP: both energy units, radioactive waste treatment facilities and various auxiliary buildings, which will not be needed in the long-term. The document describes decommissioning projects and works, provides a general work schedule, and also costs incurred and planned for the future. The plan has been approved in 2005 and is renewed every five years. The public can get acquainted with the final decommissioning projects and make proposals.

« INPP reactor hall

FUNDING

The National Energy Strategy, revised on 10 October 2002, envisaged that Unit 2 of the Ignalina NPP is to be shut down by 2009 provided that financial sources are available, including the necessary funding based on agreements with EU institutions and other donors. Lithuania undertook to shut down the reactors considering that later stages of EU accession negotiations would include an adequate discussion of the issue of additional financial support for the premature closure of Unit 1 at INPP by 2005 and Unit 2 by 2009.

EU members have admitted that the decommissioning of INPP will take longer than the present financial prospects allow and that it was an excessive financial burden to Lithuania, incommensurable with its size and economic power. The EU countries have declared that in solidarity with Lithuania they were prepared to continue additional financial support from the Community for the decommissioning efforts after Lithuania becomes a member of the EU as well.

It is a usual international practice to raise the price for electricity generated at an NPP gradually and thus accumulate the decommissioning fund over the years of its operation. That is the best way. In the first decade of INPP operation, the energy prices were not increased, nor were funds accumulated for the decommissioning. The state enterprise Ignalina NPP Decommissioning Fund started accumulating funds for the decommissioning only as of 1995 and the wholesale electricity price was slightly increased. However, the funds, accumulated in the National Fund are insufficient, therefore, Ignalina NPP needs support from other sources.

INPP decommissioning programme is largely funded from the European Union (EU Ignalina Programme Fund, International INPP Decommissioning Support Fund), also state enterprise Ignalina Nuclear Power Plant Decommissioning Fund, funds from the budget of the Republic of Lithuania, the enterprise's own funds, received from commercial activity and investments.

Lithuanian Government, following the provisions of Protocol No. 4 of the Act of Accession of Lithuania to the European Union and considering the INPP decommissioning process, is under negotiations with the European Commission regarding additional financial support in order to ensure an appropriate and safe INPP decommissioning process.

Dismantling works at the turbine hall

On 20–21 June 2000, Lithuania hosted a conference of international donors, who decided to finance decommissioning projects of Unit 1. It was attended by representatives of the European Commission, G-7 countries and international financial organisations. 2001 marked the establishment of Ignalina International Decommissioning Support Fund (IIDSF), administered by the European Bank for Reconstruction and Development (EBRD). IIDSF funds and/or co-funds have chosen technical decommissioning projects and energy sector measures, which are important for the final closure of INPP.

The approval of the project funding depends on IIDSF Donor Assembly's decision. The Donor Assembly is the manager of Ignalina International Decommissioning Support Fund. The donor countries are Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Luxembourg, the Netherlands, Norway, Poland, Spain, Sweden, Switzerland and the European Commission. The Assembly has the competence to change the content of the projects.

IGNALINA NPP DECOMMISSIONING STAGES

Initial stage

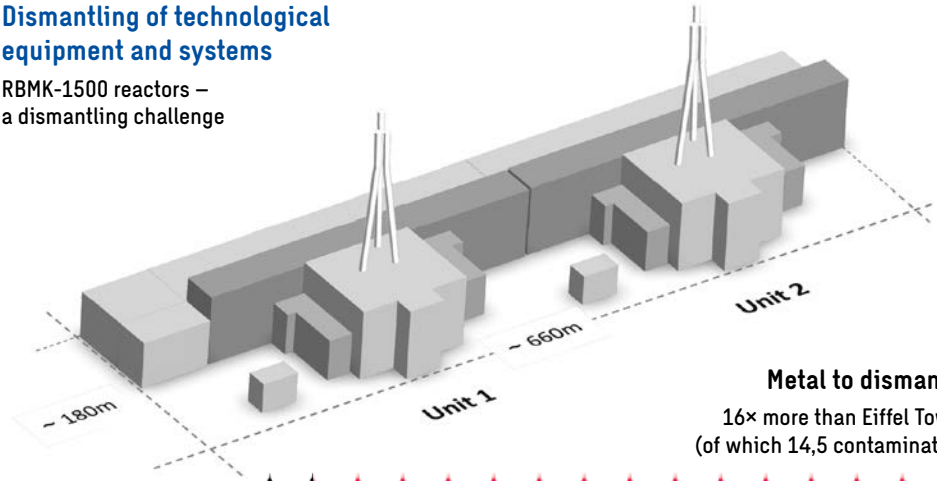
The nuclear power plant has been shut down permanently. It is cleaned and decontaminated using available equipment. The spent nuclear fuel and accumulated radioactive waste is transferred to interim storage or repository. Low-radioactivity equipment can be removed.

Dismantling

This stage should immediately follow the first one. Dismantling involves removing radioactive equipment and the inner layer of radioactive buildings. This is the most difficult stage from the technical point of view. Immediate dismantling means that the entire radioactive equipment must be removed from the site as soon as possible. Radioactive waste is treated and packaged to ensure safe storage or entombment conditions. Materials that are not radioactive are recycled, reused or handled as simple industrial waste.

Dismantling of technological equipment and systems

RBMK-1500 reactors – a dismantling challenge



Metal to dismantle

16× more than Eiffel Tower (of which 14,5 contaminated)

Turbine hall before dismantling

Demolition of buildings

This stage involves demolishing buildings or leaving them for further use. The demolition is the same as of other industrial buildings, except that the process involves checking for even the slightest trace of radioactive substances in the debris.

RADIOACTIVE WASTE MANAGEMENET INFRASTRUCTURE

Based on the amount and characteristics of the radionuclides, radioactive waste is divided into three categories:

- Very low-level short-lived radioactive waste includes waste, the radionuclides of which are relatively rapidly degraded (the length of the half-life is shorter than 30 years) and do not pose any further danger to the environment. Therefore, they can be handled using simple natural or artificial engineering barriers (e.g. landfill-type repositories).
- Low and medium-level short-lived radioactive waste requires artificial engineering protective facilities that are more complex than the ones, used for very low-level short-lived radioactive waste.
- Spent nuclear fuel and other long-lived radioactive waste need special engineering barriers for radiation protection. Currently, this type of waste is stored at special containers, which are transferred to interim storage. The storage period is 50 years. Later this waste must be buried in a deep geological repository for all times.

All operations at Ignalina NPP are implemented in strict compliance with the requirements of the law and licence provisions. In order to ensure that the radioactive waste does not pose danger to humans and the environment during Ignalina NPP decommissioning works and that their storage does not pose any negative effect on the future generations, the enterprise is designing and building new modern objects – storage and repositories.

Spent nuclear fuel management

Throughout its entire life, Ignalina NPP used 21 571 heat-emitting fuel assemblies. With no options for recycling, the entire spent nuclear fuel (SNF) is stored in the territory of Ignalina NPP. In late 2004, after the shut-down of Unit 1, about 70 % of the nuclear fuel assemblies that were not completely spent, were left in its reactor. Using this fuel in Unit 2 would save costs for purchasing new fuel and also reduce the costs for SNF treatment. Therefore, a project was implemented to create equipment for transporting the partially spent fuel from Unit 1 to Unit 2, which was used to move 924 fuel assemblies. This helped to save about 400 new fuel assemblies.

Until 2010, the SNF from both units was transported to the SNF storage, operated since 1999. The storage is currently full and cannot accept more SNF. This storage contains 118 casks with 6,016 fuel assemblies.

New Waste Facilities

All new waste interim-storage or disposal facilities to be created on, adjacent to, Ignalina NPP site (radius ≈ 1.5m km):

- Simplifies permissions
- Reduces new infrastructure
- Reduces transport
- Facilitates physical protection

A new **interim spent nuclear fuel storage facility** was commissioned in 2017 and the fuel from the power units is currently transferred to this facility. The remaining SNF (15,555 assemblies) will be kept there. The entire SNF will be placed into 190 casks. Based on the current fuel unloading schedule, the fuel must be removed from the power units until 2022. When the entire SNF is removed from the units and placed into the new storage facility, the enterprise will be issued an INPP decommissioning licence, enabling to continue the dismantling of INPP equipment, including the major task – dismantling the reactors, management of the accumulated radioactive waste and demolishing of unneeded buildings.

This will ensure safe and reliable SNF storage according to the requirements of the Republic of Lithuania, European Union standards and IAEA recommendations.

It is planned to build a deep geological repository repository for keeping the SNF and other long-lived waste when the storage facility operation period is over (in 50 years). Its location and technical specifications will be discussed in the future.

Solid radioactive waste, accumulated during INPP operation, is stored at interim storage facilities, divided into sections, where the waste is sorted into three groups and stored separated, based on the level of radiation. The solid radioactive waste management and storage facility will handle solid radioactive waste, accumulated before the final shut-down of Unit 2, and the waste, accumulated during the decommissioning of INPP. The waste is removed at the facility and transported to the treatment place, where it is sorted, treated and packaged into casks, which are then placed into the new storage facilities and kept until the repositories are completed.

» Interim spent fuel storage facility

Upon the commissioning of the new facility, INPP has been equipped with a new solid radioactive waste management and storage system, which meets the latest requirements of the law of the Republic of Lithuania, European Union standards and IAEA recommendations.

The solid radioactive waste, accumulated during the dismantling works, usually contain small amounts of radioactivity. This waste will be stored in a short-lived low-level radiation waste repository (landfill-type), which will be completed in 2020. The landfill will feature 3 modules, containing approximately 20,000 m³ waste (a total of 60,000 m³ 3 waste containers). This will be an above-ground construction, consisting of a concrete slab with waste containers put on top. The filled and sealed repository will resemble a barrow. In order to protect the waste from water, animals and plant roots, the waste containers will be covered with several layers of artificial and natural materials. The repository will be equipped with monitoring, security and other necessary systems. The repository will be filled throughout the entire period of the NPP decommissioning and, when it is full and sealed, it will be monitored for 30 years. This will be followed by 70 years of passive monitoring with the limited use of the land in the repository's territory.

» Dismantling works

RW management works

» Dismantled equipment

Finally, **the low and medium-level waste**, accumulated during the operation of INPP and its decommissioning, will be stored at the low and medium-level short-lived radioactive waste facility on the surface, which will be built until 2024. The repository will consist of three reinforced concrete modules, which will be able to hold up to 100,000 m³ treated radioactive waste, cemented and packaged into concrete containers. When a group of sections is filled with radioactive waste, the empty space between the containers will be filled with concrete and each of the sections will be covered with a reinforced concrete plate and, finally, each of the section groups will also be covered with a multilayer (clay, gravel, sand, pebble and vegetable soil) covering, thus forming a hill. The waste will be transported to the repository throughout the entire decommissioning period until 2038.

After the final closure, the repository will be monitored for at least 300 years. The first 100 years will involve ensuring its physical security, technical maintenance works, as well as the monitoring of the repository and its surroundings. The subsequent 200 years will involve passive monitoring and the use of land in the territory of the repository will be limited.

THE CHALLENGE OF DISMANTLING THE REACTORS

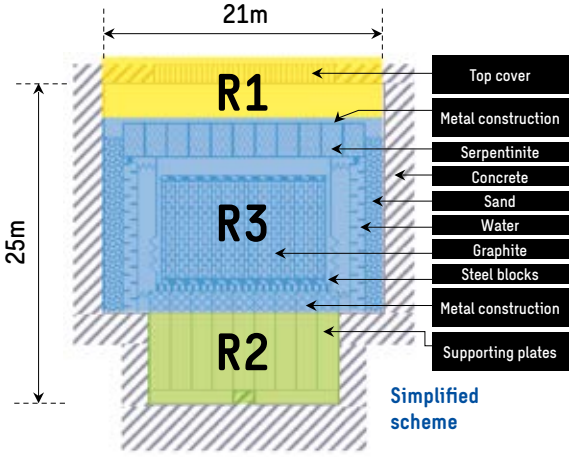
INPP is implementing an unprecedented project and Lithuania is the first in the world to dismantle RBMK-type reactors and related systems after the spent nuclear fuel is removed.

The dismantling of the reactors will produce a large amount of radioactive waste. The estimated amounts include about 3,765 tonnes of graphite, 3,116 tonnes of serpentinite, 6,735 tonnes of steel and 8,300 tonnes of sand, used to fill the construction cavities between the concrete walls and the circular water tank.

The majority of these materials, for example, the sand, will most likely not be radioactive. The majority of the steel will also be deactivated. However, the graphite, closest to the active core or the steel and a part of the serpentinite have been affected by the neutron flux and activated. This resulted in all kinds of radionuclides, including long-lived ones, and this waste cannot be cleaned, which makes it necessary to remove it to a deep geological repository.

The reactor dismantling works are expected to commence in 2027.

EXTRAORDINARY PROJECT: dismantling the equipment of the 1st and 2nd reactors



Simplified scheme

R1 and R2 zone (~2,053 tonnes in the unit)

- Experience in the field of technical maintenance
- Easy access
- Not many types of materials
- Low/no radiation (except for the channels and some of the internal parts)

R3 zone (~10,913 tonnes in the unit)

- Less experience
- Difficult access
- Not many types of materials (mineral fillings, graphite, steel)
- Internal radiation, peripheral contamination
- There are no solutions for handling the graphite

REACTOR'S FEATURES

RBMK-type reactors are classified as 'boiling water' reactors. The number of BWR-type reactors (Boiling water reactor) in the world is quite high (75 reactors were operating in 2018 and in total there are ~450 power reactors in the world). The steam, which turns the turbines, is produced in the reactor (single thermodynamic cycle, differently from the pressurised water reactors (PWR)), resulting in a much larger share of the equipment affected with radionuclides and thus creating a larger amount of radioactive substances, which must be appropriately handled.

RBMK is a channel-type reactor. Differently from BWR or other reactors with containment buildings (these are the majority), there is no containment building, which could be removed as a whole, because of the reactor's constructions are integrated into the reactor's building.

Cask with SNF

RBMK reactors are classified as a thermal neutron reactor, which uses graphite to slow down neutrons (differently from the light water reactors (BWR, PWR), where the water both carries the heat and slows down neutrons). RBMK is not the only type of reactors, which uses graphite to moderate neutrons. For example, gas-cooled reactors (*Magnox* and AGR-type, popular in the United Kingdom (a total of 43), also UNGG reactors (10) in France (6), although these were also built in Spain, Italy and Japan) are similar similar to this perspective. The dismantling and handling of radioactive graphite is a challenge and there is no time-tested solution, applicable on an industrial scale to this day.

Reactor's surface parts

SNF storage pool hall

The world has no experience in dismantling reactors of such type and size as the ones at Ignalina NPP. INPP and its contractors will encounter challenges that are similar to projects, which involve developing and testing new technology. INPP will be the first to do it because all other countries have chosen a delayed graphite reactor dismantling strategy, i.e. the reactors will be dismantled in approximately 50 years of their shut-down.

A reactor is similar to a car engine. Besides the engine there is also the body, various systems and components, the car needs a garage and a repair shop. Thus, an NPP has so much more than 2 reactors – a number of structures and equipment, which will be dismantled, their waste – handled and the buildings – cleaned and demolished. INPP had approximately 167,000 tonnes of equipment and, in 2019, approximately 1/3, i.e. More than 50,000 has already been dismantled. So far, the majority of the equipment is cleaned and sold as scrap metal. It is expected that approximately 3/4 of this amount (125,000 tonnes) will be cleaned and sold for secondary use. Therefore, the majority of metal, used for INPP equipment, will be recycled and reused. Producing a single average car requires 900 kg steel, so, the materials, reclaimed from the INPP could make approximately 140,000 light vehicles. The number of new light vehicles, sold in Lithuania in 2018, was about 32,000, so the metal from INPP could supply Lithuania with cars for 4–5 years.

RADIOLOGICAL MONITORING

People are constantly exposed to natural ionizing radiation: cosmic radiation from the Universe and the surface of the Sun, also radiation from terrestrial soil, water bodies and airborne radionuclides. Aside from the natural radiation, people also are exposed to radiation from artificial sources. One of the largest sources of artificial ionizing radiation is the state enterprise Ignalina Nuclear Power Plant, currently implementing decommissioning of the power plant. Although decommissioning its activity as of 31 December 2009 instead of producing power, Ignalina NPP retained its status as an enterprise, operating a nuclear power object. Ignalina NPP remains an enterprise, working with nuclear fuel and radioactive waste, so its activity continues to be subject to the laws of Nuclear Power, Radiation Safety, Radioactive Waste Management, etc.

In order to protect the environment and the entire population, the level of radionuclides, released into the air and Lake Drūkšiai from INPP, is limited by the standards and requirements in force in Lithuania.

The appropriate level of the radionuclides, released from Ignalina NPP, is ensured by radiological monitoring, also taking the air, rainwater, soil, plant, water (Lake Drūkšiai, drinking water, etc.), bottom sediment, food product (fish from Lake Drūkšiai, meat, milk, grain, cabbage, potato, mushroom) samples. These measurements are taken by qualified and licensed staff at special INPP laboratories, which work with modern equipment (environmental surveillance laboratory and radiological research laboratory). Surveillance shows that the radionuclides, released from Ignalina NPP not only do not exceed the limits but also constitute a very small share.

The radiation doses are measured by thermoluminescent dosimeters, located at various places in the sanitary security zone (3 km radius around INPP) and monitoring zone (30 km radius around the INPP), while the dose rate is measured by 22 stationary Skylink system sensors. There are 10 sensors in the settlements, located in the surveillance zone and 12 more in the sanitary security zone, which enable to implement real-time dose rate control. The controlling authorities of the Republic of Lithuania can constantly monitor the results of these measurements. Besides INPP, environmental exposure studies are also implemented by the Radiation Protection Centre.

It takes samples of air, rainwater, soil, plants, water (Lake Drūkšiai, drinking water, etc.), bottom sediment, food products (fish from Lake Drūkšiai, meat, milk, grain, cabbages, potatoes, mushrooms).

Mushrooms are considered to be the best indicator of environmental contamination. Based on the RPC and INPP data, the annual effective dose of radiation received by the Lithuanian population due to detection of 137Cs element in mushrooms was about 5×10-3 mSv (RPC data) and for INPP region – about 1.9×10-3 mSv (INPP data), on a condition that the amount of mushrooms, consumed every year does not exceed 10 kg. In this case, the assessment is rather conservative, as the amount of element 137Cs that vaporizes during cooking is not included in the shown data.

A good indicator of the contamination of water is fish. Based on INPP data, the annual effective dose of radiation received by the Lithuanian population due to detection of elements 137Cs and 90Sr in the fish of Lake Drūkšiai was 1.81×10-4 mSv,on a condition that the amount of fish consumed per year does not exceed 18 kg.

Based on all of the data received by monitoring processes realized by RPC and Ignalina NPP, it can be stated that the Lithuanian population has not been exposed to any additional radiation during the INPP commissioning and decommissioning periods.

Decommissioning of MAIŠIAGALA RADIOACTIVE WASTE STORAGE (RWS) FACILITY

Maišiagala RWS was built in Bartkuškis forest of Žalioji Forest District in Širvintai District in 1963. It is 9 km north-east from the town of Maišiagala and 40 km from Vilnius.

It is a 200 m³ monolithic reinforced concrete basement, located in the depth of 3 metres, where the radioactive waste used to be buried under liquid concrete. Concrete absorbs and contains the ionising radiation of the radionuclides in the radioactive waste and also prevents it from being washed out of the waste by water. These storage facilities were built in most of the former Soviet Union and Eastern European states.

Maišiagala RWS contains radioactive waste, collected from industrial enterprises, medical and scientific institutions, which used radioactive materials and radioactive sources. The waste, stored at the facility in Bartkuškis forest, was brought not only from Lithuania, but also Kaliningrad and Grodno areas.

Maišiagala Radioactive Waste Storage Facility »

The waste used to be accumulated at Maišiagala RWS until 1989. Then it was decided to close it because the facility did not meet modern environmental protection requirements. It should be noted that the waste was not sorted, i.e. short-lived and long-lived waste was stored in the same place. According to modern requirements, each type of waste must be sorted and kept in special containers and designated radioactive waste repositories. When the facility was closed, it had accumulated about 120 m³ of radioactive waste, which took 60 % of the facility's total capacity. The remaining place was filled with sand, covered with concrete, bitumen, asphalt and a thick layer of soil.

The amount of radioactive waste, accumulated in Maišiagala RWS is rather small – about 120 m³, but it contains all types of waste: long-lived very low-level waste, short-lived low and medium-level waste, and long-lived radioactive waste. A detailed assessment of the facility's safety showed that the engineering barriers, built on the surface cannot ensure long-term protection from radionuclide leakage, therefore, the radioactive waste storage facility cannot be transformed into a repository. The waste must be sorted, packed into special containers and placed into radioactive waste repositories separately – each type of waste into a designated repository.

» **Dismantled equipment decontamination**

According to expert opinions, Maišiagala RWS cannot be the final place to store the waste, contained inside. That is why a decision was adopted to decommission Maišiagala RWS and retrieve the radioactive waste stored there to Ignalina NPP for keeping and sorting into repositories.

Until 31 December 2018 the maintenance of Maišiagala RWS and environmental surveillance was done by the Radioactive Waste Management Agency (RWMA) and when after reorganisation RWTA was merged with INPP, as of 1 January 2019, the commissioning was transferred to Ignalina NPP. According to plan, the radioactive waste will be removed, treated and transferred to INPP repositories, while the territory of the storage facility will be cleaned by the end of 2023, according to the project 'Decommissioning of Maišiagala Radioactive Waste Storage Facility', funded by the European Union.

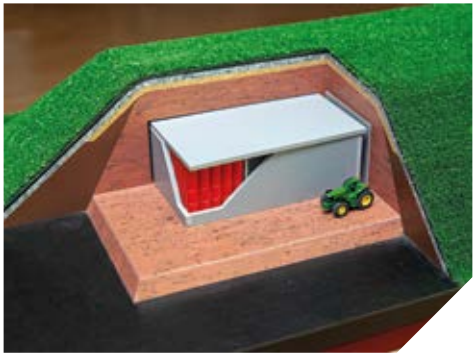
FOR THE CONCLUSION

What will remain after the decommissioning process is complete, is only the facilities that ensure safe interim storage of the treated radioactive waste and its storage in the repositories, and the interim storage of the spent nuclear fuel. The final goal is to achieve a condition, when the territory can be used without limitations or used according to the provisions of the law after the facilities are decontaminated, dismantled, when the territory is cleaned of the residue of the decommissioning, when the residue is treated and after all the other necessary works are done.

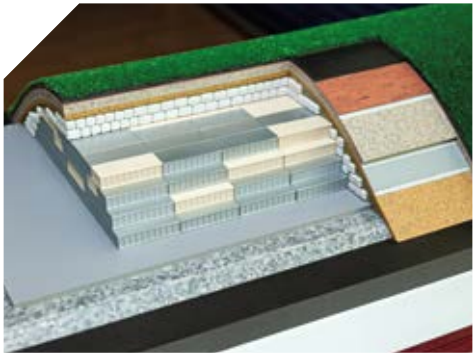
The dismantling of the reactors and final closure of the INPP until 2038, will be followed by another enormous project – the construction of a deep geological repository. To this day, this is the only reliable method for final handling of the long-lived radioactive waste and putting them for keeping for the rest of the time. Here the nuclear fuel and other long-lived radioactive waste would be stored for 10,000 years.

Currently, it is unknown, who will design, build and fund this megaproject. The complex underground repository could be built until 2066.

Upon implementing the decommissioning of the energy units with RBMK-type reactors, INPP is accumulating unique experience, which can be standardised and applied to other nuclear energy projects. This is an opportunity both for the enterprise and experts to apply their experience and competence in providing services in similar nuclear power projects. They accumulate experience and exchange knowledge and discoveries with other states, implementing nuclear power plant decommissioning.



Model of a near surface repository »



Model of Landfill facility »

VISITING US
WHAT CAN WE SHOW YOU

A VISIT TO IGNALINA NPP INFORMATION CENTRE

PURPOSE: dedicated to schoolchildren and other persons, who are interested in the INPP construction history and operation, safety systems and decommissioning works.

LOCATION: INPP Information Centre, where you can see an operating INPP unit model, a fuel assembly model, a model of a CASTOR spent fuel cask, and the models of the planned low and medium-level short-lived radioactive waste repositories. During the tour, using the special surveillance equipment, visitors can watch the plant, namely, the reactor hall, the turbine hall and the spent fuel storage hall. In case of a demand, there are also documentaries on the NPP and other training films on radiation (in Lithuanian or Russian languages).

DURATION: ~1 h. Tours can begin from 9.00 a.m. until 3 p.m.

TOURS ARE ORGANISED FOR: groups of up to 30 people on weekdays and working hours.

A VISIT TO IGNALINA NPP CONTROLLED ZONE

PURPOSE: the tour is dedicated for interested natural and legal persons, interested in the history of Ignalina NPP, its operation, decommissioning works, funding, controlling institutions, closure process, radiation safety requirements, etc.

LOCATION*: after passing a control post, the tour takes place in the controlled zone of INPP – the reactor hall, machine hall, unit control room.

* Based on the circumstances, the tour route may be subject to changes.

DURATION: ~2.5 h. Available from 10.00 a.m. To 1 p.m.

TOURS ARE ORGANISED FOR: groups of up to 15 people on weekdays (Mondays, Wednesdays, Thursdays, Fridays).

* Tour time and days of hosting tours may be subject to changes.

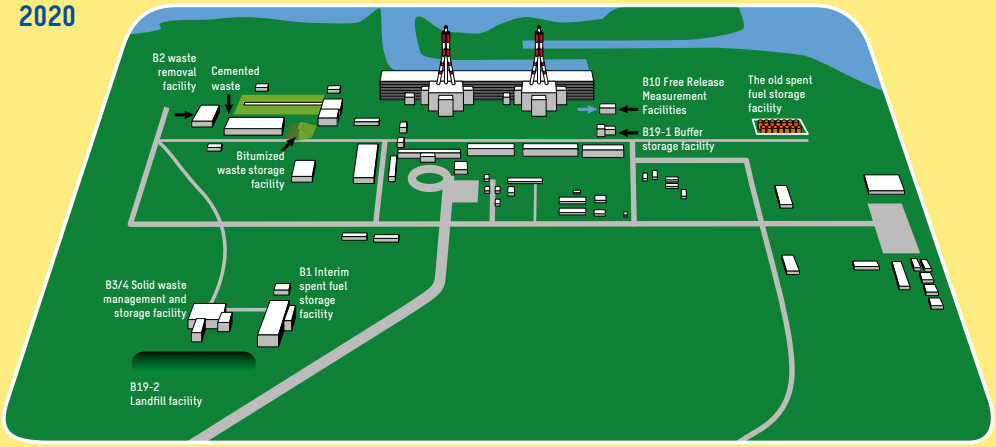
ORGANISATION:
For an inquiry regarding a tour, please contact us on weekdays from 8 a.m. to 4 p.m. by phone + 370 386 28512 / 29911 or by e-mail info@iae.lt

More information about INPP is available at www.iae.lt

» INPP reactor control room

Ignalina NPP territory

2020



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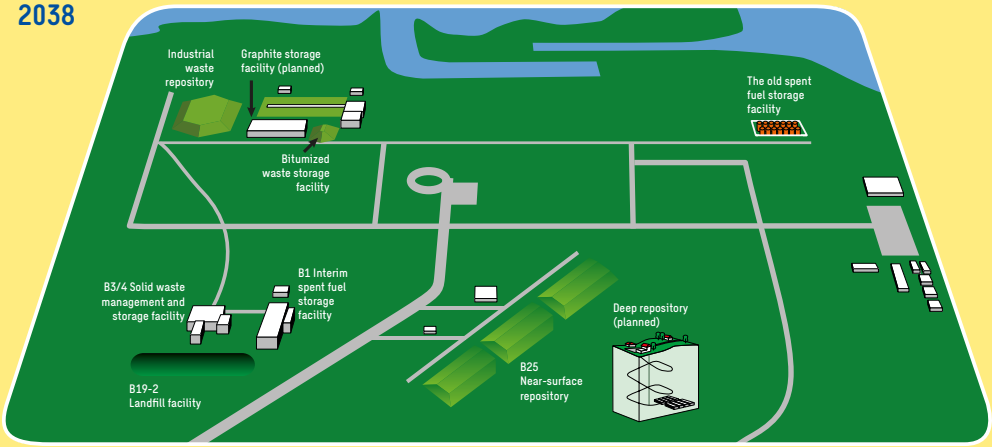

Decommissioning of INPP is co-funded by the European Union