



Ignalina NPP

Ignalina Nuclear Power Plant Decommissioning

**Transboundary consultations on EIA – Dismantling
and decontamination of equipment from Ignalina
Nuclear Power Plant Unit 2 reactor R1 and R2 zones**



Decommissioning of Ignalina NPP is
co-financed by the European Union

INPP decommissioning: background information

INPP New Waste Treatment Facilities and radioactive waste streams

Scale of INPP dismantling and applied technologies

Unit 2 reactor R1 and R2 zones equipment dismantling

New project: Reactor core dismantling

Environmental monitoring



Ignalina NPP - Design and operation



Location: Far north-east corner of Lithuania. Immediately bordering Latvia and Belarus



Design: 2 × RBMK-1500 water-cooled, graphite-moderated channel-type power reactors



Capacity: Intended to supply NW region of former USSR (not Lithuania). After independence, one unit could produce 80% of Lithuanian electricity demand



Operation:

Unit 1 commissioned Dec 1983 / closed Dec 2004
Unit 2 commissioned Aug 1987 / closed Dec 2009



Ignalina NPP decommissioning preconditions and progress



Early closure: Required to facilitate EU accession due to safety concerns. **First decommissioning of RBMK-type NPP**



Progress: Planning started in **2001**. Investment projects to open waste-routes started in **2003**. Dismantling started in **2010** (Unit 1) and **2014** (Unit 2)



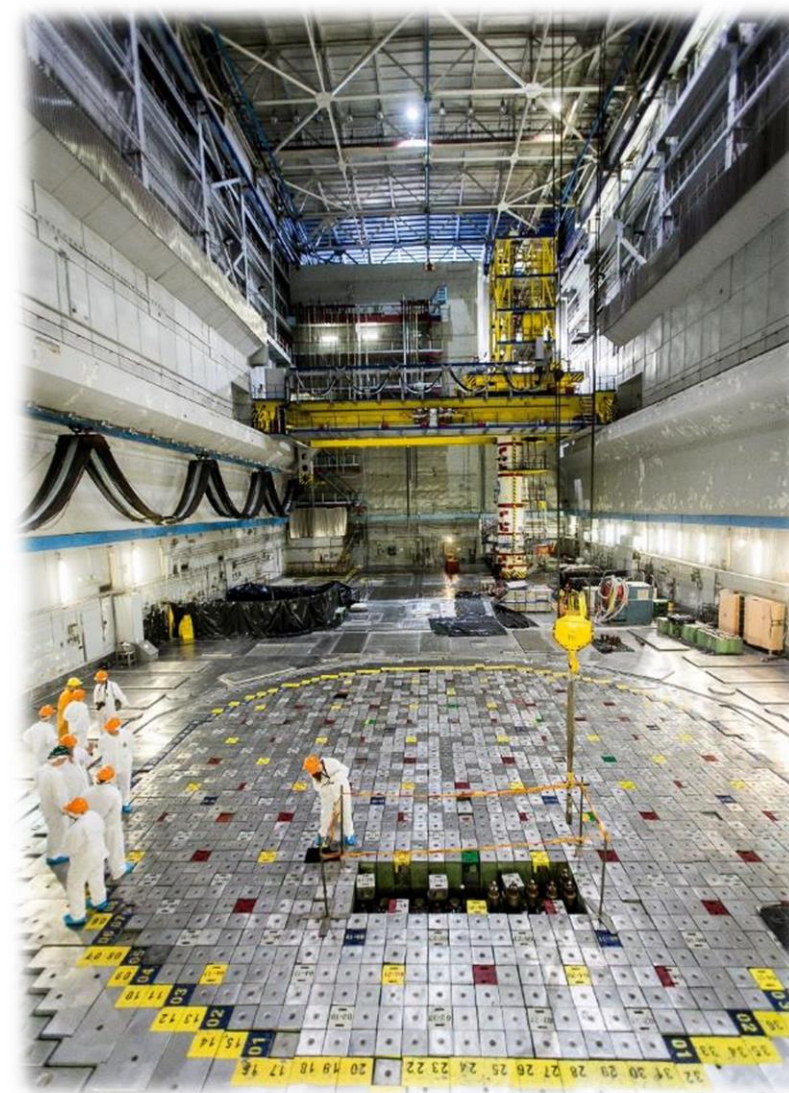
Licensing: Plant is still licensed as “**operating**” because of nuclear fuel in the units. Preparation for decommissioning license obtaining is ongoing



Schedule and cost: Completion by **end 2038**
Cost approx. **3.4 billion euro** (with 3% inflation and risks)



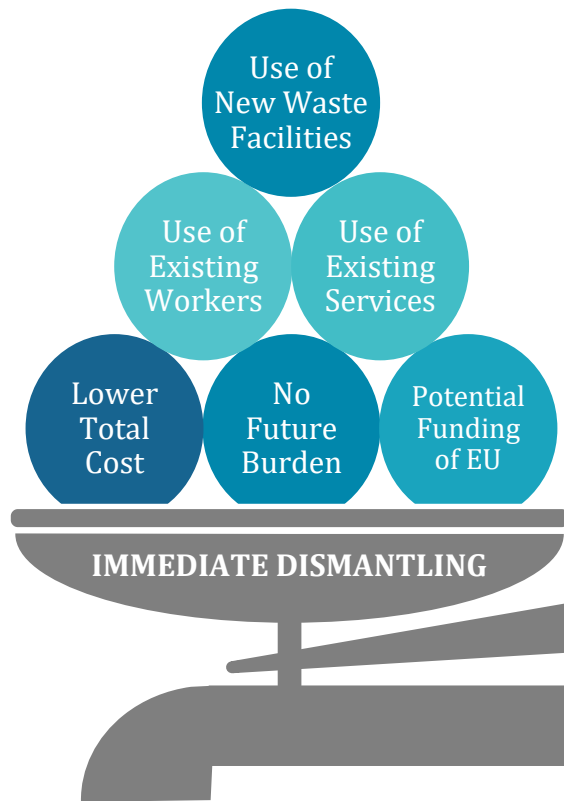
Staffing: A key factor in immediate dismantling that is being implemented using **INPP’s own resources**. INPP by far the main employer in the region





Strategy

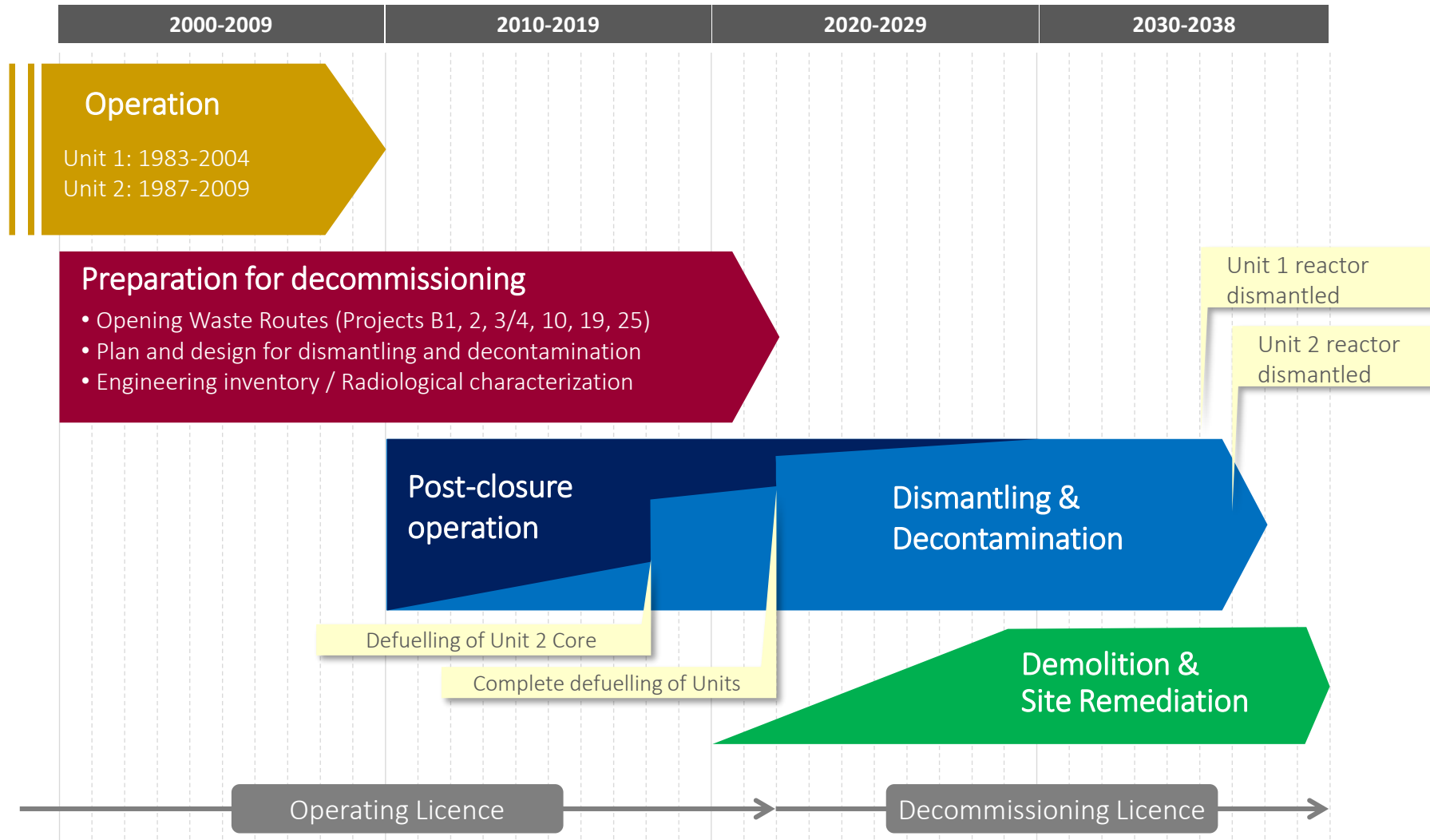
- **Immediate Dismantling** selected by Government for technical, social and financial reasons



Final decommissioning plan






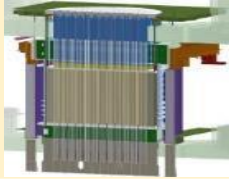

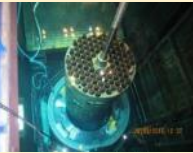

- **Technical measures** for dismantling, radioactive waste management and disposal with financial estimate.
- Approved 2005, revised version approved 2020; verified and accepted by the EC

Ignalina NPP Decommissioning schedule



Ignalina NPP Waste Inventory



Stored Operational Waste (legacy)	Solid Waste A B C	27,000 m ³			
	Bituminized Waste B	14,000 m ³			
	Cemented Waste C	4,000 m ³			
Decommissioning Waste from Technological equipment D&D	Technological equipment (Steel) A B C	160,000 t			
Decommissioning Waste from Reactor D&D	Steel A C D E	12,170 t.			
	Graphite D E	3,800 t.			
	Fillers A C	11,940 t.			
Decommissioning Waste from Buildings demolishing	Concrete 0 A B	900,000 m ³			
	Steel 0 A	200,000 t.			
Spent nuclear fuel	Fuel Assemblies	21,571 item			

Waste classification

0 Free Release Waste

Short-lived Low Level and Intermediate Level Waste:

A Very Low Level Waste (<0,2 mSv/h)

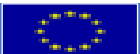
B Low Level Waste (0,2-2 mSv/h)

C Intermediate Level Waste (>2 mSv/h)

Long-lived Low Level and Intermediate Level Waste:

D Low Level Waste (<10 mSv/h)

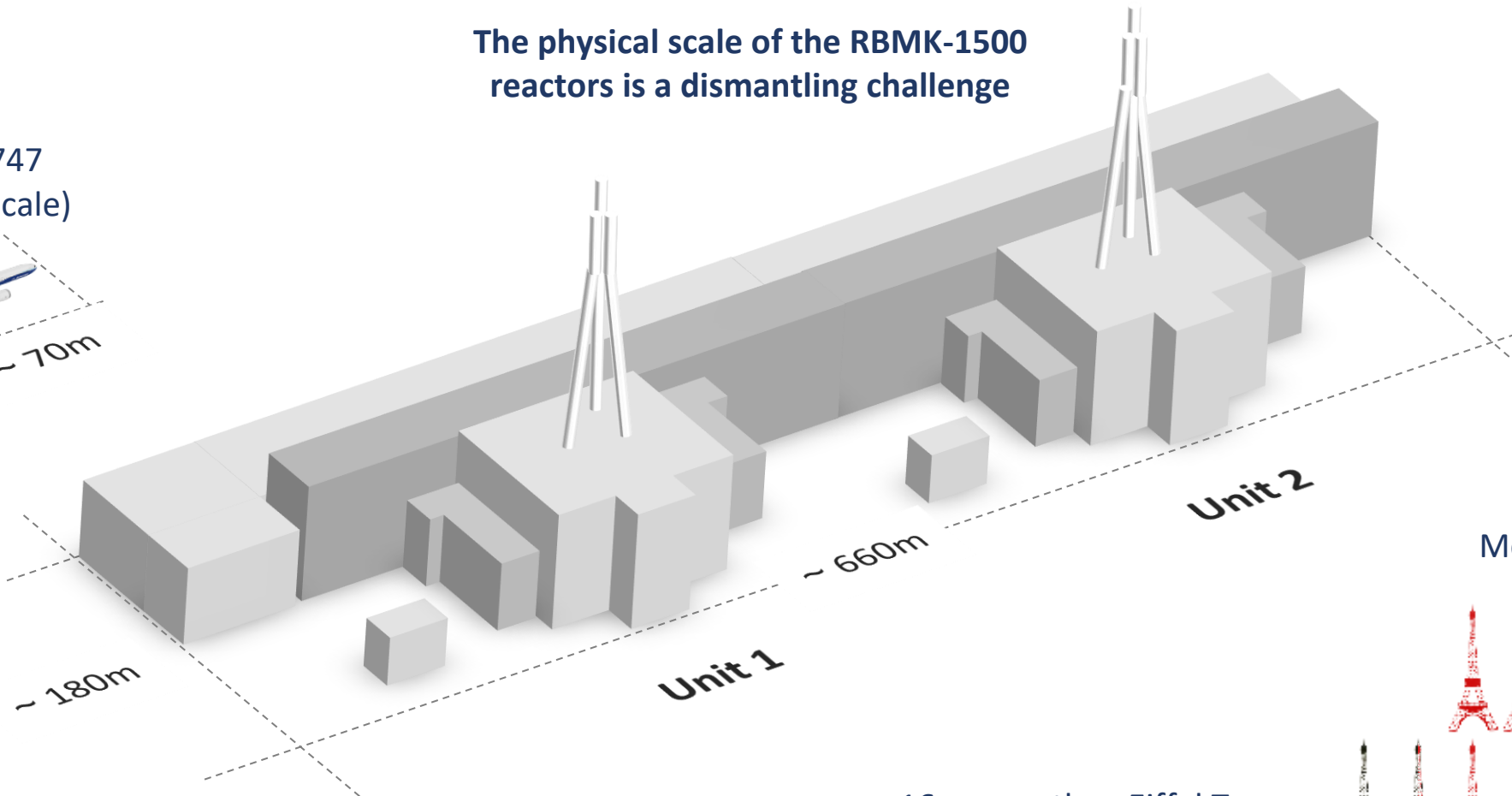
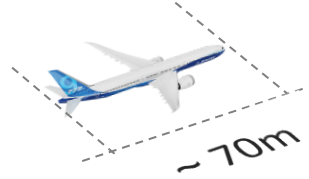
E Intermediate Level Waste (>10 mSv/h)



Scale of Dismantling

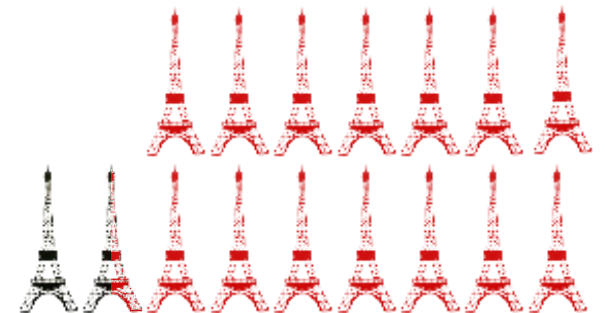
The physical scale of the RBMK-1500 reactors is a dismantling challenge

Boeing 747
(to same scale)



Metal to dismantle

16× more than Eiffel Tower
(of which 14½ contaminated)



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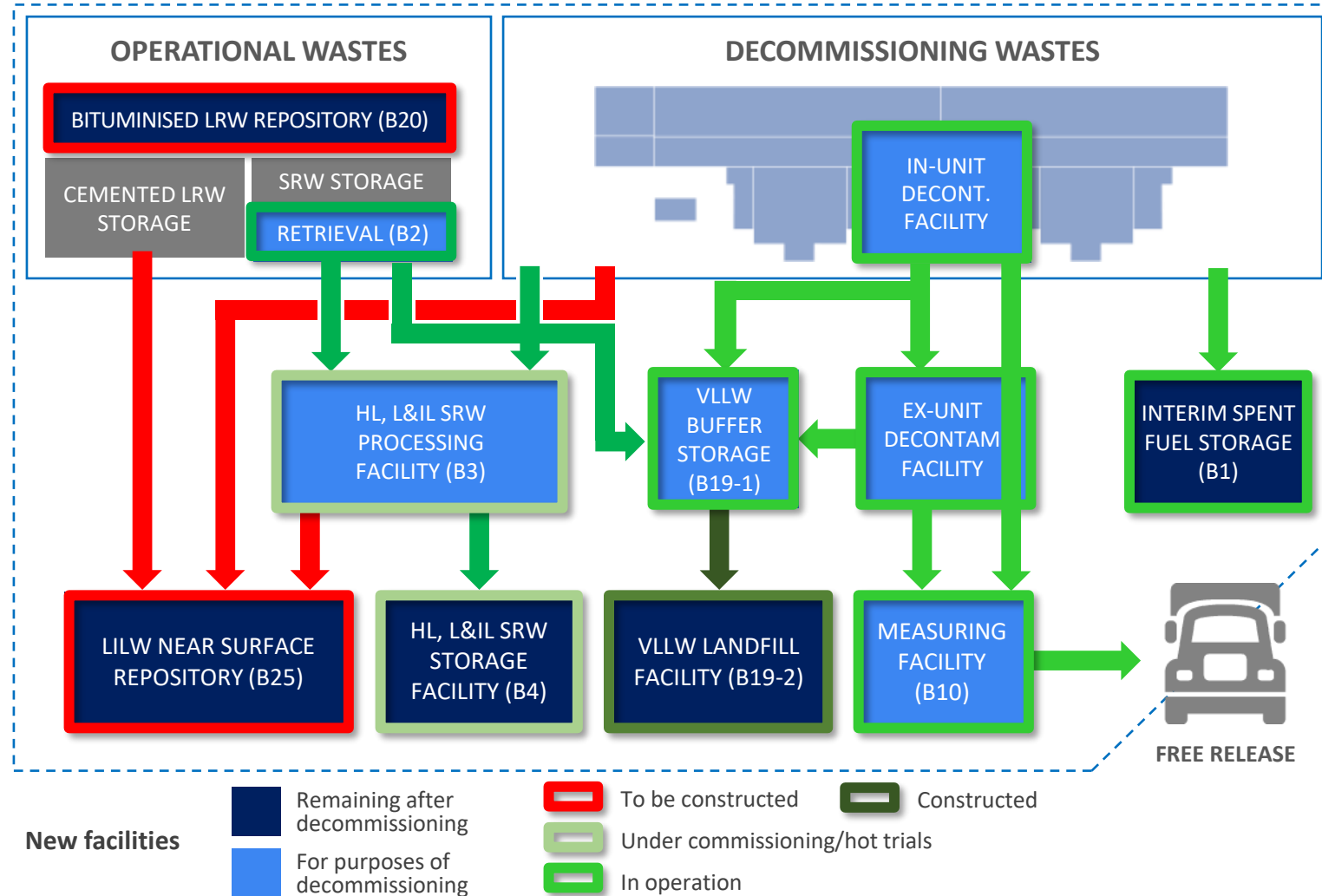
Unit 2 reactor R1 and R2 zones equipment dismantling

New project: Reactor core dismantling

Environmental monitoring



Ignalina NPP Opening waste routes



Ignalina NPP New Waste Facilities



All new waste interim storage or disposal facilities are constructed/to be constructed adjacent to Ignalina NPP site (radius \approx 1.5 km)



- Simplifies permissions
- Reduces new infrastructure
- No use of public roads
- Facilitates physical protection



Interim Spent Fuel Storage Facility (B1)



Objectives:

- To build Interim Spent Fuel Storage Facility, to manufacture and install all related equipment
- To design and manufacture **191** new-type casks with 80% increased capacity for INPP RBMK-1500 type reactor spent fuel (incl. damaged SF)
- To develop the technologies for casks loading and transportation to ISFSF and install it

Results:

- Start of industrial operation – **5 May 2017**
- Reactor Unit 2 defueling – **28 February 2018**
- 172 casks loaded to date

Next steps:

- Storage pools halls of Unit 1,2 defueling Intact SF – **2021**
- Storage pools halls of Unit 1,2 defueling Damaged SF – **2022**



New-type
CONSTOR® RBMK1500/M2
cask

Capacity: 91 assemblies

Diameter: 2.63 m

Empty cask weight: 91 t

Loaded cask weight: 118 t



Solid Waste Management & Storage Facilities (B2/3/4)



Objectives:

- To build the facility for treatment of solid radioactive operational and dismantling waste, comprising:
 - B2 Retrieval Facility (retrieval from existing interim storages and transportation to B3)
 - B3 Processing Facility (sorting and treatment before transportation to B4)
 - B4 Storage Facilities (for long - and short-lived radioactive waste)

Results for B2:

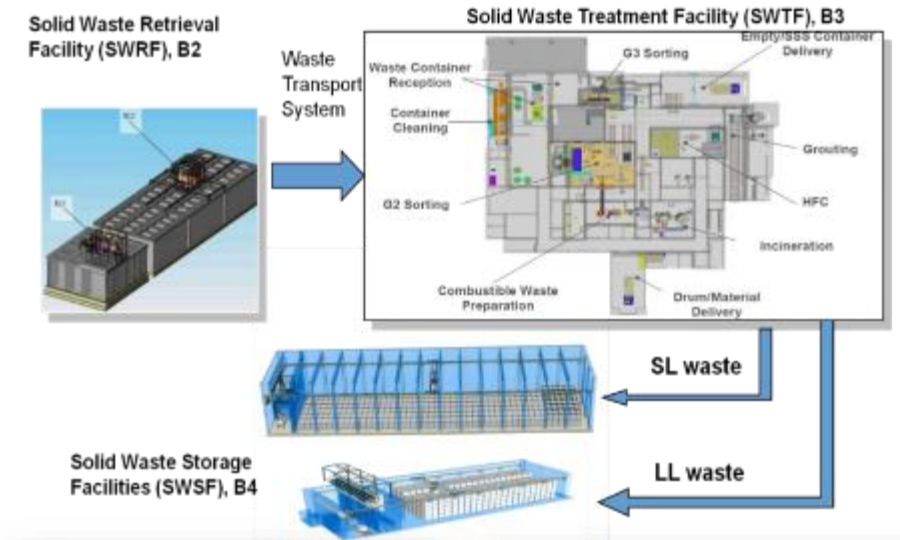
- Start of Industrial operation – **April 2020**

Results for B3/4:

- Operational License and start of hot-trials – **13 October 2017**

Next steps:

- License for Industrial operation of B3/4



New Very Low Level Short Lived Waste Storage Facility (B19)



Objective:

- Construction of Landfill type disposal modules for SL VLL waste 60,000 m³ arising from:
 - Operational waste retrieved from B2
 - Units 1 and 2 dismantling
- After its closure the surveillance of the repository will be carried out for at least 100 years



Key dates:

- Landfill Buffer storage facility in operation **since 2013**
- Landfill modules construction started - 2018
- Construction completion – **2020**
- First campaign of transportation of radioactive waste to Landfill facility – **second half 2021**



Near Surface Repository for Low and Intermediate Level Short-lived Radioactive Waste (B25)



Objectives:

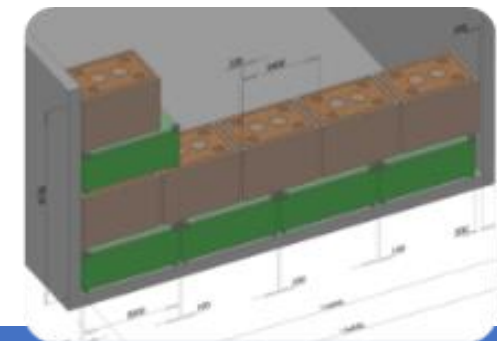
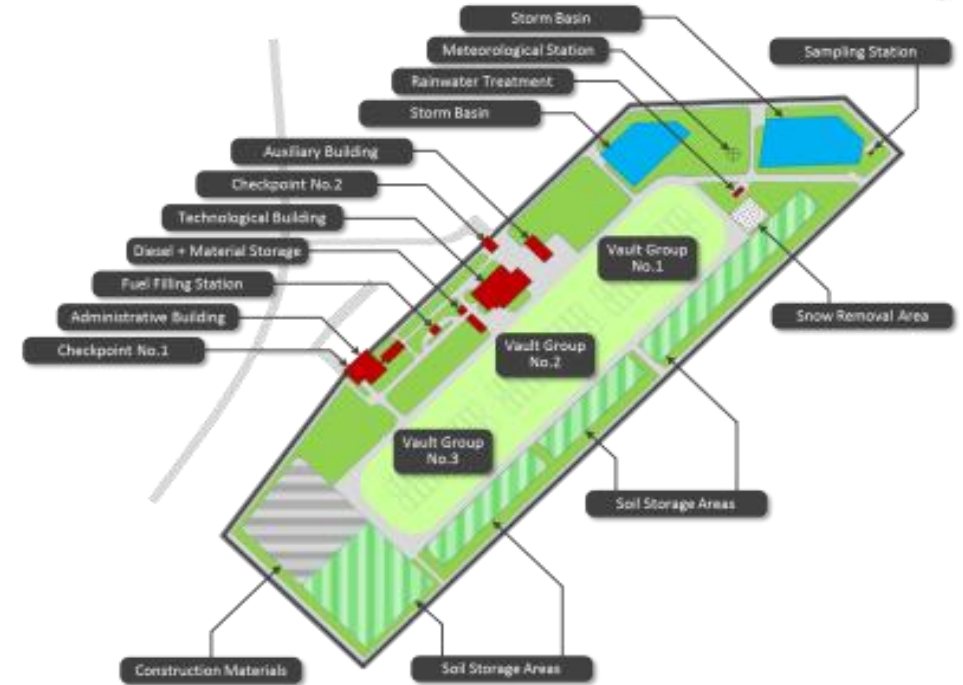
- Construction of Near Surface Repository for 100 000 m³ Low and Intermediate Level Short-lived Radioactive Waste arising from:
 - ✓ Operational solid waste retrieved from B2
 - ✓ Operational cemented liquid waste
 - ✓ Units 1 and 2 dismantling
- After its closure the surveillance of the repository will be carried out for at least 300 years

Key dates:

- Technical Design and PSAR completed and agreed with state institutions - **May 2017**
- VATESI Licence for Construction and Operation - **November 2017**

Next steps:

- Tender procedures for procurement of 1st and 2nd vault construction
- Completion of vault construction – 2024
- Start of operation - 2025



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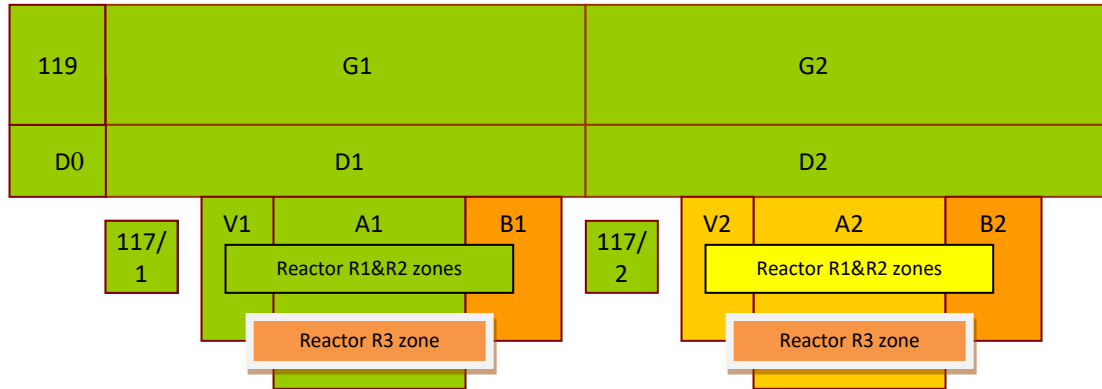
Environmental monitoring



INPP Units equipment D&D projects environmental impact assessment, including new INPP nuclear facilities



Conducted/planned to be conducted EIA procedures



- D&D projects for which EIA procedure is completed and the decision of the competent institution is obtained.
- EIA procedure is ongoing
- Planned D&D projects subject to the transboundary environmental impact assessment
- EIA procedure is ongoing (subject-matter of these consultations)

Transboundary environmental impact assessment of new INPP nuclear facilities that the Republic of Latvia participated

B1 project – Interim spent fuel storage facility

In 2007 the Republic of Latvia participated in the transboundary environmental impact assessment process, comments and proposals were provided, public hearing was held in Daugavpils on 13 March 2007.

B2/3/4 project – Solid radioactive waste treatment and storage facility

In 2008 the Republic of Latvia participated in the transboundary environmental impact assessment process, public hearing of the EIA report was held in Daugavpils on 13 March 2008, comments and proposals were provided, transboundary consultations with experts of the Ministry of Environment and the Radiation Protection Centre of the Republic of Latvia were held in Vilnius on 4 June 2008.

B19 project – Very-low-level short-lived radioactive waste Landfill facility

In 2009 the Republic of Latvia participated in the transboundary environmental impact assessment process, public hearing of the EIA report was held in Daugavpils on 22 April 2009, no comments were provided.

B25 project – Low- and intermediate-level short-lived radioactive waste near surface repository

In 2005 the Republic of Latvia participated in the transboundary environmental impact assessment process, public hearing of the EIA report was held in Daugavpils on 9 June 2005, public hearing of the updated EIA report was held in Daugavpils on 12 December 2006 and comments were provided; concluding transboundary consultations with experts of the Ministry of Environment and other institutions of the Republic of Latvia were held in Vilnius on 16 March 2007, provided comments and the state position were overviewed.



INPP planned economic activities subject to the transboundary environmental impact assessment



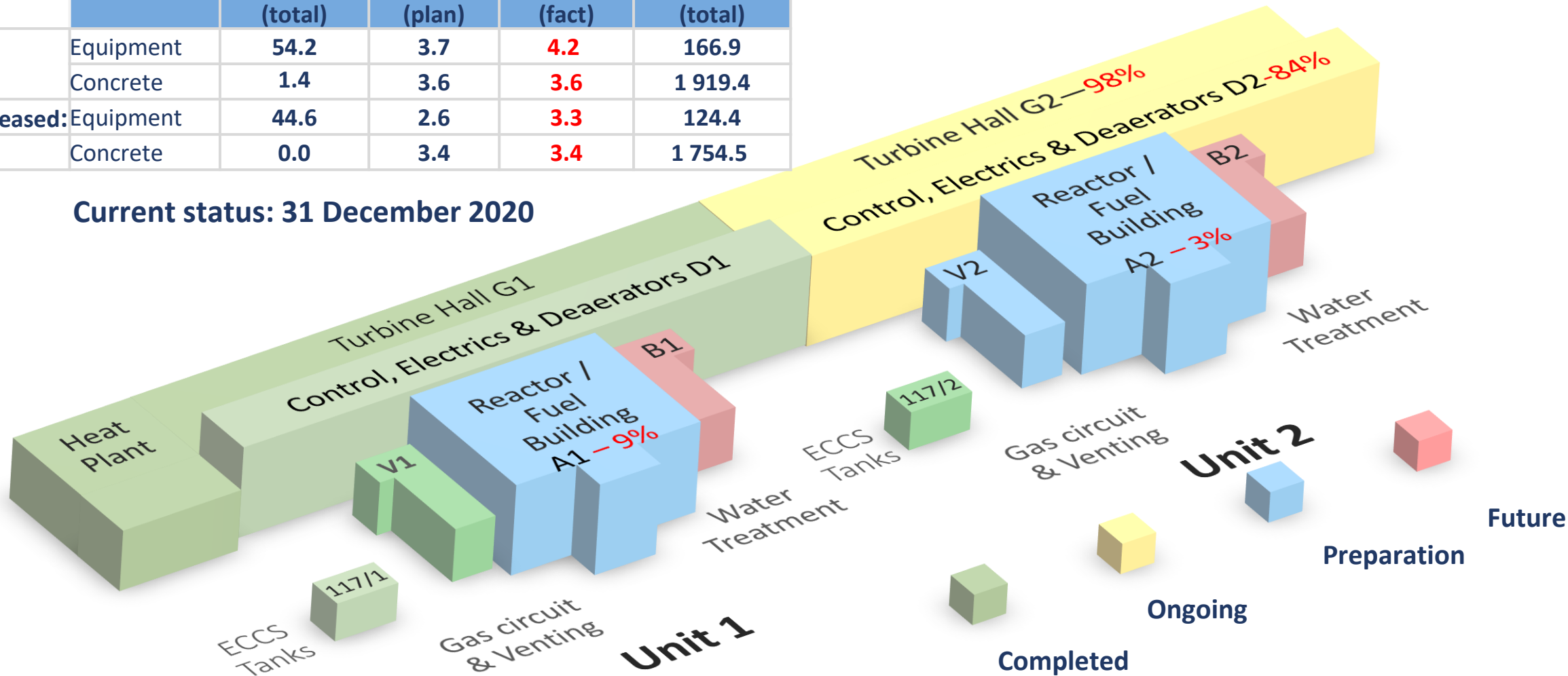
- Unit 2 reactor R1 and R2 zones equipment dismantling (subject-matter of these transboundary consultations).
- Units 1 and 2 reactor R3 zones dismantling (UP01/R3).
- Conversion of Bituminized radioactive waste storage facility into the repository.



Overview of current status of INPP decommissioning

	x 1000 tons	2010-2019	2020	2020	2010-2038
		(total)	(plan)	(fact)	(total)
Dismantled:	Equipment	54.2	3.7	4.2	166.9
	Concrete	1.4	3.6	3.6	1 919.4
Waste free-released:	Equipment	44.6	2.6	3.3	124.4
	Concrete	0.0	3.4	3.4	1 754.5

Current status: 31 December 2020



Cutting methods:

- Hot cutting – plasma cutting, acetylene oxygen cutting.
- Cold cutting – band saws, electric hand saws, electric and hydraulic shears, etc.



Decontamination methods:

- physical (mechanical) techniques such as blasting, jetting, wiping, brushing, etc
- ultrasonic techniques
- chemical techniques

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Unit 2 reactor R1 and R2 zones equipment dismantling



Goal of the planned economic activity:

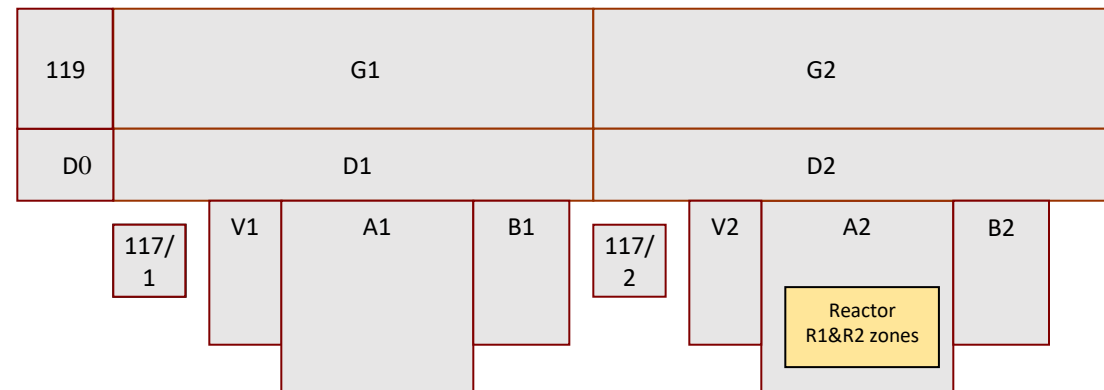
- safe dismantling of equipment from Unit 2 reactor R1 and R2 zones;
- pre-treat originated waste at the pre-treatment sites arranged in Unit 2;
- package the waste;
- transport the waste packages for further management to the corresponding INPP radioactive waste management facilities following the radioactive waste management requirements.

All the works within the scope of this planned economic activity will be conducted exceptionally inside the premises of building 101/2.

Dismantling works performance dates:

- start: 2023
- completion: 2028

Interrelation of separate dismantling and decontamination projects with INPP Units and buildings



Bld.117 – Emergency core cooling system

Unit G – turbine equipment with auxiliary systems

Unit V – reactor gas circuit and gas system

Unit B – low salted water purification and main circulation circuit water bypass purification equipment

Unit D – control room, electrical equipment and deaerators

Unit A – reactor building

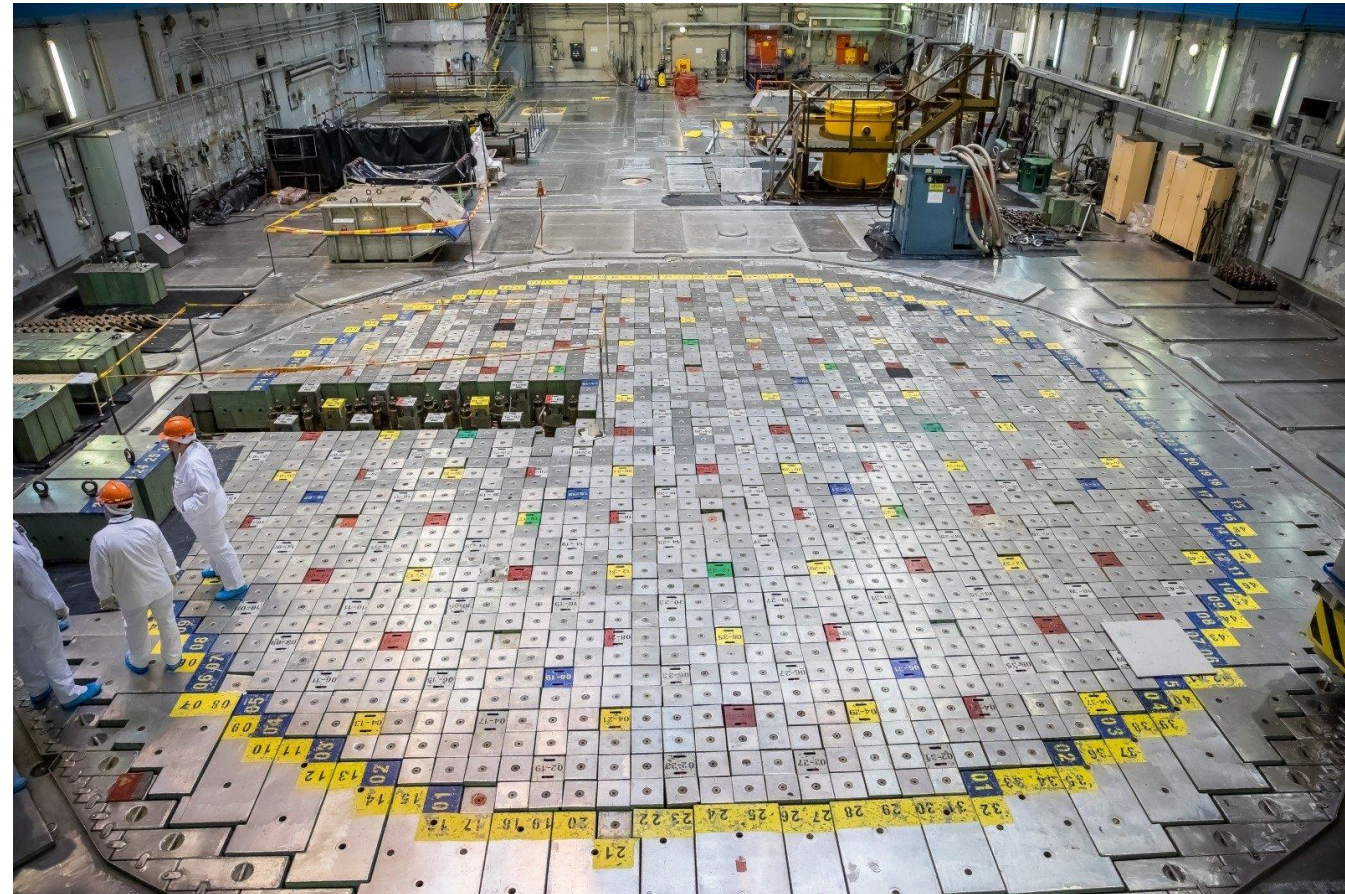


Unit 2 reactor R1 and R2 zones equipment dismantling



Unit 2 reactor R1 and R2 zones equipment D&D performance technologies are dedicated for:

- Reduction of collective and individual personnel exposure doses in compliance with the optimisation of radiation protection (ALARA) principle;
- Reduction of radioactive waste volumes by pre-treating the waste and reclassifying to lower activity radioactive waste classes, thus reducing the radioactive impact to the environment and the radioactive waste management cost;
- Non- exceed of the impact limits to the personnel, general public and the environment set in the legal acts of the Republic of Lithuania.

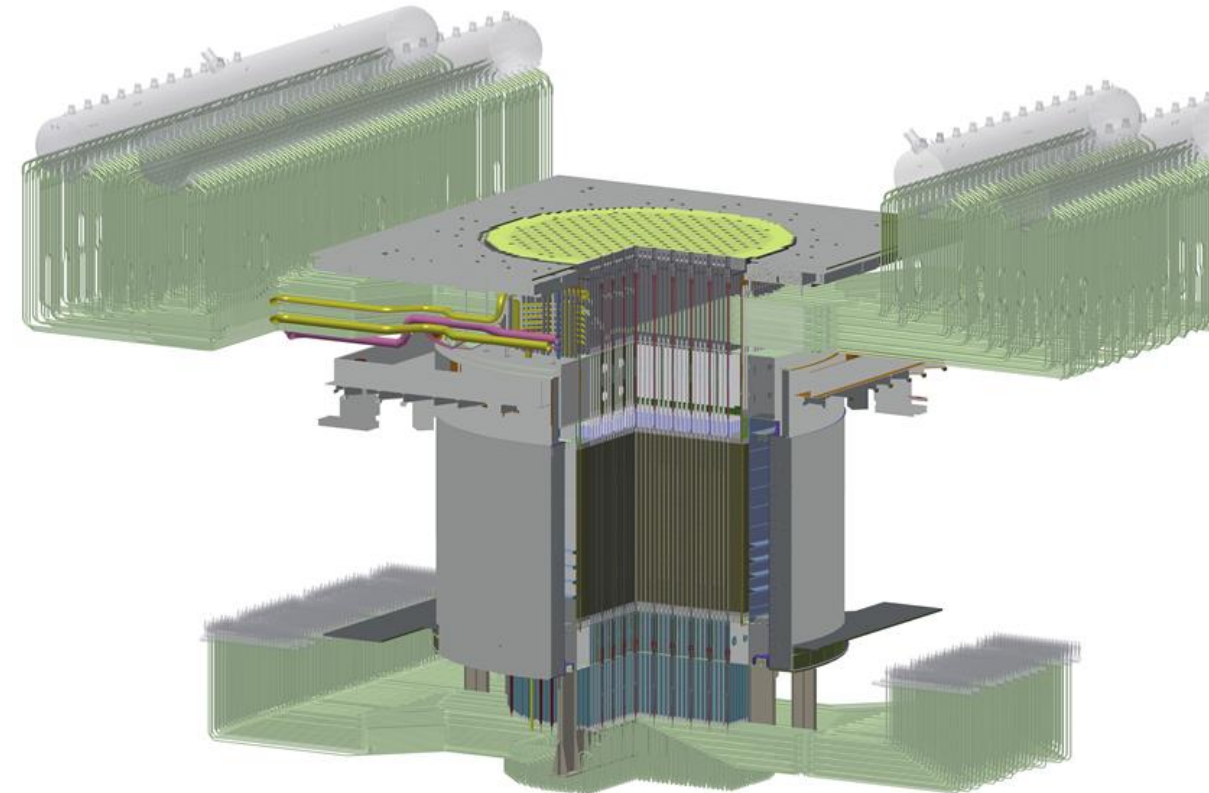


Unit 2 reactor R1 and R2 zones equipment dismantling



The main equipment to be dismantled within the scope of the planned economic activity:

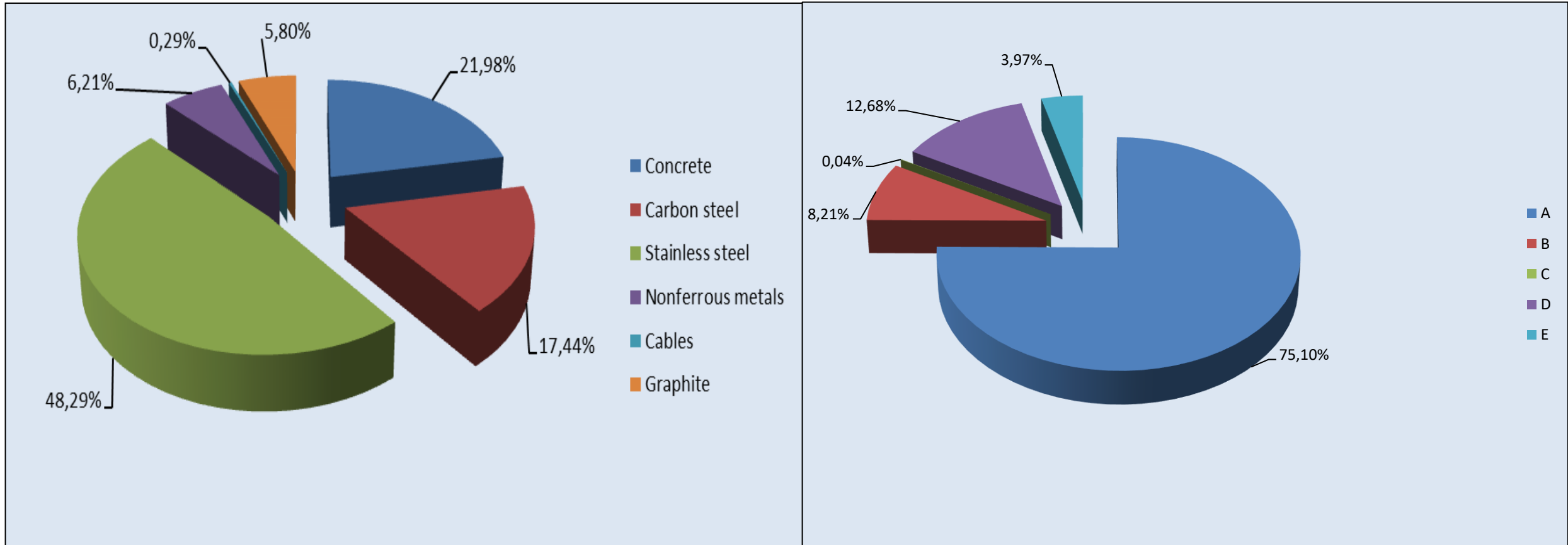
Equipment	Function (location)
Fuel channels	Pipes for fuel assemblies, inside the reactor
Control and Protection System (CPS) channels	Pipes for control and protection systems (inside the reactor). All absorption rods are already removed.
Reflector Cooling Channels	Pipes for cooling graphite neutron reflector (inside the reactor)
CPS channels capping (asm.33)	Biological shielding. Control and protection system mechanisms are mounted on top of the capping.
Top cover (removable floor) slabs and blocks (asm.11)	Biological shielding, part of reactor hall floor
Steam-water communications	Hot leg of primary circuit (above the top of the reactor)
Lower water communications	Cold leg of the primary circuit



Unit 2 reactor R1 and R2 zones equipment dismantling



General composition of to be dismantled waste depending on materials and waste classes



Assessed impact of the planned economic activity to the public health:

- The evaluated maximum annual effective dose to the representative due to radioactive releases into the air will be **7.47E-04 mSv** (0.00747 μ Sv), if compared to the dose constraint of the annual effective dose - 0.2 mSv (200 μ Sv)(Hygiene Norm of Lithuania HN 73:2018).
- The annual effective dose to the representative due to all nuclear facilities in the INPP sanitary protection zone during the period of 2023-2028 (current project implementation period) will not exceed **1.62E-02 mSv** (16.2 μ Sv).
- Exposure doses of the population of the neighbouring countries **will be even lower** due to more distant location to the release sources.
- **No uncontrolled discharge of any effluents to the environment** are planned during the normal course of performance of the planned economic activity. All effluents originated during the work performance will be accumulated in the special sewerage system of Bld. 101/2 and then treated as liquid radioactive waste in Bld. 150 (special sewerage system, evaporation facilities, cementation facilities).

Content



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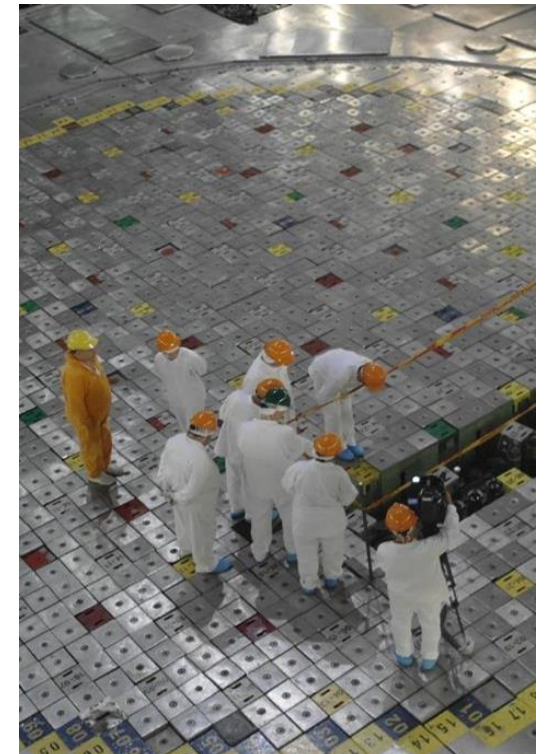
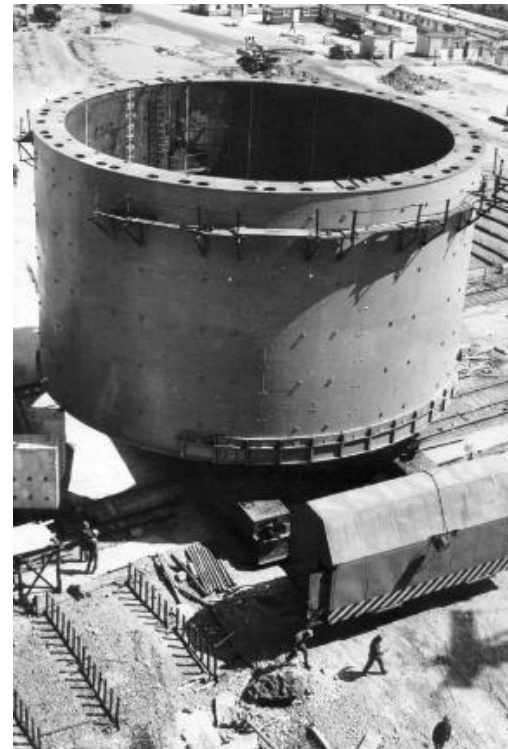
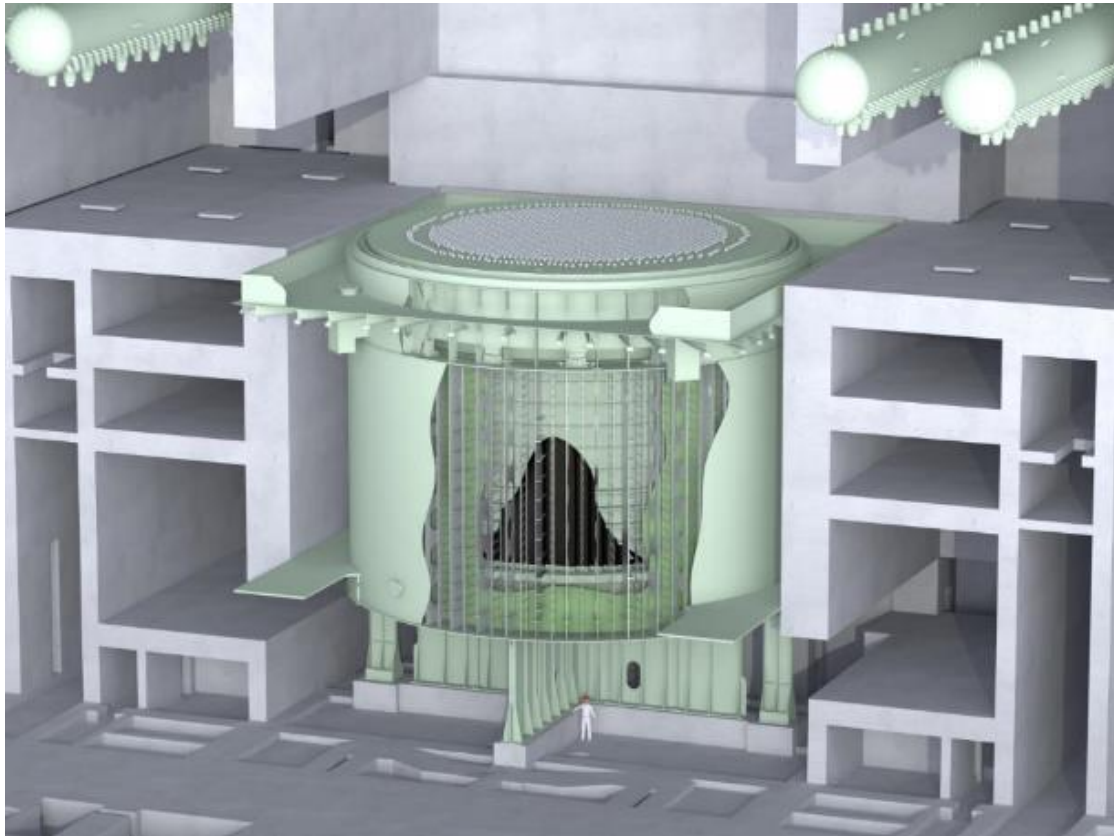
Unit 2 reactor R1 and R2 zones equipment dismantling

New project: Reactor core dismantling

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RBMK-1500 reactor core dismantling



R3 reactor core dismantling is the key project for INPP decommissioning critical pass

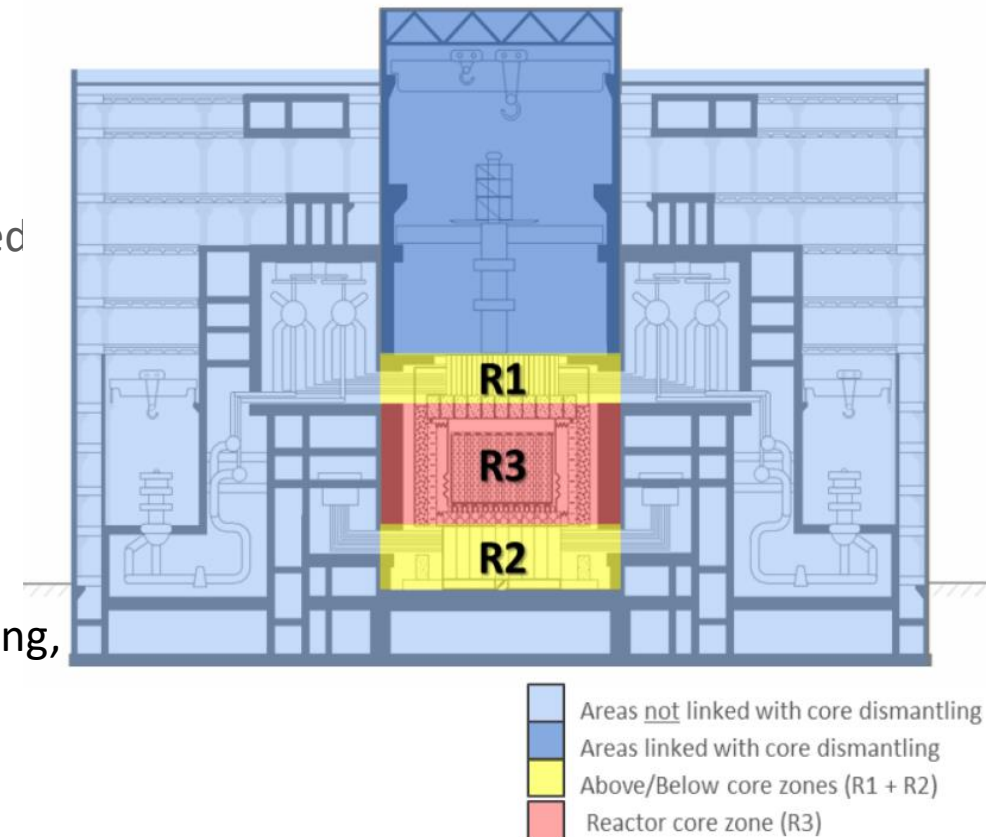
Name of the Project: Units 1 and 2 Reactor Facility Dismantling in area R3 (UP01/R3)

Project objective:

- to develop the dismantling technologies for structures and equipment from INPP Units reactor shaft (in the R3 area);
- to develop the technologies for radioactive waste management generated as a result of both units graphite stacks dismantling;
- to dismantle the reactor structures and equipment from INPP Units reactor shaft applying the developed technologies.

Project implementation stages:

- R3 D&D and Radioactive Waste Interim Storage Facility (RWISF) Optioneering, Conceptual Design and Environmental Impact Assessment Report development;
- R3 D&D and RWISF design and safety justification development.



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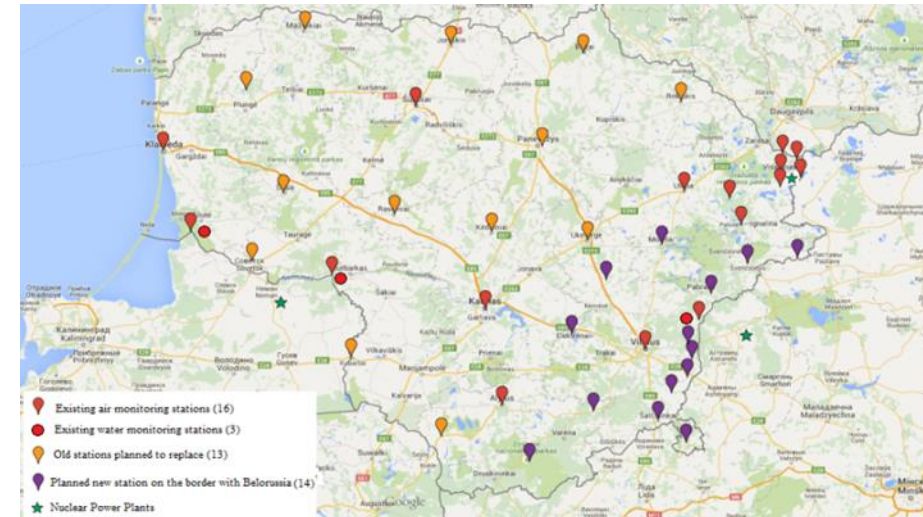


Environmental monitoring



National environmental radiological monitoring program - Environmental Protection Agency

- Automated monitoring network (gamma dose rate and gamma spectroscopy) including 5 stations in the vicinity of INPP
- Continuous monitoring of radionuclides in aerosols and deposition (including 3 stations in the vicinity of INPP)
- Monitoring of radionuclides in water, bottom sediments and biota (including Drūkšiai lake used for cooling)



Ignalina NPP radiological monitoring of the environment

The Environmental Monitoring Laboratory started its activity in 1986 and carried out radiological monitoring of the environment during the INPP operation phase (1986-2009) and also performs radiological monitoring during the decommissioning stage.

In 2020 the Environmental Monitoring Laboratory was accredited according to the international standard ISO 17025.

The INPP environmental monitoring program includes:

- Monitoring of radionuclide concentration in the air and precipitation;
- Radiological monitoring of water discharges from the INPP site;
- Radiological monitoring of gas releases into the air;
- Meteorological observations;
- Monitoring of radionuclide concentration in the lake and groundwater (network of 120 boreholes);
- Exposure dose and dose rate monitoring in the sanitary protection zone (3 km) and observation area (30 km);
- Monitoring of radionuclide concentration in fish, algae, soil, grass, sediments, mushrooms, leaves;
- Monitoring of radionuclide concentration in food products (milk, potatoes, cabbage, meat, grain-crops).

Environmental monitoring



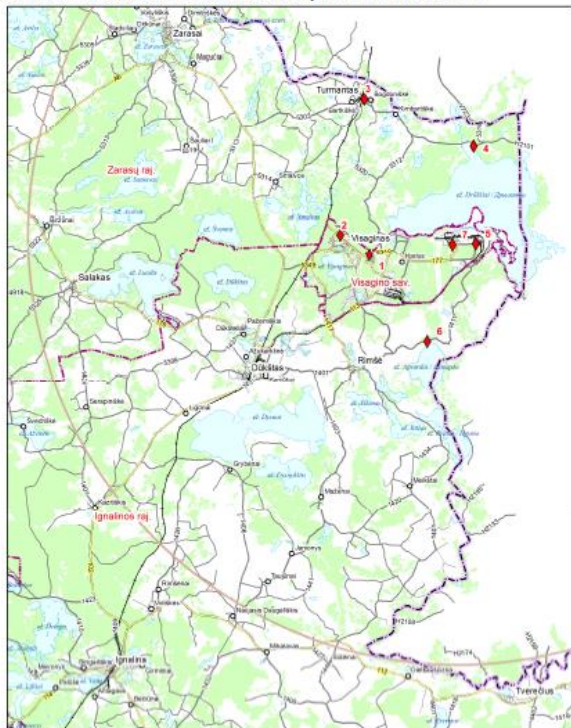
DV'Sed-0410-3V7	APLINKOS APSAUGA	42 lapas iš 67
	RADIOLOGINIO APLINKOS MONITORINGO PROGRAMA	Pakeit. Nr.

DV'Sed-0410-3V7	APLINKOS APSAUGA	44 lapas iš 67
	RADIOLOGINIO APLINKOS MONITORINGO PROGRAMA	Pakeit. Nr.

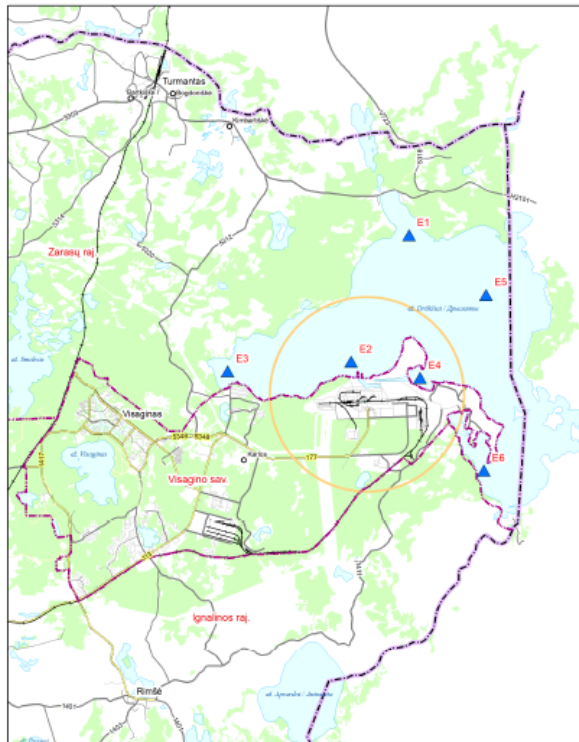
DV'Sed-0410-3V7	APLINKOS APSAUGA	46 lapas iš 67
	RADIOLOGINIO APLINKOS MONITORINGO PROGRAMA	Pakeit. Nr.

DV'Sed-0410-3V7	APLINKOS APSAUGA	53 lapas iš 67
	RADIOLOGINIO APLINKOS MONITORINGO PROGRAMA	Pakeit. Nr.

2 PRIEDAS. NUOLATINIO STEBĖJIMO POSTŲ IŠDĖSTYMO SCHEMA



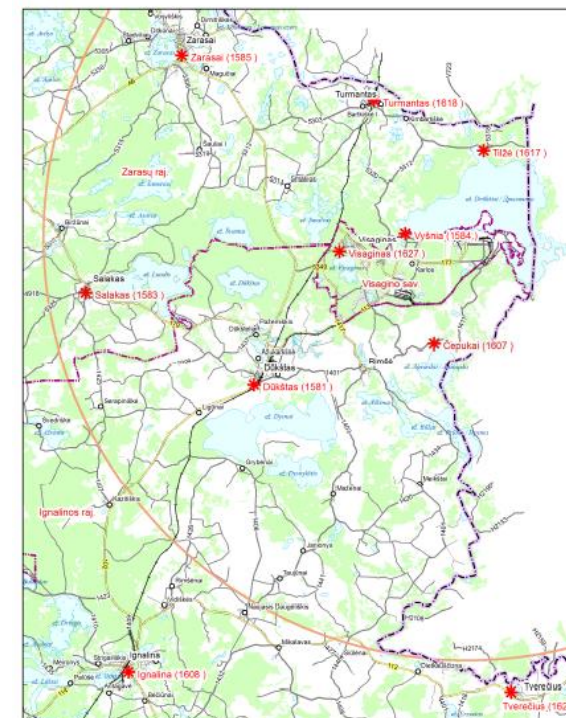
4 PRIEDAS. „NULINIO“ FONO TYRIMO VIETŲ IŠDĖSTYMO SCHEMA



6 PRIEDAS. TLD IŠDĖSTYMO VIETOVĖJE SCHEMA



13 PRIEDAS. SKYLINK SISTEMOS GAMA DAVIKLIŲ IŠDĖSTYMAS IAE 30 KM ZONOJE



Environmental monitoring



Aplinkosauga | Ignalinos atominė elektrinė

Paieska

APIE ĮMONĘ | NAUJIENOS | STRUKTŪRA IR KONTAKTAI | TEISINĖ INFORMACIJA | VEIKLA | KORUPCIJOS PREVENCIJA | ADMINISTRACINĖ INFORMACIJA | PASLAUGOS | DUK | NUORODOS

zonoje esančiose gyvenvietėse įrengta 10 daviklių, sanitarinėje apsauginėje zonoje - 12 daviklių, kurie leidžia realiu laiku vykdyti dozės galios kontrolę. LR kontroliuojančios institucijos turi galimybę pastoviai stebėti šių matavimų rezultatus.

Dozės galios matavimų duomenis galite stebėti tiesiogiai:

2021 - 01 - 26 15:23

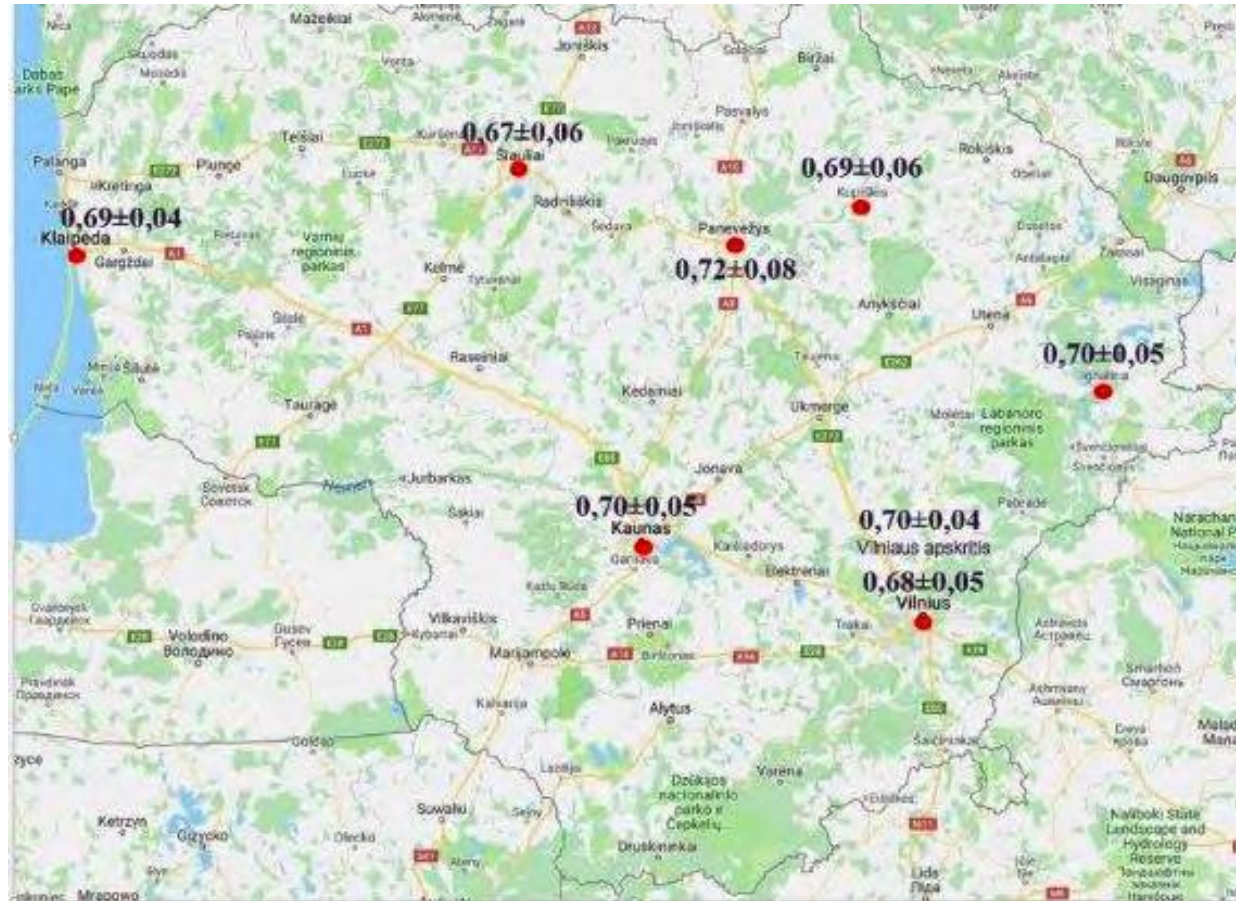
1. Salakas - 10.23 mkr/val	8. Tverėčius - 11.08 mkr/val
2. IAE LPBKS - 11.15 mkr/val	9. Turmantas - 0.00 mkr/val
3. IAE p.186 - 10.40 mkr/val	10. Zarasai - 11.13 mkr/val
4. Tilžė - 9.68 mkr/val	11. Dūkštas - 12.15 mkr/val
5. Čepukai - 10.60 mkr/val	12. Ignalina - 0.00 mkr/val
6. Vyšnia - 9.83 mkr/val	13. IAE PBKSS - 12.85 mkr/val
7. Visaginas - 10.43 mkr/val	

detektoriai aptarnavime

15:39 2021.01.26



Average value of annual ambient dose equivalent , 2019 (mSv)



SE Ignalina Nuclear Power Plant

Drūkšinių km, Visagino sav
LT-31500, Lithuania

Phone +370 386 28985

Fax +370 386 24396

E-mail iae@iae.lt

Thank you for attention!



Decommissioning of Ignalina NPP is co-financed by
the European Union