INPP Decommissioning Overview

General Information

- Largest and the most advanced RBMK design (also with later safety upgrading)
- It was intended to build 4 units
- Construction of 3rd unit was suspended in 1989 (about 60% of construction works were accomplished)
- Supplied 70-80% of LT national demand
- Closed at around mid-life
- No funds accumulated for decommissioning due to early closure of the Plant

<table>
<thead>
<tr>
<th>Plant type</th>
<th>RBMK-1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of units</td>
<td>2 (of 4 planned)</td>
</tr>
<tr>
<td>Power per unit</td>
<td>1500 MW</td>
</tr>
<tr>
<td>Staff in 2014</td>
<td>~2100 (max 5600 during operat.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit</th>
<th>Unit 1</th>
<th>Unit 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>First operation</td>
<td>Dec 1983</td>
<td>Aug 1987</td>
</tr>
<tr>
<td>Final Closure</td>
<td>Dec 2004</td>
<td>Dec 2009</td>
</tr>
<tr>
<td>Power generation</td>
<td>137 TWh</td>
<td>170 TWh</td>
</tr>
</tbody>
</table>
INPP Decommissioning Programme

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>2022</td>
<td>2024</td>
<td>2026</td>
</tr>
<tr>
<td>Key dates</td>
<td>2028</td>
<td>2030</td>
<td>2032</td>
</tr>
</tbody>
</table>

**Preparation for decommissioning**
- Engineering inventory / Radiological characterization
- Construction of RW management facilities

**Operation**
- Unit 1: 1983-2004
- Unit 2: 1987-2009

**Site demolition**
- Reactors dismantled
- Pools dismantled
- 2026-2038

**Reactors defueled**
- Unit 1: 2017-2021
- Unit 2: 2017-2022
- Unit 1: 2018-2032
- Unit 2: 2023-2034

**Pools defueled**
- 2022
- 2034

**Central Projects Management Agency**
- Ignalina Program

**The European Bank for Reconstruction and Development**
- International Ignalina Decommissioning Support Fund

**State Enterprise Energy Agency**
- National Decommissioning Fund

**Ministry of Energy of LR**
- State Budget Fund

**Ignalina NPP Board**
- INPP own-financial resources

**State Enterprise INPP decommissioning**

Ignalina/NPP decommissioning activities are co-financed by European Union.
**INPP Decommissioning cost**

In accordance with Final Decommissioning Plan (amended in 2014):
Total for the remaining decommissioning period 2014-2038 (including inflation) **2658.68 MEUR**

Cost distribution by decommissioning programs (MEUR):

- Enterprise Activity Organizing Programme (General Types of Activities)
- Preparation for the decommissioning programme
- Dismantling / demolition / site restoration programme
- Spent Nuclear Fuel Handling Programme
- Waste Handling Programme
- Post-operation Programme

---

**Status of Spent Nuclear Fuel**

- **Unit 1: final closure Dec 2004**
  - core fully defueled in 2009;
  - 7175 fuel assemblies in pools.

- **Unit 2: final closure Dec 2009**
  - 1134 fuel assemblies remain in the core to be removed;
  - Planned defueling – starting 2017;
  - 7246 fuel assemblies in pools.

Final defueling from SFP – 2022.
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Status of Waste Inventory

Ignalina NPP 3000 MW (RBMK)

- **Stored Operational Waste**
  - Solid Waste: 6,016 vnt., 27,000 m³
  - Decommissioning Waste: 15,555 vnt., 130,000 L
  - Concrete: 4,000 m³

- **Decommissioning Waste**
  - Reactor
    - Fuel Assemblies: 15,555 vnt.
    - Steel: 12,170 L
    - Graphite: 11,940 L
    - Concrete: 1,000,000 m³
    - Steel: 200,000 L
  - Buildings
    - Steel and Structures: 16,403 t.

- **Dismantled Waste**
  - 2010 to July 2014
    - 130,000 t.
    - 15,555 vnt.

Free Release Waste
- Very Low Level Waste (<1 mSv/h)
- Low Level Waste (0.5-2 mSv/h)
- Intermediate Level Waste (>2 mSv/h)

Long-lived Low Level and Intermediate Level Waste:
- Low Level Waste (<10 mSv/h)
- Intermediate Level Waste (>10 mSv/h)

<table>
<thead>
<tr>
<th>Type</th>
<th>Radioactivity Level</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid Waste</td>
<td>&lt;1 mSv/h</td>
<td>6,016 vnt.</td>
</tr>
<tr>
<td>Decommissioning Waste</td>
<td>&gt;2 mSv/h</td>
<td>15,555 vnt.</td>
</tr>
<tr>
<td>Concrete</td>
<td>&gt;2 mSv/h</td>
<td>4,000 m³</td>
</tr>
<tr>
<td>Reactor</td>
<td>&gt;10 mSv/h</td>
<td>130,000 L</td>
</tr>
<tr>
<td>Buildings</td>
<td>&gt;10 mSv/h</td>
<td>1,000,000 m³</td>
</tr>
<tr>
<td>Steel and Structures</td>
<td>&gt;10 mSv/h</td>
<td>16,403 t.</td>
</tr>
</tbody>
</table>

Infrastructure and status as of 2015

- Buffer Storage Facility
- Interim Spent Fuel Storage Facility
- Near Surface Repository
- Old SFSF
- VLL Waste Repository

**Free Release Level Measurement Facility:** In operation

**Non-radioactive Waste:**
- Tendering shortly

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Interim Spent Fuel Storage Facility (B1)

(financed by IIDSF administrated by EBRD)

Objective of the Project B1:

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

Results:

- Spent fuel will be stored in casks CONSTOR RBMK-1500/M2 (full weight – 118 t)
- 191 new-type casks will be manufactured
- Total storage capacity – 202 casks

<table>
<thead>
<tr>
<th>Contractor</th>
<th>NUKEM Technologies GmbH / GNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract signed</td>
<td>5 January 2005</td>
</tr>
<tr>
<td>Start of operations (foreseen)</td>
<td>2017-10</td>
</tr>
<tr>
<td>Operational period</td>
<td>50 + 5 years</td>
</tr>
</tbody>
</table>
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Interim Spent Fuel Storage Facility (B1)
(financed by IIDSF administrated by EBRD)

Key works are in progress:

- ISFSF cold trials completed in June 2015
- Spent Fuel Pools Unit 1, 2 Modification is progressing
- Leaking fuel classification system is under implementation
- Heavily Damaged Fuel Design / PSAR review
- Main SPH-1,2 cranes 125 t modification is progressing

Interim Spent Fuel Storage Facility (B1)
(financed through EBRD)

Key Milestones (as to technical delivery schedule)

<table>
<thead>
<tr>
<th>Task Details</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISFSF Cold Trial completion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>JND</td>
</tr>
<tr>
<td>SPH-1 Main Crane is ready for operation</td>
<td></td>
<td></td>
<td></td>
<td>JND</td>
<td>JND</td>
</tr>
<tr>
<td>INPP preparedness to Unit 1 Cold Trial</td>
<td></td>
<td></td>
<td></td>
<td>JND</td>
<td>JND</td>
</tr>
<tr>
<td>SPH-2 Main Crane is ready for operation</td>
<td></td>
<td></td>
<td></td>
<td>JND</td>
<td>JND</td>
</tr>
<tr>
<td>Approval of Updated SAR/TDD by VATESI</td>
<td></td>
<td></td>
<td></td>
<td>JND</td>
<td>JND</td>
</tr>
<tr>
<td>VATESI Licence for Operation</td>
<td></td>
<td></td>
<td></td>
<td>JND</td>
<td>JND</td>
</tr>
<tr>
<td>Hot Trial completion</td>
<td></td>
<td></td>
<td></td>
<td>JND</td>
<td>JND</td>
</tr>
<tr>
<td>Approval of Final SAR by VATESI</td>
<td></td>
<td></td>
<td></td>
<td>JND</td>
<td>JND</td>
</tr>
<tr>
<td>ISFSF Construction Completion Act</td>
<td></td>
<td></td>
<td></td>
<td>JND</td>
<td>JND</td>
</tr>
<tr>
<td>VATESI Permission for Industrial Operation</td>
<td></td>
<td></td>
<td></td>
<td>JND</td>
<td>JND</td>
</tr>
</tbody>
</table>
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**Solid Waste Management & Storage Facilities (B2/3/4)**

*financed by IIDSF administrated by EBRD*

**Objective:**
- To build facility for treatment of solid operational and from dismantling radioactive wastes, comprising:
  - Retrieval Facility (B2)
  - Processing Facility (B3)
  - Storage Facility (B4, for long and short lived waste)

**Results:**
- Radioactive wastes will be retreated from the existing interim storages and transported to new treatment facility;
- Wastes will be sorted and treated (resized, incinerated and compacted);
- Treated wastes will be packed into containers and stored in new treatment facility until the repository facilities will be built.

<table>
<thead>
<tr>
<th>Contractor:</th>
<th>NUKEM Technologies GmbH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract signed:</td>
<td>30 November 2005</td>
</tr>
<tr>
<td>Start of operations (foreseen):</td>
<td>November 2018</td>
</tr>
</tbody>
</table>

Contractor: NUKEM Technologies GmbH
Contract signed: 30 November 2005
Start of operations (foreseen): November 2018

---

**Key works are in progress:**
- Pre-commissioning is in progress
- B2,3,4 Facilities construction completion phase
- B3,4 process equipment and engineering networks installation
- B3,4 Updated TDD/SAR preparation
- Operational documentation preparation
Solid Waste Management & Storage Facilities (B2/3/4)  
(financed by IIDSF administrated by EBRD)

Key Milestones:

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Start Date</th>
<th>End Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start of Pre-Comissioning (Cold Trials)</td>
<td>2015 August 25</td>
<td>2015 October 28</td>
</tr>
<tr>
<td>Pre-Comissioning (Cold Trials)</td>
<td>2015 October 25</td>
<td>2015 November 20</td>
</tr>
<tr>
<td>Approval of Updated SAR/TDD by VATESI</td>
<td>2015 December 30</td>
<td>2015 December 30</td>
</tr>
<tr>
<td>Operational license</td>
<td>2016 January 5</td>
<td>2016 January 5</td>
</tr>
<tr>
<td>Start of Commissioning (Hot Trials)</td>
<td>2017 May 10</td>
<td>2017 May 10</td>
</tr>
<tr>
<td>Commissioning (Hot Trials)</td>
<td>2018 June 28</td>
<td>2018 June 28</td>
</tr>
<tr>
<td>Approval of Final SAR by VATESI</td>
<td>2019 November 25</td>
<td>2019 November 25</td>
</tr>
<tr>
<td>VATESI Permission for Industrial Operation</td>
<td>2020 November 26</td>
<td>2020 November 26</td>
</tr>
</tbody>
</table>

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Landfill Facility for Short-lived Very Low Level Waste (B19)  
(financed by IP administrated by CPVA)

The Landfill Facility will consist of:

- **The Buffer Storage Facility B19-1**: A temporary closed building of 0.2 ha area where the systems designed for radiological measurement, transportation and temporary storage of wastes are installed. Capacity of Buffer Storage Facility is 4000 m³. *In operation since May 2013*

- **Disposal Modules B19-2**: An above ground structure, in which carbon steel 20 feet ISO half-height containers with waste will be closely placed in five layers on the concrete slab.

<table>
<thead>
<tr>
<th>Contractor (B19-1 design and construction, B19-2 design)</th>
<th>Consortium (Speciaulis-Montažas NTP, Vilstata, LEI, PramProjektas)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract signed:</td>
<td>December 2007</td>
</tr>
<tr>
<td>Contractor (B19-2 design correction)</td>
<td>Joint Venture Partnership (Eksortus, PramProjektas)</td>
</tr>
<tr>
<td>Contract signed:</td>
<td>August 2014</td>
</tr>
<tr>
<td>Start of B19-2 operations</td>
<td>2018</td>
</tr>
</tbody>
</table>

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**Landfill Facility for Short-lived Very Low Level Waste (B19)**  
(financed by IP administrated by CPVA)

**Key works / plans are:**

- **2015-08** – Agreement of the corrected Technical Design by regulating institutions
- **2015-09** – Tender on Landfill construction announcement
- **2016-02** – Commencement of Landfill construction
- **2017-05** – Commencement of operation, first (trial) disposal campaign
- **2018-02** – Issue of permission on commercial operation

---

**Near Surface Repository (B25)**  
(designing - financed by IIDSF administrated by EBRD)

**Objective:**
- To design and construct Near Surface Repository for Low and Intermediate Level Short-lived Radioactive Waste.

**Results:**
- Cellular reinforced concrete repository will be build which will consist of several groups of sections designed for final disposal of 100 000 m$^3$ of treated radioactive waste packed into concrete containers and cemented radioactive wastes.
- Upon completion of radioactive waste disposal the repository will be closed and its surface will be covered with erosion resistant multilayer engineered protection barriers. After its closure the surveillance of the repository will be carried out for at least 300 years.

**Contractor:** Joint Venture Partnership (Areva-TA, ANDRA, LEI, PramProjektas, Speciaulus-Montažas NTP)

**Contract for designing signed:** 23 October 2010

**Start of operations (foreseen):** 2020
Near Surface Repository (B25)
(designed - financed by IIDSF administrated by EBRD)

Key works / plans are:

- **June 2015** – Technical Design General Expertise is in progress
- **August 2015** - TDD/PSAR accepted by INPP
- **September 2015** - Submission of TDD/PSAR to Lithuanian Authorities
- **September 2016** - Obtaining Permit for Construction from the Ministry of Environment
- **December 2016** - Obtaining License for Construction and Operation from VATESI
- **April 2017** - Construction works tender and the contract signing

Ignalina NPP decommissioning activities are co-financed by European Union

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Dismantling & Decontamination
D&D Activities

<table>
<thead>
<tr>
<th>Building</th>
<th>Turbine Hall G1</th>
<th>Turbine Hall G2</th>
</tr>
</thead>
<tbody>
<tr>
<td>D0</td>
<td>Control, Electrics &amp; Deaerators D1</td>
<td>Control, Electrics &amp; Deaerators D2</td>
</tr>
<tr>
<td>B1</td>
<td>Reactor / Fuel Building A1</td>
<td>Reactor / Fuel Building A2</td>
</tr>
<tr>
<td>100%</td>
<td>Gas circuit &amp; Venting</td>
<td>Gas circuit &amp; Venting</td>
</tr>
<tr>
<td>V1</td>
<td>Water Treatment</td>
<td>Water Treatment</td>
</tr>
<tr>
<td>117/1</td>
<td>ECCS Tanks</td>
<td>ECCS Tanks</td>
</tr>
<tr>
<td>117/2</td>
<td>63%</td>
<td>6%</td>
</tr>
</tbody>
</table>

Unit 1

<table>
<thead>
<tr>
<th>Completed</th>
<th>In progress</th>
<th>Design stage</th>
<th>Future</th>
</tr>
</thead>
<tbody>
<tr>
<td>x 1000 tons</td>
<td>2010-2014 (in all)</td>
<td>2015 (7 months)</td>
<td>2015 (plan)</td>
</tr>
<tr>
<td>Equipment dismantled</td>
<td>26.5</td>
<td>4.9</td>
<td>7.0</td>
</tr>
<tr>
<td>Waste free-released</td>
<td>23.8</td>
<td>4.0</td>
<td>5.6</td>
</tr>
</tbody>
</table>

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Ignalina NPP decommissioning activities are co-financed by the European Union.

Progress in D&D activities

D&D of Unit 1.2 Turbine Hall equipment (TG-1, 2)

Before D&D

Current view

D&D of Boiler House Equipment (bld. 119)

Before D&D

Current view

D&D of Dismantling of Bld. 117/2 equipment

Before D&D

Current view
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**Progress in D&D activities - VLLW size reduction (fragmentation) / decontamination**

- Band Saw Cutting Area with two band saws and bridge crane
- Manual Decontamination Booth with equipment for dry decontamination
- Technical cleaner used for discharging an ion exchange resin
- Size Reduction Containment Booth with equipment for hot cutting (plasma and oxy-acetylene cutters)
- Bld. 117/1,2 ECCS Pressurized Tanks flame cutting
- Automatic Dry Blasting Machine inside the Containment Booth

**D&D activities: Reactor Shaft (Unit 1, UP01)**

**Project Objectives:**
- To develop the dismantling technologies for structures and equipment from INPP Unit 1 reactor shafts
- To dismantle the reactor structures and equipment from INPP Unit 1 reactor shafts applying the developed technologies
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### Radiological characterization – current status

- **Radiological research of the equipment before dismantling**

<table>
<thead>
<tr>
<th>Bid.119</th>
<th>Turbine hall G1</th>
<th>Turbine hall G2</th>
</tr>
</thead>
<tbody>
<tr>
<td>D6</td>
<td>D1 Control, Electrics &amp; Deaerators</td>
<td>D2 Control, Electrics &amp; Deaerators</td>
</tr>
<tr>
<td></td>
<td>A1 Reactor/Fuel Building</td>
<td>B1</td>
</tr>
<tr>
<td></td>
<td>A2 Reactor/Fuel Building</td>
<td>---</td>
</tr>
</tbody>
</table>

- **Nuclide vector for the equipment**

<table>
<thead>
<tr>
<th>Bid.119</th>
<th>Turbine hall G1</th>
<th>Turbine hall G2</th>
</tr>
</thead>
<tbody>
<tr>
<td>D6</td>
<td>D1 Control, Electrics &amp; Deaerators</td>
<td>D2 Control, Electrics &amp; Deaerators</td>
</tr>
<tr>
<td></td>
<td>A1 Reactor/Fuel Building and R1, R2, R3 areas</td>
<td>B1</td>
</tr>
<tr>
<td></td>
<td>A2 Reactor/Fuel Building and R1, R2, R3 areas</td>
<td>---</td>
</tr>
</tbody>
</table>

- Completed
- In progress
- Planned
- Developed
- Planned (by comparing)
- Procurement

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Thank you for attention

Ignalina Nuclear Power Plant