Lithuanian regulatory policy, challenges and activities during transitional period from operation to decommissioning of Ignalina NPP

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WENRA Workshop on Regulatory Aspects of Decommissioning
Ignalina NPP Decommissioning Scheme

Preparation for decommissioning

1 unit - 1983
2 unit - 1987

Operation

Final shutdown

Transition period

Reactors defueled
Pools defueled

Post-operation

Post-operation as a nuclear facility ensuring:
- nuclear fuel safety
- containment

Post-operation as a waste storage facility ensuring:
- containment

Dismantling & Decontamination

D&D implementation ensuring:
- safe post-operation
- D&D of items not needed any more

Decommissioning

Conventional demolition

2000

1 unit - 2004
2 unit - 2009

2018

2022

2038
Planning of Decommissioning of Ignalina NPP

1. On 26 November 2002, Lithuanian Government passed a resolution to the effect that the Ignalina nuclear power plant (Ignalina NPP) Unit 1 to be decommissioned through immediate dismantling in order to avoid serious social, economic, financial and environmental consequences. The choice of method of decommissioning was influenced by various factors: economic, social, safety aspects and decommissioning work experience at other nuclear power plants.

2. In implementing the commitment of the Republic of Lithuania pursuant to the provisions of Protocol No 4 “On the Ignalina Nuclear Power Plant in Lithuania” of the Treaty of Accession to the European Union the Ignalina NPP Unit 1 was shut down on the 31st December 2004 and Unit 2 – on the 31st December 2009.

3. The Final Decommissioning Plan (FDP) of Ignalina NPP was approved by the Ministry of Economy in 2005.

4. According to Nuclear Safety Requirements BSR-1.5.1-2019 “Decommissioning of Nuclear Facilities” FDP should be updated every 5 years.

5. According to FDP, during the reactor final shutdown stage and in compliance with the national regulations authorizing to undertake activities during transition period enabling to prepare for nuclear facility decommissioning (complete defueling, isolation, decontamination, dismantling of systems that are not needed anymore, etc.), as well as setting clear binding conditions for this stage, the Ignalina NPP will implement a number of separate projects related to dismantling and decontamination of systems and equipment not needed any more for safety that are located in separate Ignalina NPP buildings.
Post-operation of Ignalina NPP: Defueling Stage

1. Pursuant to the provisions of the Law on Nuclear Safety the Ignalina NPP Units operation licences are valid as long as all nuclear fuel is not completely removed from the Units. All requirements pertaining to the operation of Units are applicable during this period.

2. Therefore, currently Unit 1 and Unit 2 are maintained in the post-operation state, based on VATESI operation licence and in accordance with the safe operation conditions and limits set in the Technical Specifications for operation of the Units.

3. The defueling phase of Ignalina NPP Units is subdivided into two stages: Stage 1 – defueling of reactors (fuel is being unloaded from the reactor core and transferred for storage to the spent fuel storage pools in the Units); Stage 2 – defueling of Units (complete fuel removal from the spent fuel storage pools to the Interim Spent Fuel Storage Facility, including damaged fuel).

4. Defueling of Unit 1 reactor started in 2006 and was completed in December 2009. Defueling of Unit 2 reactor started in 2010 and was completed in February 2018.

5. Defueling Stage 2 of both Units have been continued (schedule is till the end of 2022). The removal of nuclear fuel from the Units will decrease the risks related to the storage of nuclear fuel, thus leading to decrease in the number of systems important to safety and remaining in operation. After reclassification and safety justification these systems will be subject to dismantling under the Decommissioning Licence following the regulatory requirements.
Safety assessment of Ignalina NPP during transition period (after final shutdown and during defueling phase)

1. Law on nuclear safety of the Republic of Lithuania requires that **not less frequently than every 10 years** after the issuance of licence for operation of facility, the **licence holder must make a periodic safety analysis** and substantiation and prepare a periodic safety evaluation report, which shall be submitted to VATESI for its review and evaluation.

2. In addition, in order to be able to proceed with isolation, modification, dismantling and decontamination of some of the equipment and systems which are not needed anymore during each defueling stage, the **Ignalina NPP was required to perform safety structures, systems and components analysis to determine their status (safety class) during separate defueling stages** by comparing performed corresponding functions prior to shutdown and the need of these functions to be performed after the reactor final shutdown and **such reclassification of structures, systems and components was justified from the safety point of view**.

3. After this analysis, **2 decommissioning projects and following documents for dismantling and decontamination activities during defueling stage have been prepared, coordinated and accepted by with VATESI:**

For Unit 1
- Decommissioning Project for INPP Unit 1 Final Shutdown and Defueling Phase, U1DP0
- Safety Analysis Report for INPP Unit 1 Final Shutdown and Defueling Phase

For Unit 2
- Decommissioning Project for INPP Unit 2 Final Shutdown and Defueling Phase, U2DP0
- Safety Analysis Report for INPP Unit 2 Final Shutdown and Defueling Phase
Main aspects for authorization of dismantling and decontamination activities in Ignalina NPP during transition period:

1. After permanent shutdown most of the Ignalina NPP Unit 1 and 2 systems and equipment, which do not relate to the provision of fuel cooling, defueling, transfer and safe storage at the Units and not perform safety functions and not needed anymore, can be dismantled (as agreed in U1DP0 and U2DP0).

2. Systems that provide normal conditions for operation and maintenance of the building (heating and ventilation, lighting, fire-prevention, drainage, etc.) will stay in operation.

3. The Ignalina NPP systems and equipment dismantling sequence under the Ignalina NPP immediate dismantling strategy follows “building after building” approach.

4. During the reactor final shutdown stage in compliance with the national regulations authorizing to undertake activities enabling to prepare for nuclear facility decommissioning (complete defueling, isolation, decontamination, dismantling of systems that are not needed anymore, etc.), as well as setting clear binding conditions for this stage, the Ignalina NPP implements a number of separate projects related to dismantling of systems and equipment not needed any more for safety assurance and operation and that are located in separate INPP buildings.

5. The regulatory authorization is required for each dismantling and decontamination project.
Ignalina NPP Dismantling and Decontamination projects

Completed (started – finished):
- Boiler House (common for both units) (2010 – 2013)
- Pressurised Tanks of Emergency Core Cooling System, Unit 1 (2010 – 2013)
- Reactor gas circuit and special venting system, Unit 1, D1 phase (2012 – 2014)
  - Turbine Hall, Unit 1 (2013 – 2016)
- Block D1, electrical equipment and deaerators, Unit 1 (2016 – 2019)

On-going (started):
- Turbine Hall (G2), Unit 2 (2015)
- Block D2, electrical equipment and deaerators, Unit 2 (2018)

Planned:
- A1 building (except reactor), Phase1, Unit 1 (2020)
- R1 and R2 areas in reactor shaft, Unit 1 (2020)
- R3 area in reactor shaft, Unit 1 (2027)

For example: Turbine hall (G2) D&D project. Main activities:
- Dismantling of equipment;
- Resizing of waste;
- Decontamination;
- Radiological characterization;
- Preparation for storage, or free release.
# Dismantling and Decontamination Progress in Ignalina NPP

<table>
<thead>
<tr>
<th>Building</th>
<th>Unit 1</th>
<th>Unit 2</th>
</tr>
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<tbody>
<tr>
<td>Bldg. 119</td>
<td>Turbine Hall G1 (2206 project)</td>
<td>Turbine Hall G2 (2207 project)</td>
</tr>
<tr>
<td>Control, Electrics &amp; Deaerators D1</td>
<td>Control, Electrics &amp; Deaerators D2</td>
<td></td>
</tr>
<tr>
<td>ECCS Tanks</td>
<td>Gas circuit &amp; Venting</td>
<td>Water Treatment</td>
</tr>
<tr>
<td>117/1</td>
<td>V1</td>
<td>4%</td>
</tr>
<tr>
<td>0 A</td>
<td>0 A</td>
<td>0 A</td>
</tr>
<tr>
<td>Reactor / Fuel Building A1 (2203 project)</td>
<td>Reactor / Fuel Building A2</td>
<td></td>
</tr>
<tr>
<td>B1</td>
<td>B2</td>
<td></td>
</tr>
<tr>
<td>0 A</td>
<td>0 A</td>
<td>0 A</td>
</tr>
<tr>
<td>Water Treatment</td>
<td>Gas circuit &amp; Venting</td>
<td>Water Treatment</td>
</tr>
<tr>
<td>95%</td>
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### Equipment Dismantled

<table>
<thead>
<tr>
<th>Year</th>
<th>Unit 1</th>
<th>Unit 2</th>
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</thead>
<tbody>
<tr>
<td>2010-2016 (in all)</td>
<td>38.2</td>
<td>32.0</td>
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<tr>
<td>2017 (plan)</td>
<td>6.7</td>
<td>4.6</td>
</tr>
<tr>
<td>2017 (fact)</td>
<td>5.8</td>
<td>4.2</td>
</tr>
<tr>
<td>2010-2038 (in all)</td>
<td>153.0</td>
<td>112.5</td>
</tr>
</tbody>
</table>

### Waste Free Released

- **Unit 1**
  - Free Release Waste
  - Short-lived Low Level and Intermediate Level Wastes:
    - Very Low Level Waste (<0.5 mSv/h)
    - Low Level Wastes (0.5-2 mSv/h)
    - Intermediate Level Waste (>2 mSv/h)
- **Unit 2**
  - Long-lived Low Level and Intermediate Level Wastes:
    - Low Level Waste (<10 mSv/h)
    - Intermediate Level Waste (>10 mSv/h)
Development of radioactive waste management infrastructure in Ignalina NPP

1. **One of the main challenges** to perform decommissioning activities according to the plans and schedules is **the availability of radioactive waste management facilities**.

2. **The need of interim radioactive waste storage facilities was determined by the lack of disposal facilities for radioactive waste in Lithuania.**

3. A large part of **resources** (financial and human) of Ignalina NPP were allocated for the development of radioactive waste management infrastructure during transition period:
   - **Free Release Measurement Facility** (project B10) (in operation from 2010);
   - **Landfill disposal facility for Short-Lived Very Low Level Waste** (project B19) (consist of the following facilities: Buffer storage of VLLW (project B19-1) in operation from 2013; and three Disposal Modules (Project B19-2) – under construction);
   - **New Interim Spent Nuclear Fuel Storage Facility** (B1 project) (in operation from 2017);
   - **Low and intermediate level radioactive waste disposal facility** (project B25) (planned).
Thank you!