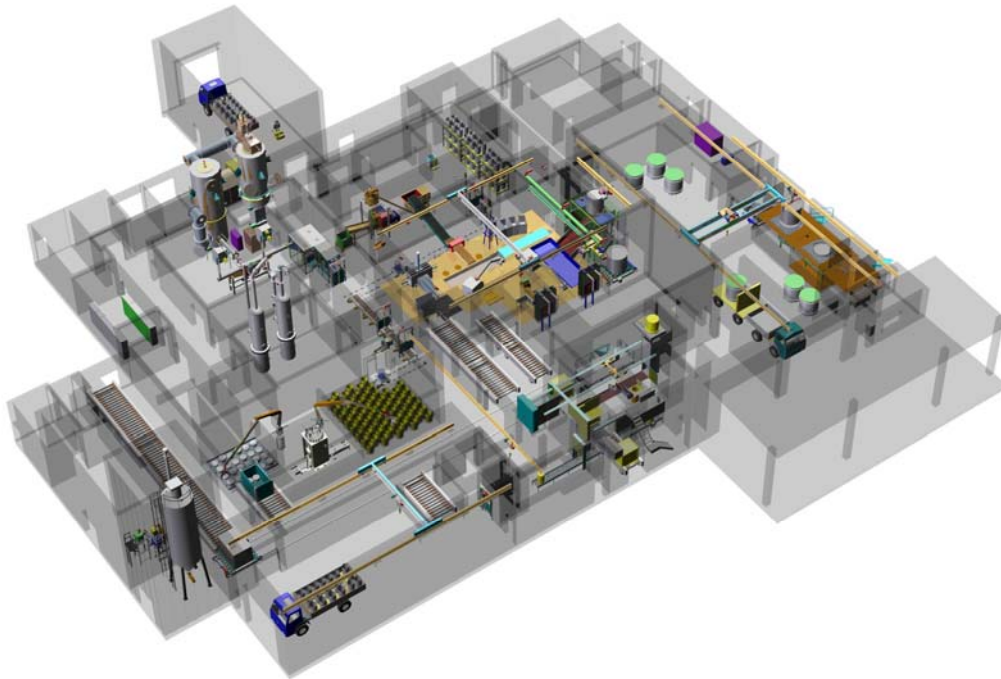


## Solid Waste Management and Storage Facilities at Ignalina Nuclear Power Plant (INPP)



On the 30th November 2005, Lithuanian Ignalina Nuclear Power Plant (INPP) signed a contract with NUKEM for design, construction and commissioning of the New Solid Waste Management and Storage Facilities (SWMSF) which will be used for the purpose of retrieving, transferring, sorting, treating (as applicable), packing, characterization and storage of the short and long lived radioactive waste.

The new facilities are required on the INPP in order to support ongoing decommissioning work, including removal of radioactive waste from existing waste storage buildings.

The Project is financed by the Ignalina International Decommissioning Support Fund (IISDF) administered by the European Bank for Reconstruction and Development (EBRD) and has a value of Euro 120.1 million.

The INPP is situated in the North-Eastern part of Lithuania close to the borders with Latvia and Belarus and on the shore of Lake Druksiai. It is approximately 120 kilometers from the capital city Vilnius. The power plant has two RBMK-type water

cooled graphite-moderated pressure tube reactors each of design capacity 1,500 MWe.

Unit 1 was shutdown for decommissioning on 31.12.2004 and Unit 2 on 31.12.2009.

The commissioning of SWMSF is scheduled for 2012.

The new SWMSF will be located on two separate sites: the Solid Waste Retrieval Facility (SWRF, Lot1) will be built in connection with the existing waste storage buildings 155, 155/1, 157 and 157/1 inside the perimeter of the INPP, and the Solid Waste Treatment and Storage Facilities (SWTSF, Lot 2) will be built on a new site close to the INPP adjacent to the Project "New Interim Spent Fuel Storage Facility".

All equipment and operations will be designed with safety in mind. As the design develops it will be subjected to regular safety and risk assessments to satisfy the Lithuanian Regulators. Inside the facilities the dose to the operators shall be as low as reasonably achievable (ALARA) but in no event shall exceed those dose limits contained in Technical Specification. NUKEM will provide all the necessary licensing support to INPP required to satisfy the Lithuanian licensing process.

A key part of the SWMSF will be the waste assaying and tracking system. It will maintain inventory data (weight, material content, radiological data, etc.) for every waste stream and help operations during the entire waste sorting, treating and conditioning process. The tracking system will also be used to support the assay systems for waste characterization of the different packages which leave the solid waste treatment facility (SWTF), and to support the 30/50 year life of the solid waste treatment and storage facilities.

#### THE SOLID WASTE RETRIEVAL FACILITIES (SWRF)

The purpose of the SWRF will be to extract waste from the present storage location, pre-sort it, segregate adequate material for Landfill disposal and package non Landfill material for transport to the solid waste treatment facility (SWTF).

The SWRF (Lot1) will mainly comprise three retrieval units (RU's) and a control building. The retrieval units will be fully confined cells in which the recovery, pre-sorting, segregation for landfill and packaging for transfer to SWTF will take place. The control building will be situated close to the existing storage buildings and will

house all common facilities including changing room, sanitary facilities and the SWRF control room for remote operation of the retrieval units.

The advantage of using three retrieval units is that it will give greater operational flexibility. It will be possible to modulate the output of each unit to suit the SWTF, and a problem on one unit will not stop the stream of waste to the SWTF.

The waste comprises the following main categories:

- Group 1 (G1) waste is in general the combustible and non-combustible waste produced during normal operational and service functions at INPP.
- Group 2 (G2) waste consists mainly of replaced equipment, parts, components and maintenance service material. This waste is more heavily contaminated than G1 waste and again can be either combustible or non-combustible. Some waste with the same physical content as G1 can be regarded as G2 waste because of high contamination levels.
- Group 3 (G3) waste is in general metallic and produced in the "hot cells" or "cutting facilities". This waste is more active than G2 waste.
- Special waste comprises waste that needs to be sorted out from the other waste because of its special characteristics, e.g. filters, asbestos, waste oil, PVC and spent sealed sources (SSS).

The RU1 will be used to retrieve waste from Buildings 155 and 155/1 by using two remotely operated vehicles (ROV) which will enter the storage compartments via access apertures cut in the side of the buildings.

The RU2 will be a mobile Unit located on top of the building 157/1 and will be used to remove G1 and G2 waste from the top of the building. The benefit of this arrangement is that it is much safer than tunnelling into the much deeper piles of waste present in this building.

The RU3 will be also a mobile Unit located on top of the building 157 and will be used to remove the G3 waste from the respective compartments. G3 waste removal will be executed in two phases:

- The waste in the compartments will be removed in a similar way than they were loaded. A shielded cask with a basket inside will be attached to a shielded loading hatch on top of the storage building. The basket that is attached to a winch will be lowered down to the storage compartment and will be filled by means of a telescopic arm.
- The compartment's final cleaning operations are started when no further waste can be removed with the telescopic arm only. To clean up the compartments a remote operated vacuum cleaner with a suction nozzle is attached to the telescopic arm. Further support for cleaning up will be provided by a remote operated high pressure cleaner.

The retrieval operations will be managed remote controlled from the control building. The control room will also communicate with the SWTF to coordinate the dispatch and return of the waste containers and will have radio contact with the transport drivers, ensuring safe, efficient and controlled transfer operations.

#### THE SOLID WASTE TREATMENT FACILITY (SWTF)

The SWTF design is based on different separate sorting cells for G2 and G3 Waste and subsequent waste processing facilities. In the sorting cells, named after the incoming waste type, waste will be processed in parallel streams according to its respective radiological properties. Following on from sorting, size reduction and other preparations will take place prior to incineration, high-force compaction and/or grouting. After sorting, the waste will be re-categorized from Class B to Class F (the new waste characterization in Lithuanian) according to its ultimate destination:

- Class B and C waste: low and intermediate level for short-lived (SL) intermediate storage
- Class D waste: low level graphite waste for long-lived (LL) intermediate storage
- Class E waste: intermediate level waste for LL intermediate storage
- Class F waste: SSS waste for LL intermediate storage

Treatment of the waste is expected to last until 2023. After 2023, and up to the end of the SWTF 30-year design life, the facilities will be used to process only decommissioning waste.

### G2 Sorting Cell

Preliminary sorting of the waste entering the G2 sorting cell will be performed by one of two remotely operated vehicles. Combustible G2 waste will be segregated from other waste and sent as combustible Category B&C waste to the incineration line. Large items will be selected for size reduction. The remaining waste will then undergo a further fine sorting using manipulators, and special waste, i.e. PVC, hazardous waste, SSS, etc. will be collected in 200-liter drums for transfer to appropriate treatment process. The compactable waste is packed into 200-liter drums and sent to the high-force compactor for further size reduction. Non-compactable waste, including graphite, is placed directly into appropriate containers for interim storage.

### G3 Sorting Cell

The G3 sorting cell will use manipulators to sort SSS and PVC liners out of the G3 waste stream delivered from the G3 compartments of Building 157. The PVC waste that has been sorted out will be size reduced by shredding, packed into 200-liter drums and sent to the high-force compactor, whereas the SSS will be collected in bins for subsequent packaging into the interim storage container. The remaining G3 waste is characterized and packed into ILW-LL waste containers.

### Further treatment

Waste that is not containerized in the sorting cells will be either incinerated or undergo high-force compaction, using a min. 15,000 kN high-force compactor, to reduce the waste volume to a minimum.

The incinerator's waste feed system and ash management system is adapted to non-manual work sequences for Category B & C waste handling. The design of the incineration plant will include features to deal with all normal industrial hazards as well as radiological hazards. The incineration of waste has the advantage being able to achieve the highest volume reduction possible and convert the organic bulk material into ashes of an inorganic nature which is suitable for storage.

Before the short-lived (SL) waste, including pellets from the high-force compaction, leaves the SWTF the waste will be grouted into 3.6 m<sup>3</sup> concrete shielded containers to be used as storage, transport and final disposal container.

## THE SOLID WASTE STORAGE FACILITIES

The SWSF will comprise two intermediate stores, which will be directly connected to the SWTF. One store for Short-Lived (SL) and the other for Long-Lived (LL) waste. The SWSF will be designed in a modular form so that it can be extended throughout its 50-year design life. The SL waste store will have an initial volume of 2,500 m<sup>3</sup>. The LL waste store will initially be capable of storing the equivalent of 2,000 m<sup>3</sup> of waste.



B34 Site on January 2011