

## DECOMMISSIONING OF NUCLEAR FACILITIES

### Jaslovské Bohunice Site

Nuclear Facility

### A1 Nuclear Power Plant

One of the first countries in the world, which started to construct the nuclear power plants, was also the former Czechoslovakia. At that time, as an industrially developed country with long-term tradition in engineering, it has contributed to development of nuclear power industry by design and construction of gas-cooled heavy water reactor in the A1 nuclear power plant (NPP) in Bohunice.

#### Technical Data

<b>Reactor type</b>	KS 150
<b>Fuel</b>	natural uranium
<b>Moderator</b>	heavy water (D <sub>2</sub> O)
<b>Coolant</b>	carbon dioxide (CO <sub>2</sub> )
<b>Max. achieved electrical output</b>	127 MW
<b>Electricity production</b>	1,464 GWh

#### Construction and Operation

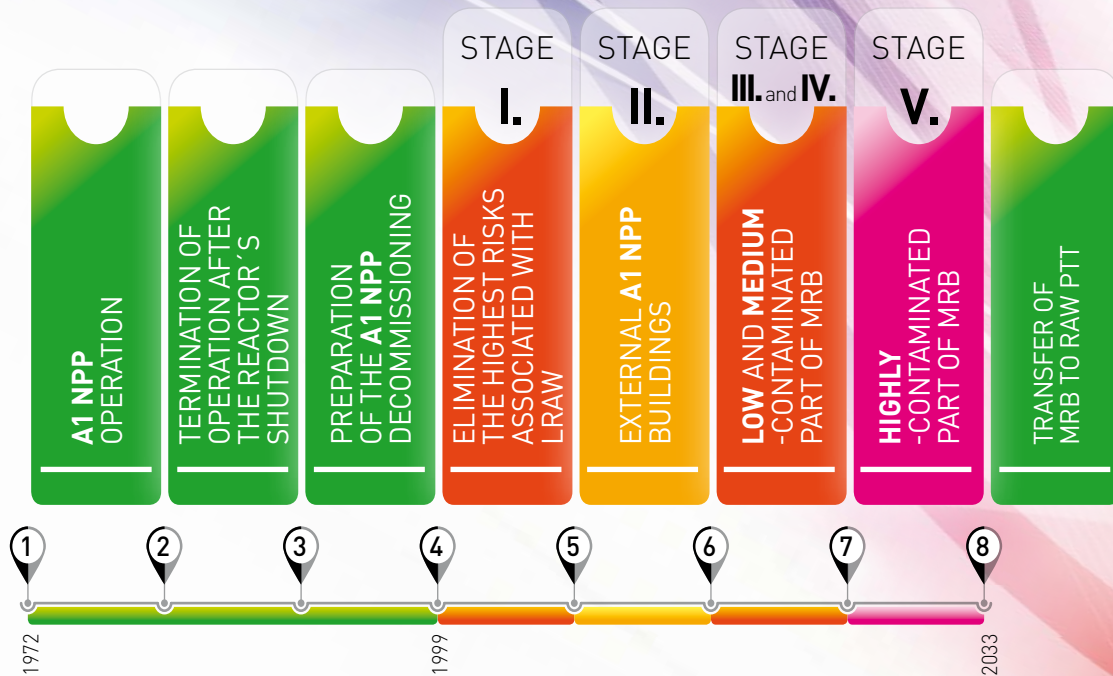
Works on design of the power plant commenced in 1956, construction of the power plant started two years later. The A1 NPP project was implemented in close cooperation with experts from the former Soviet Union. Its operation was affected by two serious accidents, causing damage to the plant equipment. Due to high repair costs required for the power plant to be put back into operation after the operational event in 1977, the Czechoslovak government decided to put a definitive end to the operation of the A1 nuclear power plant in 1979. Moreover, during this period, construction of the V1 NPP with the verified WWER 440 pressurized water reactor units was already in progress in Jaslovské Bohunice.



## A1 NPP Decommissioning

OPERATION LICENSE

DECOMMISSIONING LICENSE



### Abbreviations:

MRB – Main Reactor Building

LRAW – Liquid Radioactive Waste

RAW PTT – Radioactive Waste Processing and Treatment Technologies

### Pre-decommissioning Stage

At the time of the final shutdown of the A1 NPP, the required procedures and equipment to secure all necessary NPP decommissioning activities were not yet in place. In Czechoslovakia, at that time, there was no applicable legislation specifying the frames of the nuclear facilities decommissioning or technical conditions for implementation of such activities. Apart from legislative administrative conditions and staffing required for these activities, specific technological facilities for management of radioactive waste (RAW) and spent nuclear fuel (SNF), including the repository for final disposal of RAW and related transport means were being gradually designed and constructed.

Works executed by 1994 were focused primarily on elimination of consequences of the operational events. Subsequently, the pre-decommissioning activities were in progress by 1999. These activities included dismantling of several technological facilities, creation of areas required for installation of technological facilities for management of radioactive materials, decontamination of selected areas/premises, mainly in the main reactor building and transport of spent nuclear fuel used in the A1 NPP reactor to the former Soviet Union.

## Decommissioning Process

The process of decommissioning commenced after obtaining the license for decommissioning from the regulatory bodies in 1999. This process has been divided into five, subsequent stages with timing of completion by 2033.

### 1<sup>st</sup> Stage

The objective of the 1<sup>st</sup> stage of decommissioning was to secure a safe radiation state of the A1 NPP. Activities implemented in this stage addressed the following tasks: long-term storage for spent nuclear fuel from the A1 NPP, processing of liquid RAW in external buildings, contaminated waters and technological facilities in the plant main reactor building. Preparation of future projects focusing on decontamination and removal of the primary circuit facility and also revision of priorities of future works focused on extended monitoring of the heavy-water and gas circuit reactor.

### 2<sup>nd</sup> Stage

The activities of this stage are focused on removal of environmental loads from the A1 external buildings, removal and sorting of contaminated soil and concrete debris and monitoring and treatment of underground and leaking water, treatment and conditioning of historical RAW and RAW from the A1 NPP decommissioning, decommissioning of technological facility and civil units of external buildings and technological facility in the long-term SNF storage in the A1 NPP main reactor building and decommissioning of long-term storage for spent nuclear fuel.

Within the second stage, the disposal facility for very low level waste in nuclear facility National Radioactive Waste Repository was also erected, within the scope of first module erection, designated for disposal of very low level waste from the A1 NPP decommissioning.

### 3<sup>rd</sup> and 4<sup>th</sup> Stage

The second stage is continually followed by the third and fourth stages. Activities will be focused on continuing of decommissioning of the long-term storage for A1 NPP nuclear spent fuel, processing of sludge from the long-term storage, casks of the long-term storage of spent nuclear fuel and liquid RAW from the external tanks of storage place for liquid RAW, decommissioning of mutually connected technological parts, (steam generators with accessories, turbo compressors, section valves).

### 5<sup>th</sup> Stage

The subject of the final stage of A1 NPP decommissioning is the nuclear reactor itself and connected equipment in reactor shaft, short-term storage of the spent nuclear fuel, long-term storage pool for spent nuclear fuel and equipment situated in reactor hall, which were installed and used for the decommissioning process itself mainly in SNF management. Decommissioning of remaining steam generators with accessories will continue. From decommissioning of such facilities, certain quantity of RAW cannot be disposed of at the National Repository for low level waste and will be stored in the Interim Storage of RAW until the Deep Geological Repository is erected.

Decommissioning of LRAW external storage tanks



Charging of hermetic cask with RAW into the storage facility



Decommissioning of CO<sub>2</sub> gasholders



## Environment

Impact of the A1 NPP decommissioning on the environment during the different stages is prior to their beginning publicly assessed within the EIA process according to the Act no. 24/2006 Coll. on environmental impact assessment. In the process of the A1 NPP decommissioning, the components affecting the environment are gaseous and liquid discharges of radioactive waste with values reaching units to fractions of percent from the legislatively permitted limits of radioactive substances release into the environment. Majority of the generated waste meets the limits for disposal at the National RAW Repository, portion of the waste will be stored in the Deep Repository and a large number of materials after decontamination in line with the strict legislative limits for release of radioactive materials into the environment is released into environment.

## Safety Priority

A1 NPP decommissioning process is continual and regarding the concept of operation termination, it is a very complex and specific process. During its demanding implementation, safety is the main criterion of all activities, and therefore, with respect to the nuclear safety and radiation protection, no major negative impact of such activities on the environment was recorded so far. Decommissioning works are implemented continually pursuant to strategic document approved by the Slovak Government "The proposal of national policy and national programme for spent fuel management and radioactive waste in the Slovak Republic" as an update of the strategic document "The Strategy of final stage of peaceful use of nuclear energy in the Slovak Republic" in accordance with the demands of the Directive EC 2011/70/Euratom with an objective to fully free release the plant area for further industrial use.

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Decontamination of turbocharger of charging machine



Transport of casing of long-term storage for processing



Fragmentation of heavy water evaporator with remote controlled manipulator

