



# **Nuclear Decommissioning in Slovakia**

**Launch of ELINDER Programme  
December 2nd, 2016**

**Martin Macášek**

- JAVYS - established in April 2006 JAVYS to safely operate and decommission A1 and V1 NPPs, as well as to provide safe RAW management and disposal.
- 100 % Shareholder - Ministry of Economy of the Slovak Republic
- JAVYS performs activities in accordance with the governmental document „**National Policy and National Programme on Spent Nuclear Fuel and Radioactive Waste Management**“

NPP V1



Facility for Final Treatment and Conditioning of Liquid RAW



RAW Treatment and Conditioning Facilities



NPP A1



Interim Spent Fuel Storage

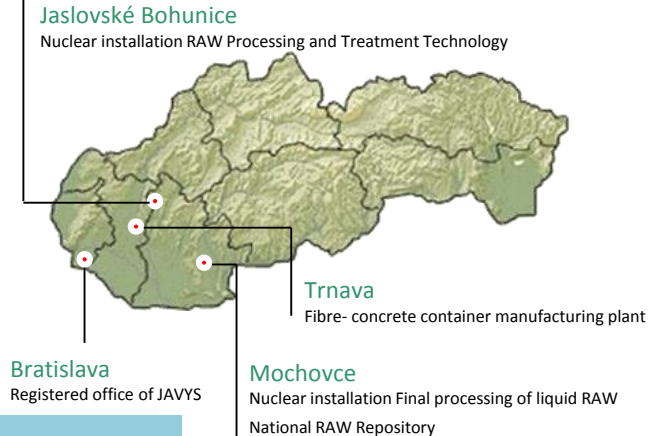


National RAW Repository



## Core activities and services provided by JAVYS, a.s.

1. Decommissioning of A1 NPP
2. Decommissioning of V1 NPP
3. Radioactive waste management
  - characterization
    - Design and implementation of RAW characterization system
    - Destructive analysis of RAW samples
    - Non-destructive inspection of RAW
  - processing and treatment
    - Processing of liquid RAW
    - Treatment of liquid RAW by cementation
    - Processing of solid RAW
    - Treatment of solid RAW by cementation
  - transport
    - Transport of solid or solidified RAW
    - Transport of new and filled fibre- concrete containers
    - Transport of institutional RAW and captured radioactive materials
4. Production of fibre-concrete containers
5. Spent Nuclear Fuel management
6. Management of Institutional RAW and CRAM



The mission of JAVYS, a.s. is to safely, reliably and effectively operate and decommission nuclear facilities (decommissioning of A1 NPP and V1 NPP), manage radioactive waste and spent nuclear fuel, with a minimum impact on the environment.



## **Essential conditions for successful decommissioning process of nuclear facilities includes following infrastructures:**

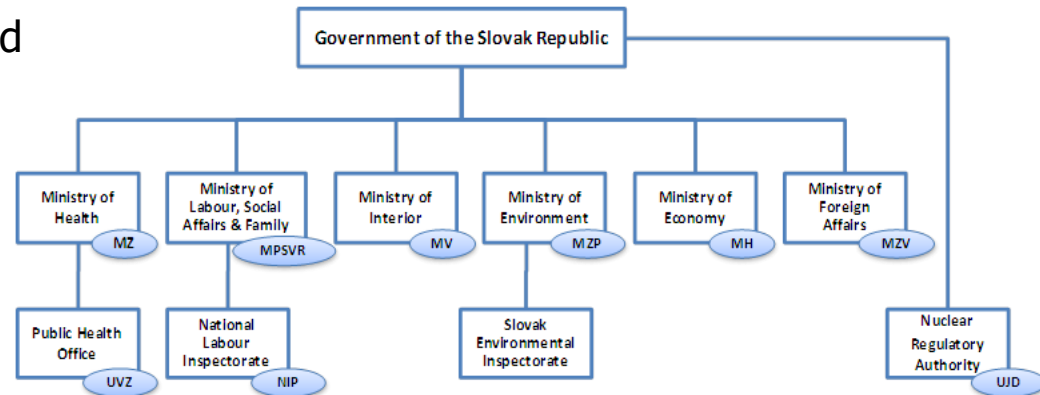
- Regulatory Framework
- Financing Sources
- Management of Materials from Decommissioning
- Site Operation Services
- Personnel Infrastructure

## Regulatory Framework

- International Agreements

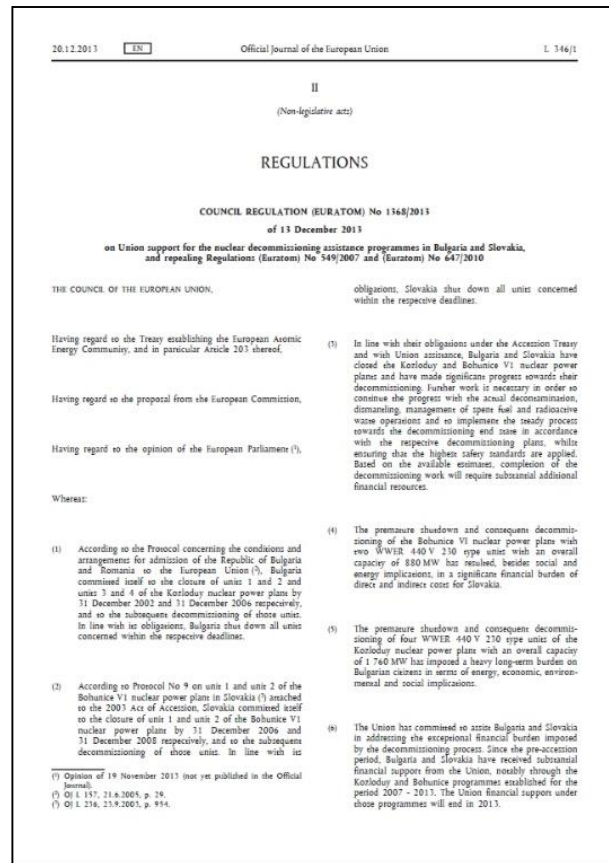
### (Main) Slovak legislation:

- Act No. 541/2004 Coll., as amended (Atomic Act)
- Act No. 24/2006 Coll., as amended (Act on EIA)
- Act No. 355/2007 Coll., as amended (Public Health Act)
- Act No. 50/1976 Coll. as amended (Construction Act)



## Financing Infrastructure

- Slovak Nuclear Fund (since 1995)
- The Bohunice International Decommissioning Support Fund
- Council Regulation No. 1368/2013 on Union support for the nuclear decommissioning assistance programmes in Bulgaria and Slovakia
- Nuclear Decommissioning Tax
- JAVYS' own resources



## Site Operation Services (SOS)

Established Site Operation Services (**SOS**) remained in most part needed for decommissioning processes. Main SOS are:

- Heating and cooling systems, water supply, electricity generation and supply
- Road&rail access with offloading facilities
- Sewage (non-/radioactive), potable water systems, other piping networks, office space
- Support services (catering, public transport, etc.)
- Non-radioactive machine shops, workshops and general production facilities, especially with large machinery, stocks of spare parts, consumables
- Maps, diagrams, drawings (land drains, active and inactive drains, roadways ... )
- Area protection system
- Spent Fuel transport and storage
- Others



## Personnel Infrastructure and Project Organisation

Each decommissioner's organisation structure is specific to:

- **Country** (overall set up of nuclear industry system, state system, politics,...)
- **Factory** (size, type of facility, private/public, shareholders' expectations)
- **History** (after accident/incident, stakeholder requirements, general conditions prior shut down)
- **Company's scope of activities** (operator of one/multiple facilities, single or multiple type of facilities, profit or non profit)
- **Future strategy and system of work** (company's business plan)
- **International obligations** (special international liabilities and regimes, e.g. EU funding)
- **Human resources available in space and time** (knowledge of decommissioning aspects)



<b>Employees' education levels:</b>	
<b>University</b>	316
<b>High school</b>	501
<b>Grammar school</b>	1
<b>PhD.</b>	6
<b>MBA</b>	1
<b>Postgradual study</b> in decommissioning of nuclear facilities (Slovak Technical University, Bratislava)	40
<b>Postgradual study</b> in public procurement (Univerzity Roma Tor Vergata)	1

# Nuclear facilities



**A1 NPP**



**V1 NPP**



**RAW Processing and Treatment Tech.**



**FP LRW**



**NRWR**



**ISFS**

# Nuclear Power Plant A1



**Reactor type** : KS 150 (3 x 50 MW)  
**Fuel** : based on natural uranium  
**Moderator** : heavy water  
**Coolant** : CO<sub>2</sub>  
**Working pressure** : 6,5 MPa  
**Steam generators** : 6  
**Turbines** : 3

# Nuclear Power Plant A1



Start of  
2. Stage of  
Decommissioning

Continuous Decommissioning Process

End of Decommissioning

2009

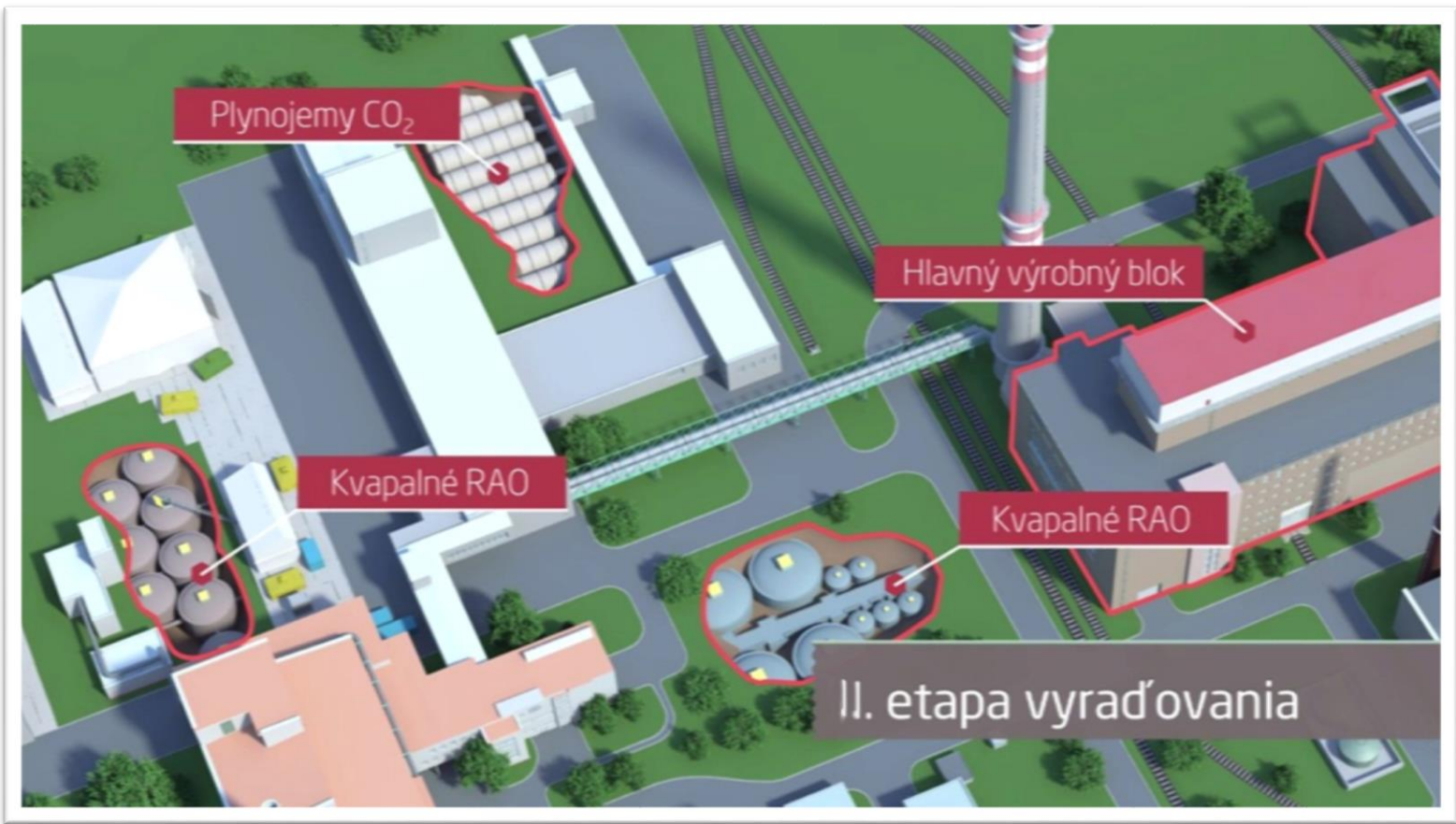
2033

- 1<sup>st</sup> stage Radiation Safety Status
- 2<sup>nd</sup> stage Decommissioning of external active objects and low contaminated parts of the Main Production Unit
- 3<sup>rd</sup> stage Continuation of decommissioning of Low contaminated parts of the Main Production Unit
- 4<sup>th</sup> stage Decommissioning of intermediate contaminated parts of the Main Production Unit
- 5<sup>th</sup> stage Decommissioning of High contaminated parts of the Main Production Unit





# Nuclear Power Plant A1 – 2. Stage of Decommissioning



# Nuclear Power Plant V1



2 x VVER 440-V230

Fuel:  $\text{UO}_2$  (2,5% U-235)

Moderator:  $\text{H}_2\text{O}$

Coolant:  $\text{H}_2\text{O}$

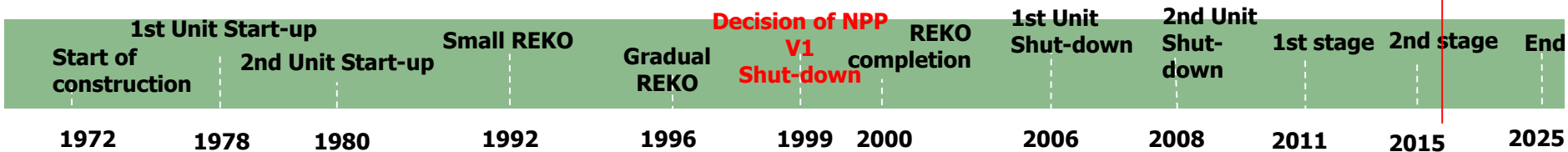
Nr. Of Units: 2

steam

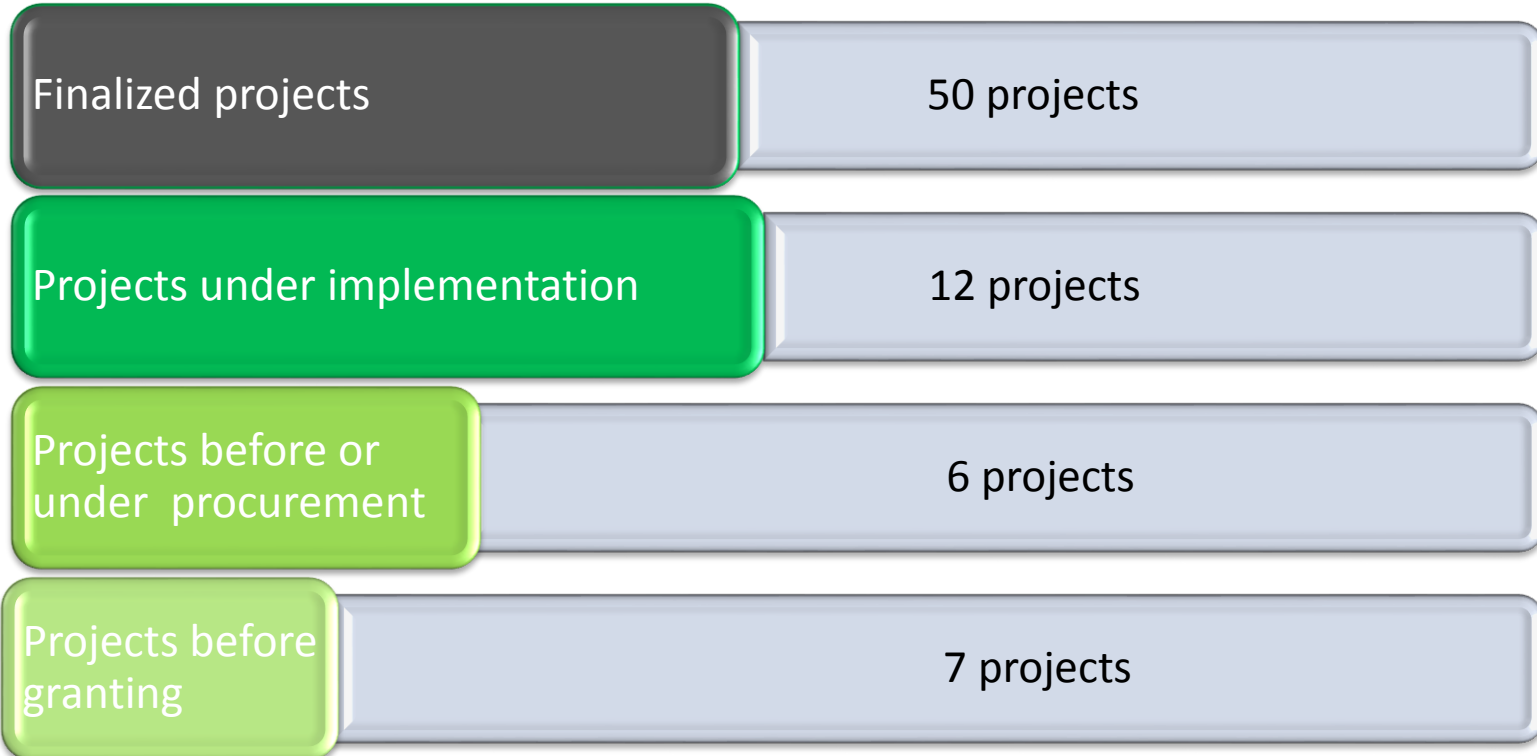
generators: 6 x 2

turbines: 2 x 2

Current stage  
(11/2016)



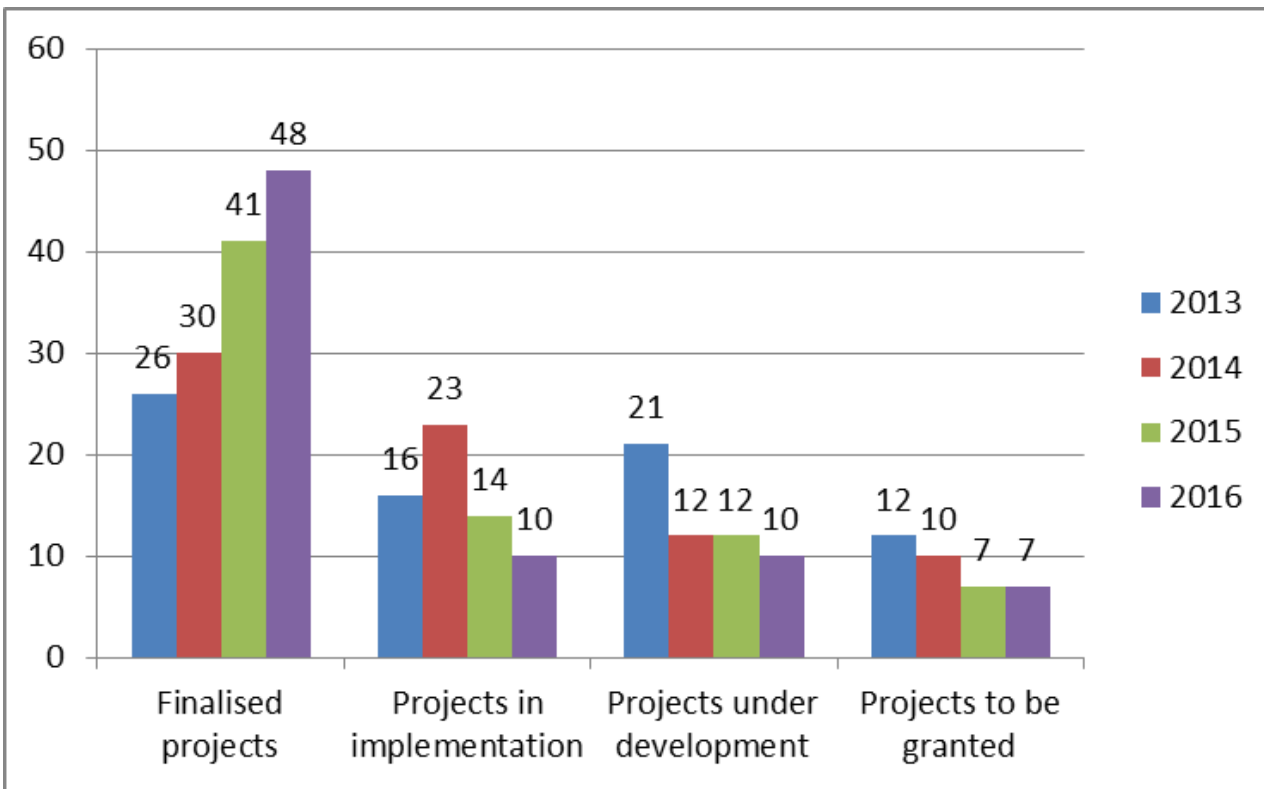
# Nuclear Power Plant V1 – Progress in Decommissioning



Status as of 30<sup>th</sup> November 2016



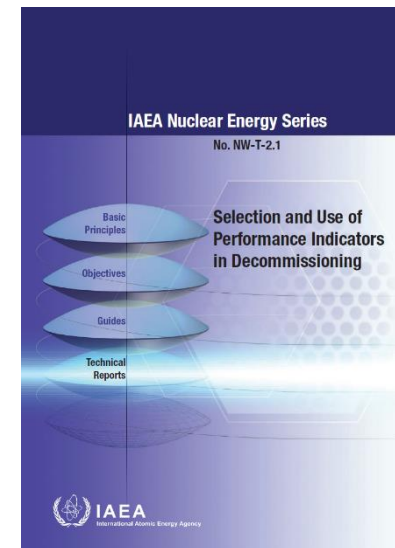
# Nuclear Power Plant V1 – Progress in Decommissioning



(as of 31<sup>st</sup> August 2016)

# Key Performance Indicators

Key Performance Indicator	1 <sup>st</sup> half of year 2016
Key Performance Indicator 1 / Overall Schedule Performance Index	0.954
Cumulative Overall Schedule Performance Index ( <b>COSPI</b> 06/2016)	0.901
Key Performance Indicator 2 / Overall Waste Conditioning Performance Index	0.888
Key Performance Indicator 3 / Overall Cost performance index for contracted projects	1
Cumulative Overall Cost Performance Index ( <b>COCPI</b> 06/2016)	1
Key Performance Indicator 4 / Excess of the 'Maximum Individual Dose'	fulfilled



Actual values converge closely to target value "1"  
 = fulfillment of targets in timely and cost effective manner

# Dismantling of insulation in Turbine Hall





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# Dismantling of the Tech. Equipment in Turbine Hall

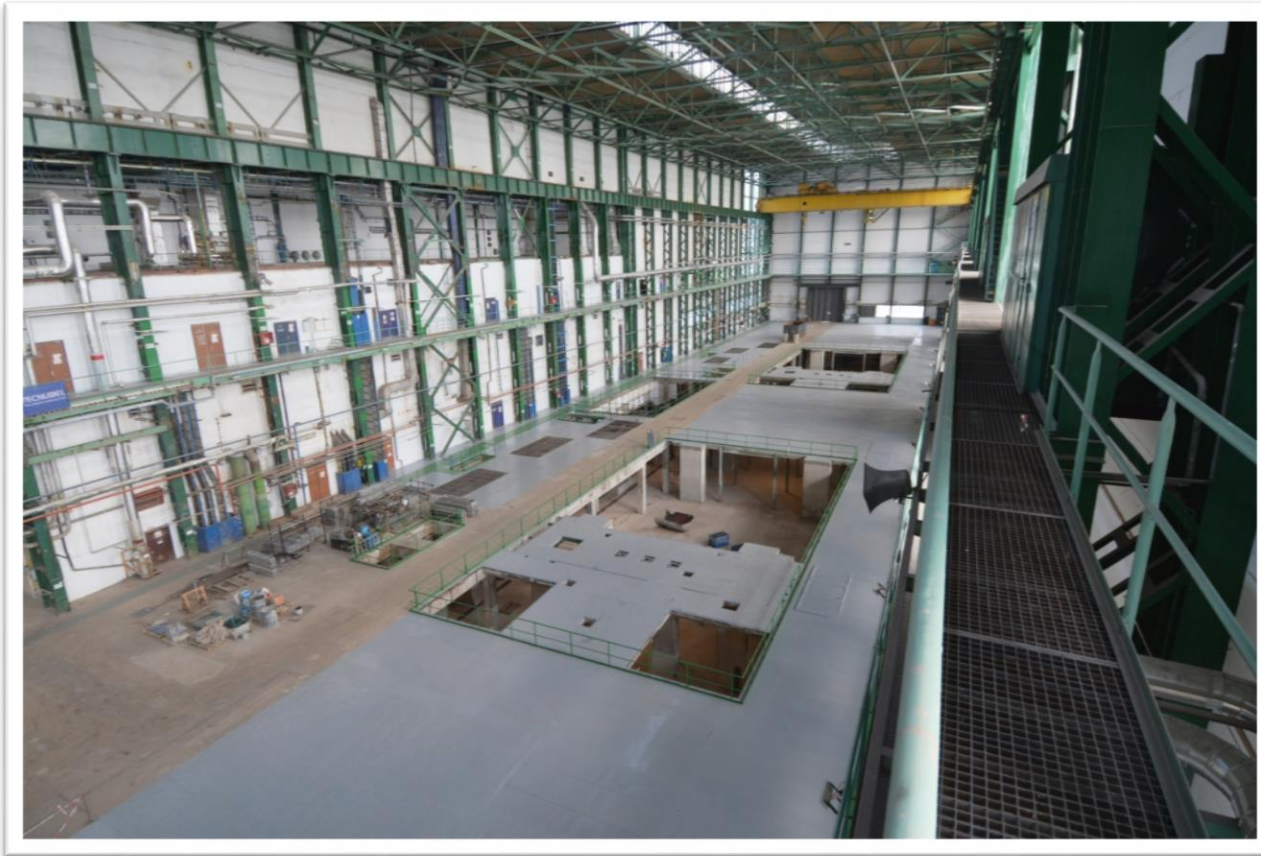


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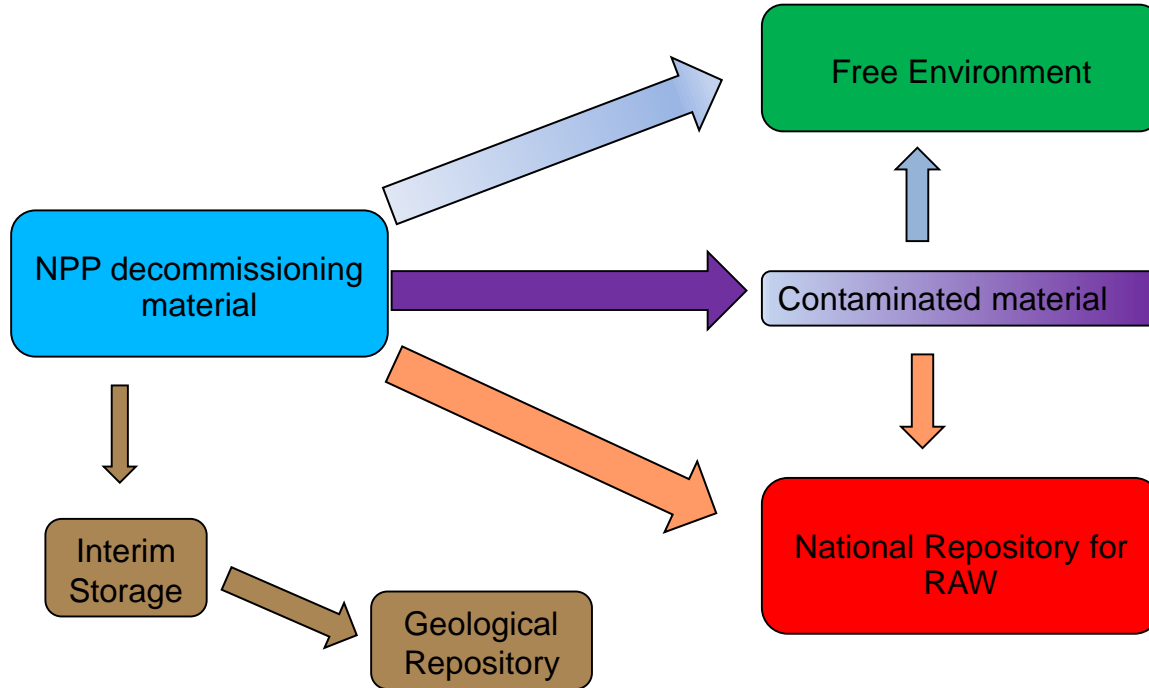




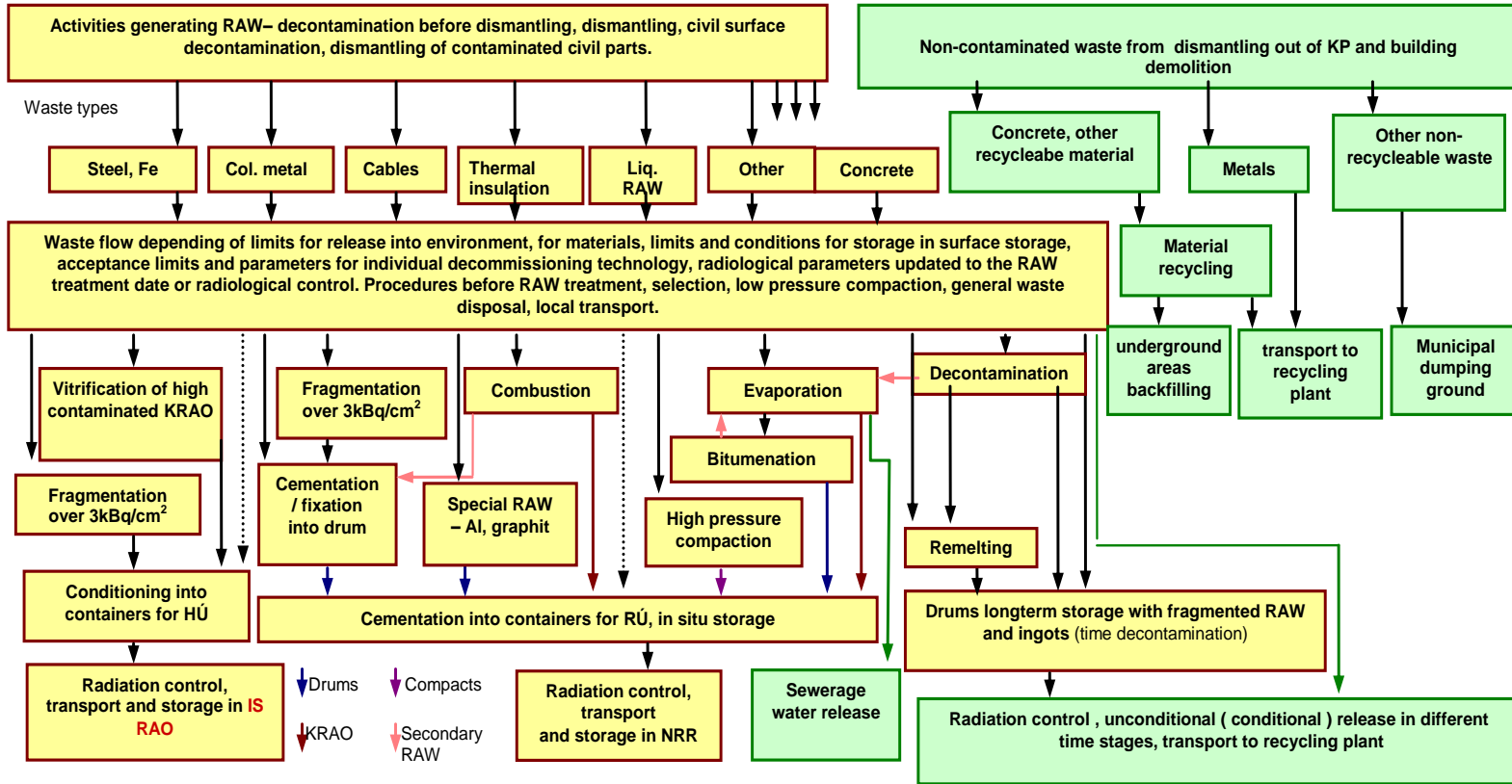
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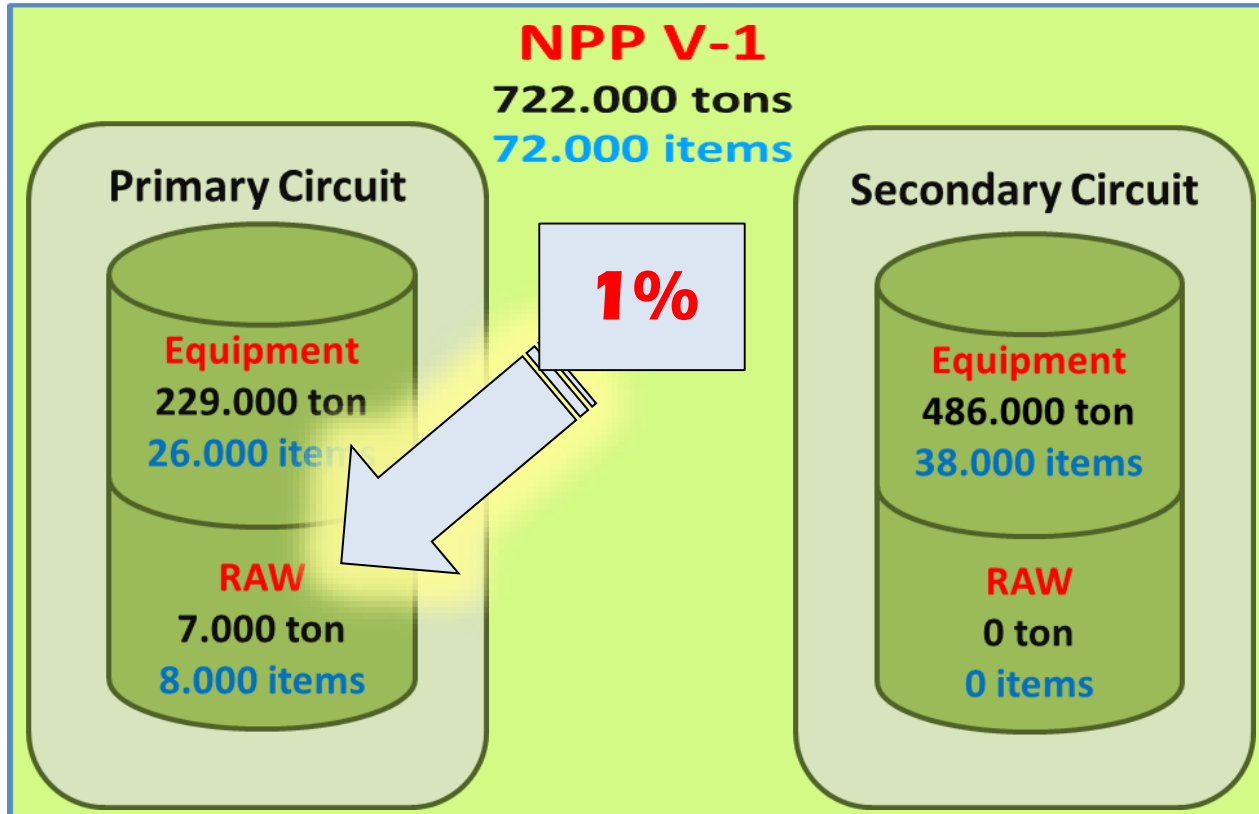


## Decommissioning Material Flow



# Waste management - Decommissioning material flow





# Dismantling and demolition of V1 NPP external buildings – Phase 1





# Dismantling and demolition of V1 NPP external buildings – Phase 1



# Dismantling and demolition of V1 NPP external buildings – Phase 1



Cooling water pumping station  
demolition



# Dismantling of Insulation in the V1 NPP Contr. Area



Dismantling, sorting, decontamination, compacting, packing, transport and final disposal of thermal insulation materials from the controlled area of the V1 NPP at both Units 1 and 2.



# Interim storage of RAW at Bohunice Site

- Storage of RAW (ILW) not disposable at the National Repository of RAW
- Decay storage
- Package forms: specially designed casks, ISO containers, 200 l drums, Fibre-Concrete Containers



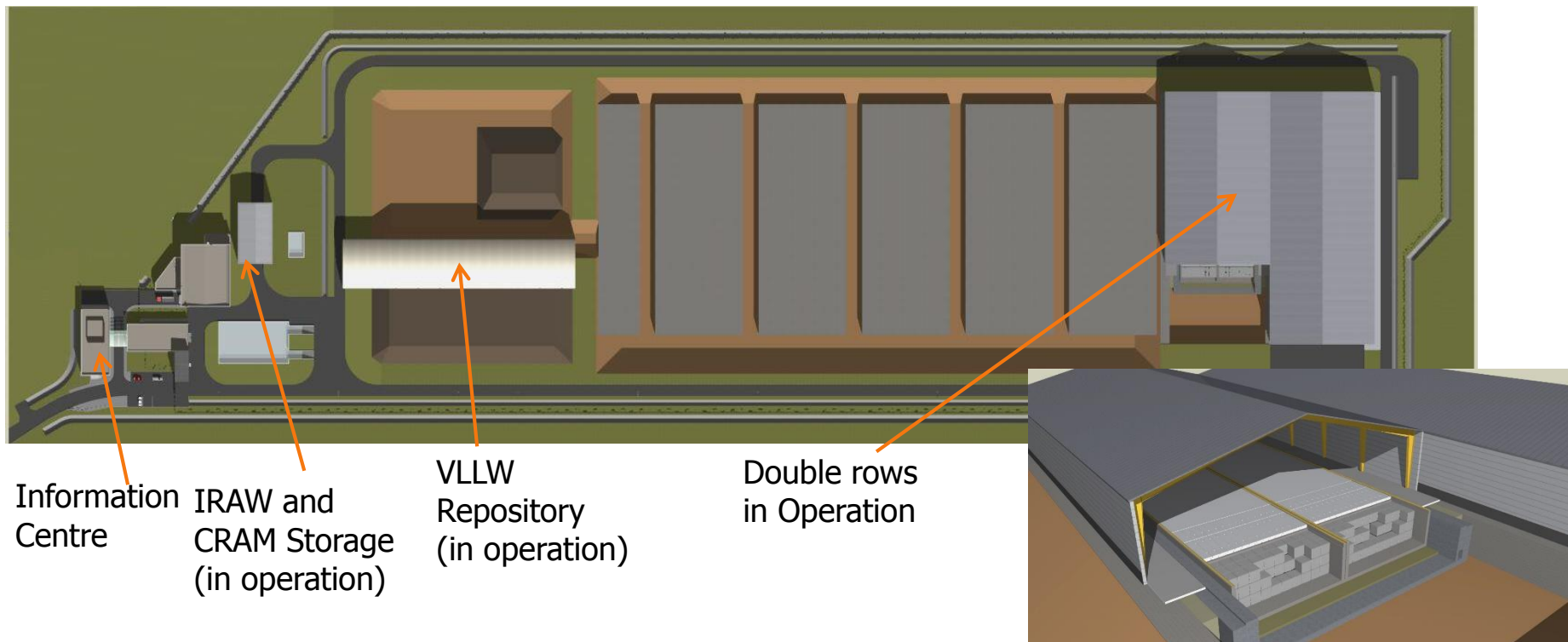
- separation
- incineration
- super compacting
- concentration
- cementation
- bituminization
- vitrification
- Low level RA-water purification facility
- Metal RAW fragmentation and decontamination facility
- Sludges fixation equipment
- Equipment for sludges from longtime storage pool fixation



**Final product: Filled fibre-concrete container (FCC)**



**Final repository of very low and low level RAW** for RAW from operation and decommissioning of Nuclear facilities in Slovakia, from research institutes, medical and other institutions (in operation since 2001)



# National Radioactive Waste Repository in Mochovce



VLLW repository - designed for a total capacity of 68 000 m<sup>3</sup> (will be built sequentially in three stages).



- I. stage** - 20 000 m<sup>3</sup>  
(in operation since 03/2016)
- II. stage** - 9 000 m<sup>3</sup>  
(operation since 2019)
- III. stage** – according to future needs

# Interim spent fuel storage



JAVYS is responsible for activities in the area of spent fuel management within the Slovak Republic.

Capacity:

14 112 spent fuel assemblies

Number of storage pools:

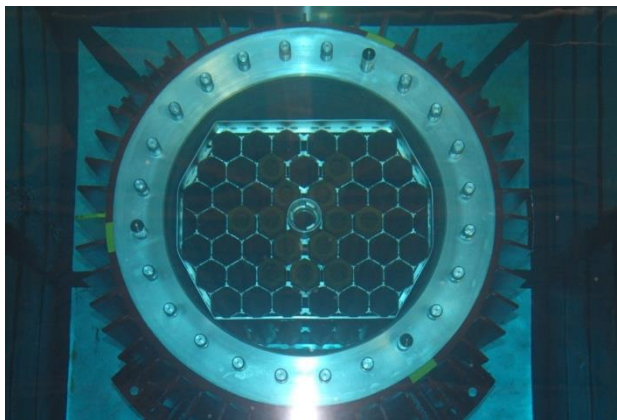
3 in operation + 1 reserve

Storage magazine types:

KZ-48, T-12, T-13

Max. cooling medium temperature:

50 °C











Thank you for  
your attention

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