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Dismantling and fragmentation of NPP EBO V1 Steam Generators

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Project D4.2 - General information

- Project: D4.2 Dismantling of Reactor Coolant System Large Components
- Client: JAVYS, a.s.
- Co-funded: European Union through the European Bank for Reconstruction and Development
- Contractor: Consortium Westinghouse Electric Spain; Westinghouse Electric Sweden; VUJE
- Start date: 10/2017
- Main target: Dismantling and fragmentation of main large components of V1 NPP (2x VVER – 440 reactors shut down in 2006 and 2008) on-site to available waste packages
- Total quantity of materials to be managed: approximately 10 000 tons

Co-funded by the European Union

Westinghouse

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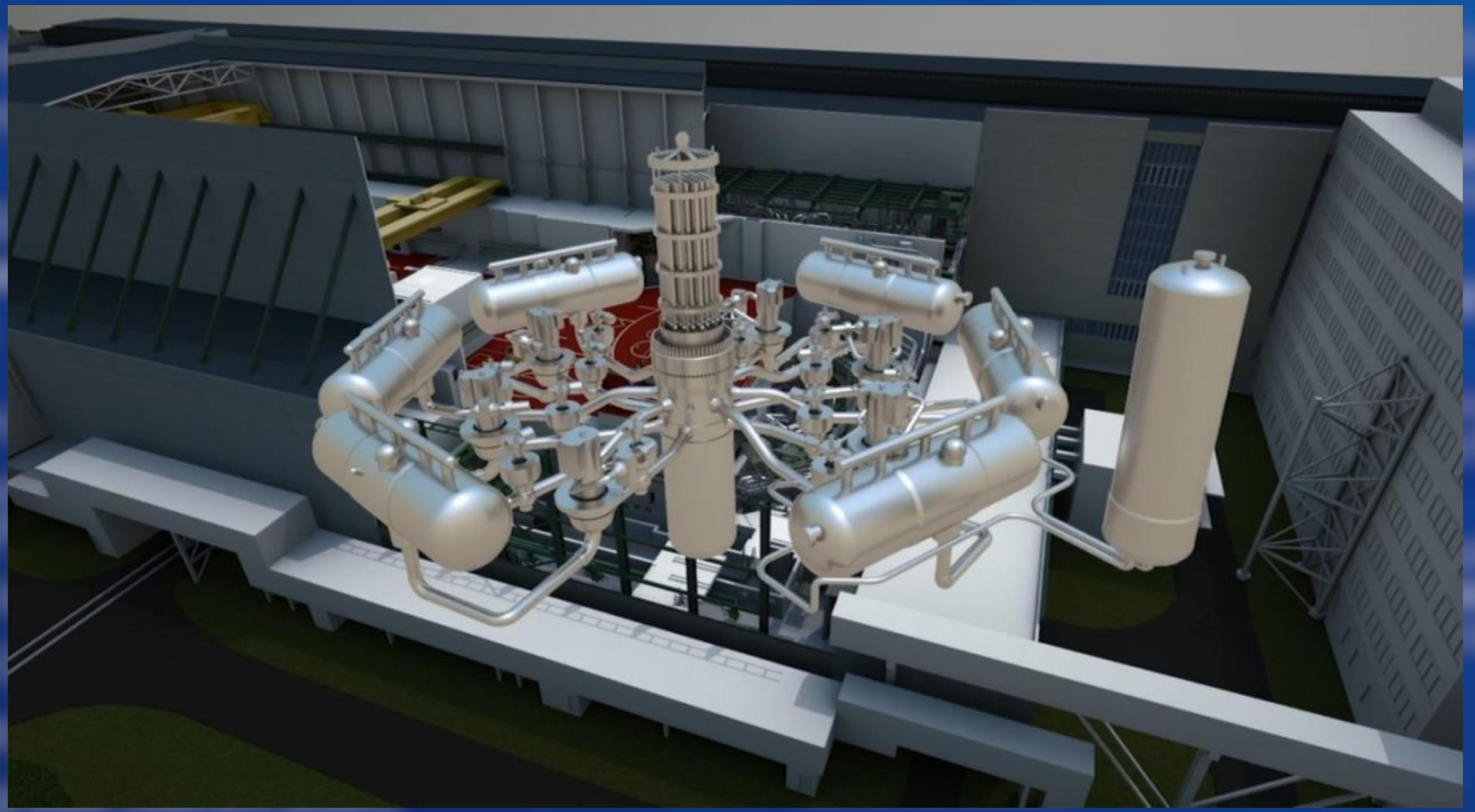
Project D4.2 - General information

D4.2 – Dismantling of V1 NPP Reactor Coolant System Large Components (in Consortium with Westinghouse)

- Dismantling and fragmentation of main **large contaminated components** and structures of V1 NPP:
  - Steam Generator (SG) - 12 pieces;
  - Pressurizer (PRZ) - 2 pieces and Pressurizer Relief Tank (PRT) - 2 pieces;
  - Main Isolation Valve (MIV) - 24 pieces;
  - Main Circulation Pump (MCP) - 12 pieces;
  - Primary piping (PP);
  - Special water treatment system;
  - Remote handled waste storage (civil part dismantling and demolition).
- **Lock-out and Tag-out activities** within the hermetic zone;
- **Dismantling and fragmentation of selected auxiliary systems and components** within the hermetic zone;
- **Demolition and/or modification of civil structures** also within controlled area;
- Design, construction, licensing support, commissioning and operation of **dry cutting workshops** for SGs and MCPs and MIVs fragmentation;
- Management and **operation** (including maintenance) of decontam**large-capacity fragmentation and post-dismantling** ination facilities (chemical, ultrasound, blasting);
- **Development** of all relevant **documentation**;
- Management, supervision and engineering support of all activities under VUJE scope



Project D4.2 - Overall dismantling strategy

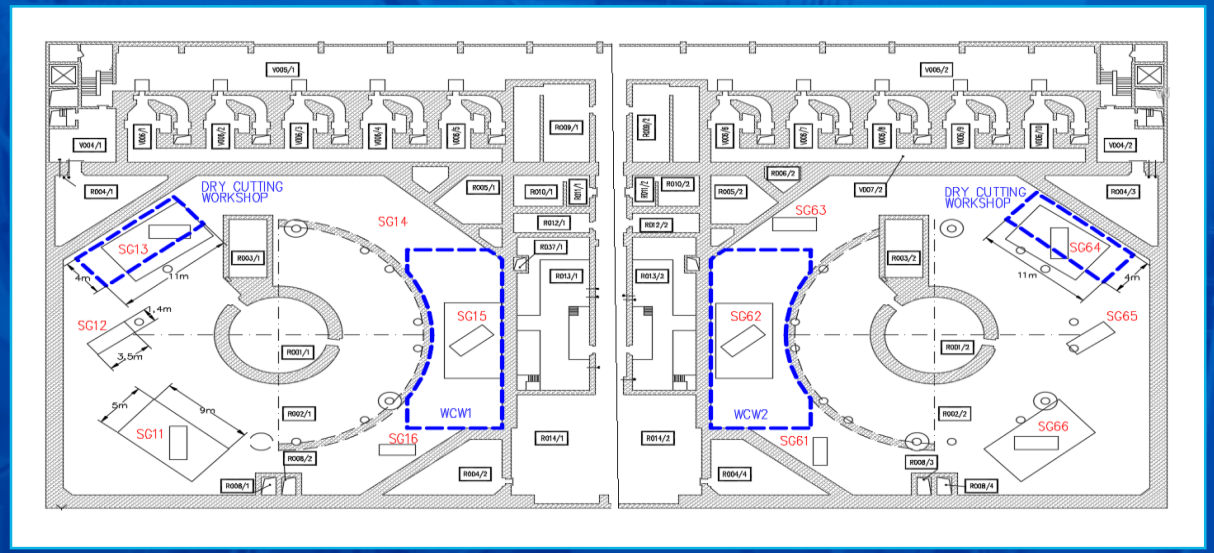
Separate the fragmentation of activated components (reactor and internals) from contaminated components

Early release of hermetic compartments to allow the establishment of new facilities:

- Two wet cutting workshops (WCW) for fragmentation of activated components
- Two dry cutting workshop for fragmentation of primary circuit contaminated components MCPs, MIVs, PP

Take the advantage of large space available in Turbine Hall:

- Establish temporary storage area for all 12 SGs
- Establish a separate dry cutting workshop for fragmentation of SGs



V1 NPP Steam generators – Basic parameters

No. of SGs – 12 pcs (horizontal)

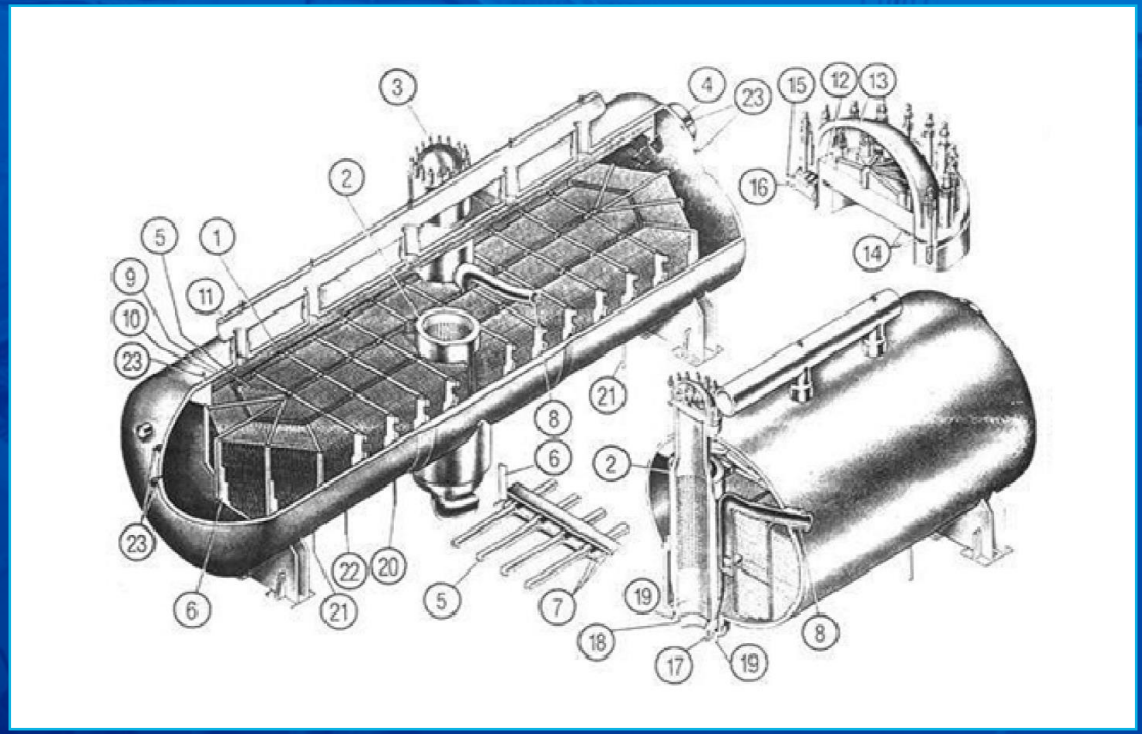
Total mass – cca 155 tons each

Shell:

- Material: Carbon steel
- Length: 11,8 meters
- Inner diameter: 3,2 meters
- Thickness: 75 - 134 millimeters

Heat exchange tubes:

- Material: austenitic stainless steel
- Number of tubes: 5 536
- Diameter: 16 millimeters
- Thickness: 1,4 millimeters
- Maximum length: 12,5 meters



Source of pictures: JAVYS

Steam generators – Requirements from the Client

Radiological conditions:

- propose a cutting procedure based on the worst expected radiological conditions
- various radiological situation of SGs: contact dose rates from tube bundles varied from 10 microSv up to 2 000 microSv
- separate the cutting of SG shell from cutting of heat-exchange tubes to avoid possible cross contamination
- collection of tubes after cutting - avoid the contact of workers with the tubes as much as possible

Waste packages for fragments (valid also for all other large contaminated components):

- Standard box pallets with dimensions: 1,2 m x 0,8 m x 0,8 m with maximum load 1000 kg (used for SG shell as well as SG collectors)
- Drums with diameter 0,6 m; height 0,82 m; volume 200 dm3 with maximum load 450 kg (used for SG heat exchange tubes and collected chips)

Retrieval and transport

(September 2018 - July 2019)

Retrieval and transport of SG to Turbine Hall:

Removal of slab

SG retrieval

SG transport to TH

SG transport to storage area

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Turbine building works

(August 2018 - November 2019)

Demolition activities

storage and est

tion

ctor Building

Established SG storage area

Initial status of TH

SG Dry Cutting Workshop

Turbine building works

(August 2018 - November 2019)

DCW establishment

DCW establishment

Fragmentation

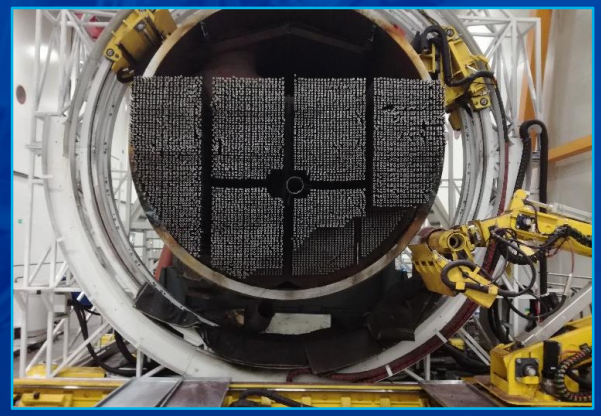
(December 2019 - August 2022 – 33 months)

- Fragmentation in DCW:Separate cutting tools (devices) for shell, tubes and collectors

SG transported into DCW

SG shell cutting device

SG collectors fragmented by band saw



SG tubes cutting

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Waste management

- Various radiological situation of SGs
- Around 1900 tons of materials produced
- More than 70 % of materials have already been released to environment (around 1350 tons of metal materials)
- SG shell completely released:
  - Directly after dismantling
  - After application of post-dismantling decontamination (manual abrasive blasting)
- SG tubes: high pressure compaction of drums; disposal as low level waste
- SG collectors:
  - Chemical (electrochemical) decontamination and release to the environment
  - Chemical decontamination and decay storage (another 100 tons expected to be released to the environment)
  - Disposal as low level waste directly in containers

Source of pictures: JAVYS

Summary and conclusion

- Establishment of separate cutting workshop in Turbine Hall for SG fragmentation
  - Reducing interfaces betwee implemented activities in D4
  - Improvement of EHS conditi
  - Additional barriers reducing contamination spreading
- Significant upfront preparatory w fragmentation were implemente structures demolition or modifica of crane, construction of dry cut
- Combination of prototype equip cutting techniques and method feasible

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Il est certifié par la présente qu'un brevet européen a été délivré pour l'invention décrite dans le fascicule de brevet, pour les États contractants désignés dans le fascicule.

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EP3984673

Tag der Bekanntmachung des Hinweises auf die Erteilung des europäischen Patents
Date of publication of the mention of the grant of the European patent
Date de la publication de la mention de la délivrance du brevet européen
26.07.2023

DEVICE FOR CUTTING PIPES IN A BUNDLE WITHOUT ADDITIONAL CLAMPING

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München, den | Munich, | Munich, le 26.07.2023

URKUNDE | CERTIFICATE | CERTIFICAT

- European patent was received for cutting method
- was completed in 4 years after works
- als was released to environemnt
- ng and reuse
- e dose - level of 80 % of the
- ategy is replicable
- ER type of reactors

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Thank you for your attention!
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