DECOMMISSIONING ACTIVITIES

DECOMMISSIONING OF OBSOLETE NUCLEAR FACILITIES ÚJV Řež, a. s.

Decommissioning of obsolete nuclear facilities ÚJV is the only ongoing decommissioning project in the Czech Republic. Decommissioning started in 2003 and it will be completed by the end of 2016.

Preparation of the project included:

- Identification and characterization of potential sources of risk, potentially exposed receptors and exposure pathways
- Safety analysis report (SAR)
- Determination of the priorities of the decommissioning
- Decommissioning design
- Estimation of the expenses

Implementation of the project comprised:

- 17 items (buildings and technologies), each of which had a detailed design and budget
- Licensing for individual activities
- Sampling, radiation monitoring, radiochemical analyses, characterization of workplaces
- Decontamination, partitioning, fragmentation
- Radioactive waste treatment, conditioning, storage and transportation
- Release into the environment
- Final monitoring and reports

The conditions and results of the implementation:

- 16 of the 17 items is already finished
- .Very specific radiation conditions
- Special decommissioning procedures required
- No extraordinary event or accident up to now

The total project budget is approx. 23.4 million EUR. The project is financed by the Ministry of Finance of the Czech Republic.

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Examples of decommissioned technologies

During the project was decommissioned many different technologies and devices contaminated with different radionuclides. These devices were previously used for waste processing, or e.g. come from original research reactor design before its major reconstruction.

Old evaporator (heater and separator

Storage tank during segmentation


Alpha boxes

EXAMPLES OF SUCH DEVICES:

- RAW treatment technology
  - Old evaporation system
  - Liquid RAW storage tanks
  - Set of mixed-bed filters.
  - Sedimentation tanks
  - 15 m3 of RAW
- Alpha boxes
  - Contaminated by U, Np, Pu, Am nuclides
  - Total volume of 80 m^3
- Storage tanks for collecting of drainage
- Two underground decay tanks
  - Each 63 m3 for liquid and solid waste
  - Irradiated metallic samples and residues of spent fuel
  - Maximum dose rate above the pile of solid RAW in hundreds of mGy/h
- RAW reloading site
  - 600 m3 of the of stored RAW
  - Incl. original reactor vessel, primary circuit, ventilation system, filters, heat exchangers, etc.
  - Dose rate around 5 mGy/h
- Surface RAW storage site
  - 90 m3 of contaminated equipment

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Examples of used methods and techniques

For decommissioning purpose were used and /or developed by us many techniques and special devices.

Surface RAW storage site – before and after RAW processing

USED TECHNIQUES

- High pressure water jetting
- Nibbler, oxyacetylene and plasma air cutting
- Chemical and ultrasonic decontamination
- Abrasive dry ice blasting
- Gamma camera for visualization of hotspots
- Special remote manipulator for removing of solid waste from the decay tank.
- Cementation unit for solidification of liquid waste and sludge from the decay tank
- MOZAYK type packaging cask and a number of other individual packaging casks

Stored RAW – VVR-S research reactor vessel

RELEASE OF WASTE INTO THE ENVIRONMENT

- Special equipment for measurement developed by the Envinet /Nuvia
- Measuring chamber equipped with several semiconductor HPGe detectors) Evaluation software

The release measurement is done for every batch of material (80 kg), the key radionuclides are determined according to the history and material type. Difficult-to-measured radionuclides are evaluated by radionuclide vectors based on radiochemical analyses.

Measuring device for release of waste into the environment

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Monitoring and characterization for decommissioning

The decommissioning process significantly increases the importance of radiation monitoring and radiochemical analyses for planning of decontamination and radiation protection measures. The key task of monitoring, however, is the characterization of materials and surfaces for waste treatment and disposing and/or for release into the environment. Quantity required analyses including difficult-to-measured radionuclides increases by 2-3 orders of magnitude compared to a normal operation.

ACCREDITED TESTING LABORATORY

- ISO 17025:2005
- Radiochemical and chemical analyses environmental and waste (bulk and particle size) samples (liquid, solid, soil, sediments, vegetation, rubber, concrete, ...)
- Activity of nuclides: H -3, C-14, Cl-36, Ca-41, Fe-55, Ni-59, Ni-63, Sr-90, Mo-93, Zr-93, Nb-94, Tc-99, Pd-107, I-129, Pm-147, Sm-151, Th-232, U-235,238, Np-237, Pu-238, 239,240, Pu-241, Am-241, Cm-242,244
- Gamma spectrometry
- Total alpha, beta and gamma nuclides
- Isotope traces using by ICP-MS (nuclear safeguard measurements)
- Using of ICP-MS, GC, HPLC, UV-VIS, LSC methods

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