



Overview of the decommissioning plan for VVR-S research reactor, rev 9


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Overview of DP



The VVR-S reactor is a tank type using water as moderator, reflector and coolant. The research reactor was initially designed for of 2 MW nominal thermal power and maximum thermal neutron flux of $2 \times 10^{13} \text{ n/cm}^2 \text{ s}$. It is of Russian design and fabrication and it has been continuously operated since July 27, 1957 until December 30, 1997 without any major events or significant refurbishment. The Total Thermal Energy generated throughout the period was 9.52 GWd.

- By Governmental Decision on April 2002, VVR-S reactor was permanently shutdown for decommissioning


Overview of DP



The Immediate Dismantling Strategy was selected for decommissioning the VVR-S reactor. The implementation of the strategy is based on the Decommissioning Plan and the Project Management. The spent nuclear fuel assemblies resulted from operation period will be removed from the reactor building before starting the decommissioning process.

- The concept (design) of isolating the DCNU building away from the Reactor Building was applied in view of implementing the decommissioning project upon safety & efficiency conditions. The fresh fuel(2003) and HEU SNF assemblies(2009) were sent to Russian Federation. LEU SNF type EK-10 from VVR-S research reactor will be sent in Russian Federation in 2012. All HLW waste resulted from reprocessing will be disposed in RF.

Overview of DP



Decommissioning technologies for decontamination (in wet condition for primary circuit and dry conditions in the rest of materials) and dismantling process will be implemented with mechanical cutting commercial equipment for free release of the site.

- The VVR-S reactor is the first major nuclear facility in Romania which will be decommissioned.
- The same site also includes some other nuclear facilities which are to be decommissioned in the future, considering that the local community is in process of expanding.

Overview of DP

- The radioactive waste streams will be safely managed taking into account the already existing Radioactive Waste Treatment Plant situated in the immediate vicinity of the VVR-S reactor and the National Repository for Radioactive Waste-Baita-Bihor, which are to be refurbish as per a refurbishment program.
- The radioactive waste streams were estimated by direct and indirect measurements. Thus, at the end of the decommissioning project the radiation dose is estimated to be about 0.1 mSv/year (as individual dose limit), 1 man mSv/y as collective dose for the release of the VVR-S nuclear facility from regulatory body control.
- The radiation protection programme: the radiation dose limit is 20mSv/year for the personnel professionally exposed, 1 mSv/year for population and 10 micro Sv/year for the free release of the material resulted from decommissioning. The aluminum and graphite activated waste will be stored in the existing storage in Radioactive Waste Treatment Plant.

Overview of DP

- The duration of the decommissioning project is 11 years and the financing mechanisms are based on the public funds and represent a re-investment process.
- IFIN-HH has all responsibilities related to finalization of decommissioning the research reactor, and almost work packages will be executed by IFIN-HH. Will be used also contractors for executed some activities where the institute don't have technical capabilities.

Overview of DP

- The key issues of decommissioning are the following:
 - - implementation of Phare project for research reactor(2008-2010)
 - - comply requirements of Euratom Treaty art. 37- 2011;
 - - obtain the funding for decommissioning project- 2009;
 - - approval of integrate management system for decommissioning-2010
- Phase 1: 3 years, start point -2010
 - - repatriation of HEU spent nuclear fuel- S-36 in 2009
 - - application of isolation concept for DCNU, elaboration of decommissioning plan for DCNU, obtaining the license for DCNU and will continued funding from governmental allocations as national nuclear installations.

Overview of DP

- The key issues of decommissioning are the following:
 - - upgrading of DMDR- DMDR and DNDR- 2010-2012
 - - implementing the work packages from phase 1 for research reactor-2009-2013
 - - repatriation of LEU spent nuclear fuel-EK-10- 2010-2012
 - - preparation the technical documentation for phase 2 and 3, procurement equipment , refurbishment reactor building, utilities, airlock
- Phase 2: start point 2013
 - - decontamination and dismantling of the primary circuit
 - - decontamination of the hot cells
 - - dismantling the secondary circuit
 - - dismantling the internal components from core zone

Overview of DP

- The key issues of decommissioning are the following:

- Phase 3: start point 2015
 - - dismantling the internal components from reactor block
 - - demolition reactor block, degasor, hot cells
 - - dismantling the active drainage up to 30 m³ underground pond
 - - final radiological survey
 - - completion of the project

Overview of DP

■ Work Breakdown Structure (WBS) of Decommissioning Project 1/2

- I. Dismantling primary circuit up to reactor block (non activated parts)
- II. Dismantling core/absorber rods, drive assembly, core components, other internal components, thermal column, cooling pond
- III. Demolition of de-aerator, hot cells, biological shield of reactor block
- IV. Dismantling underground structure: secondary circuit, connected pipes between Reactor and effluents buffer (30 m³) tank

Overview of DP

- Work Breakdown Structure (WBS) of Decommissioning Project 2/2

- V. Dismantling technological ventilation, active drainage, electrical for equipment used in decommissioning, air services
- VI. Dismantling ancillary buildings (temporary structures for material storage)
- VII. Final radiological survey for building and site

Overview of DP

- Work Packages (WP)
- WP.1. Pre-decommissioning activities-1/3

- 1.1. Spent Nuclear Fuel management – removal from site;
- 1.2. Up-grading Radioactive Waste Treatment Plant and National Repository for Radioactive Waste;
- 1.3. Commission the Radiological Characterization Laboratory & Free Release of materials for initial planning, packaging, storing, conditioning and un-conditioning release;
- 1.4. Dose-meter system in site;
- 1.5. Equipment for environmental protection and monitoring systems in/off site;

Overview of DP

- Work Packages (WP)
- WP.1. Pre-decommissioning activities-2/3

- 1.6. Commission mechanical workshop for cutting and light decontamination in Reactor Hall
- 1.7. Funding mechanism;
- 1.8. Elaboration of documentation: organizational, QMS, H&S, Safety & Security & Safeguards, Technical, Packages and Transport Specifications, Radiation Protection;
- 1.9. Worker route in site;
- 1.10. Material route in/off site;

Overview of DP

- Work Packages (WP)
- WP.1. Pre-decommissioning activities-3/3

- 1.11. Removal from site of equipment and materials resulted from research activities and radio-isotopes production;
- 1.12. Drainage of water from primary & secondary circuit, cooling pond
- 1.13. Authorization from regulatory bodies: in nuclear, environmental, industrial;
- 1.14. Maintenances of SSC in transition period and during decommissioning;
- Training of workers, public relation plan and definition of stakeholders;

Overview of DP

- Work Packages (WP)

- WP.2. Dismantling activities

- 2.1. Remove control/absorber rods, drive assembly, I&C system;
- 2.2. Remove primary heat exchangers and pumps, water purification system; piping,
- 2.3. Remove core components and internal vessels from reactor block;

Overview of DP

- Work Packages (WP)

- WP.2. Dismantling activities

- 2.4. Remove control room equipment;
- 2.5. Remove secondary circuit, buffer tank, pipes from active drainage, including underground part
- 2.6. Remove cooling pond
- 2.7. Remove active drainage
- 2.8. Remove ventilation system,

Overview of DP

- Work Packages (WP)

- WP.3. Decontamination activities

- 3.1. Decontamination of primary circuit (by washing with water and filtered in close circuit)
- 3.2. Decontamination of liner from hot cells with dry methods
- 3.3. Decontamination of walls, floors
- 3.4. Decontamination of tools and equipment used in decommissioning
- 3.5. Other large pieces will be transported in Radioactive Waste Treatment Plant for decontamination in special room

Overview of DP

- Work Packages (WP)

- WP.4. Demolition activities


- 4.1. Demolition of biological shield from reactor block, hot cells, deaerator, stack

- WP.5. Radiological characterization, packaging, transportation, disposal, storage, free release, final survey, archiving

Overview of DP

- The building purpose will be redirected to radiation processing facility for research, development and production of the water soluble polymers and recycling of other types of polymeric materials. Research and development in the material science also will be deployed in the building released from the regulatory control.

Overview of DP



Our commitment is to return both the national and international support by:

- - creating a training center for personnel involved in decommissioning activities
- - the exchange of experience and knowledge with similar nuclear facilities
- - creating a national center for decommissioning of nuclear facilities
- - completing the decommissioning project in safe and efficient conditions
- - assuring a basis for further development of the site after decommissioning.

Management System

-integrated management system

-safety is paramount

-safety, quality, security, economical, environmental and health are treated within one system;

-the structure is similar to the ISO 9001:2000 standard, but this standard not includes safety requirements

- Using NMC-11 for decommissioning the nuclear facilities

Management System

- is relevant to the whole nuclear industry;
- All documents have a consistent concept, similar structure and format;
- Developing the safety culture as requirement;
- Apply in practice Principle 3 (IAEA-2006-Fundamental Safety Principles)- Leadership and management for safety

Management System

- Safety has to be achieved and maintained by means of an effective management system
- This system integrate all elements of the management system
- The management system also ensure the promotion of a safety culture
- Recognition of interactions of individuals with technology and with organizations

Management System

- References
- IAEA-GS-R-3-The Management System for Facilities and Activities;
- IAEA-GS-G-3.1. Application of Management System for Facilities and Activities;
- IAEA-DS 349- Application System for Nuclear Facilities;

Management System

- The management system for decommissioning must be authorized by RB-CNCAN
- New organizational chart
- New Procedures for system, organizational, working

Management System

- The management system for decommissioning must be authorized by RB-CNCAN
- New organizational chart
- New Procedures for system, organizational, working
- Ensuring that health, environmental, security, quality, and economic are not considered separately from safety requirements