National Report: ROMANIA

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R²D²P: Workshop on “Safety Assessment for Decommissioning”

Risø, Denmark; 04-08 October 2010

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International Atomic Energy Agency

The improvements since the start of the R2D2P (2006) and the actual status in terms of decommissioning of nuclear facilities on the topics:

1. Legal and regulatory framework; regulatory independence
2. Basics of decommissioning / decommissioning planning, preparation of the decommissioning plan
3. Transition from operation to decommissioning - The main issues addressed or to be addressed
4. Characterisation survey – Methodology
5. Cost estimates- Approach methods
6. Decommissioning technologies - Applied or expected to be applied

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Legal and regulatory framework; regulatory independence

Nuclear decommissioning and radioactive waste management were included in legal and regulatory national framework in 2006.

- **Law no. 111/1996** *on the safe deployment, regulation, authorization and control of nuclear activities*, republished in 2006.
  - ✓**National Commission for Nuclear Activities Control – CNCAN;**
  - ✓CNCAN: an independent authority coordinated by Prime Minister‘s Cabinet;
  - ✓ CNCAN’s duties: regulation, authorization and control for nuclear activities in Romania;
  - ✓ license holder has the obligation to prove that has enough material and financial resources for the decommissioning activity and management of radioactive waste and to elaborate a program for decommissioning;
  - ✓ decommissioning is a licensed stage of the nuclear facilities and requires a quality management system.

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Legal and regulatory framework; regulatory independence (cont.)

- **Law nr. 105/June 16, 1999**, that ratified the "*Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management*".
  - ✓ decommissioning plans for a radioactive waste management facility are prepared and updated;
  - ✓ a nuclear facility in the process of being decommissioned could be considered a radioactive waste management facility (only if it is so designated by Contracting Party; not yet in Romania).
- **GO 11/2003** with modifications and completions (GO No. 31/2006, law No. 26/2007) *on the safety management of the radioactive waste*.
  - ✓ establishes the responsibilities of the nuclear license holders and of the national agency for radioactive waste (now AN&DR) for management of radioactive waste, inclusive decommissioning;
  - ✓ specifies how financial resources necessary for decommissioning and for the management of radioactive waste resulting from operation and decommissioning of nuclear facilities are accumulated (by GD is established the accumulation rate) and used. The RRs are financed yearly from state budget.

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Legal and regulatory framework; regulatory independence (cont.)

According to GO 11/2003:

- **The license holder responds for:**
  - ✓ preparation of decommissioning documentation (decommissioning plan (DP) and supporting documents etc.);
  - ✓ for decommissioning activity;
- ✓ elaboration of the feasibility studies for financing the decommissioning activity of the RRs from state budget;
- ✓ the management of radioactive waste from decommissioning.

- **AN&DR:**
- ✓ coordinates the decommissioning process; one action is to endorse the decommissioning plan prior to be approved by CNCAN.
- ✓ could respond for decommissioning activity in case of bankruptcy (undesired situation for commercial nuclear facilities) or at the end of activity (especially in the case of NPPs where a decommissioning fund is managed by AN&DR).
- ✓ responds for disposal of spent fuel and radioactive waste.

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Legal and regulatory framework; regulatory independence (cont.)

- Law No. 329/2009 *on the reorganization of some public authorities and institutions for rationalization of public expenditure* followed by Government Ordinance (GO) No. 1437/2009 *on the approval of internal rules and organisation* established **Nuclear Agency & Radioactive Waste (AN&DR) by merging former Nuclear Agency (AN) and National Agency for Radioactive Waste (ANDRAD).**
  - **AN&DR duties:**
    - **providing specialized technical assistance to the Romanian Government** in the development and adoption of policies for promotion, development and monitoring of exclusively peaceful applications of nuclear energy.;
    - **disposal of spent nuclear fuel and radioactive waste**;
    - **coordination of the predisposal management of spent nuclear fuel and radioactive waste**, **inclusive coordination of the decommissioning of nuclear facilities**;
    - **establishment of international cooperation** as a national contact point for IAEA, UE and other international organizations.

Legal and regulatory framework; regulatory independence (cont.)

- **Law No. 57/2006** *on peaceful utilization of nuclear energy* provides that the decommissioning of nuclear reactors is approved by GD.

- No any regulatory improvements since 2006, although some of them require revision .

- Are provided requirements in current norms for:
  - ✓ RRs decommissioning (2002)- requires revision;
  - ✓ Safety of radioactive waste management (2004);
  - ✓ Free release of materials resulting from authorized practices (2004) – requires revision;
  - ✓ Classification of radioactive waste (2005);
  - ✓ Surface disposal of radioactive waste (2005);
  - ✓ Quality management system in nuclear decommissioning (2003).

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Basics of decommissioning/decommissioning planning, preparation of the decommissioning plan

- In 2005 was elaborated by the Institute for Nuclear Research (INR) the first conceptual decommissioning plan for TRIGA nuclear research reactor that was approved by CNCAN with observations in September 11, 2006. The observations must be accomplished for the next revision to be approved in 2011.

- In 2008 was endorsed by ANDRAD and approved by CNCAN the revision 9 of the final plan for decommissioning of the VVR-S nuclear research reactor from IFIN-HH. The decommissioning process is envisaged to last 11 years since 2010.

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Transition from operation to decommissioning
- The main issues addressed or to be addressed -

For VVR-S

- **Carried activities:**
  - **Fuel removal from reactor core** (December 1997).
  - **HEU spent fuel return to Russian Federation** (RRRFR Program) (June 2009).
  - **Equipment procurement for radiological characterisation** (2005-2010):
    - Portable spectrometer NOMAD plus – Berthold AIV;
    - Canberra gamma spectrometer for characterization drums 220 l or 440 l with radioactive waste;
    - Contamination monitoring equipment SMART 2000- Eberline;
    - Aerosol monitor for continuous air probe, Alpha/Beta;
    - Fixed installation dose rate gamma meter with GM;
    - Survey-meter RO-07-Eberline;
    - Cleaner with HEPA- NILFISK filter;
    - Equipment for concrete scarifying of the building wall, floor;
    - Equipment for cutting and drilling (Mechanical saw HILTI WSR 1200-PE, Diamond drill equipment for concrete core extraction - DD200 , Device for sampling through stamping, type TRUMPH Nibbler N-1000-0, Discs for smears sampling).

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Transition from operation to decommissioning
- The main issues addressed or to be addressed – (cont.)

For VVR-S

- **Carried activities:**
  - **Clean up activities** (2003-2009):
    - All instruments and materials for research activities were removed from reactor hall and laboratories;
    - Linoleum from reactor hall was removed and the floor was covered by a resin;
  - **Refurbishment activities** (2006-2009):
    - The access doors were replaced with others that to permit the returning of spent fuel to Russian Federation.
    - The floor in the entrance area was consolidated to support the weight of the truck that carried the container with spent fuel.
    - Construction platform for parking the trucks with spent fuel assemblies
    - Consolidation the internal roads
  - **Health physics, dose rate measuring equipment procurement** (200x-200x):
    - Handheld Dose rate gamma meter with Geiger-Muller (GM) or proportional probe- 2 items;
    - Handheld Dose rate gamma meter with szintilation probe- 2 items;
    - Teletector with GM or proportional probe- 2 items:
    - Gamma spectrometric system HPGe including shielded measurement chamber – 1 item.

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Transition from operation to decommissioning
- The main issues addressed or to be addressed – (cont.)

For VVR-S

- **Carried activities:**
  - **Health physics, contamination measuring equipment procurement**
    - Handheld contamination monitors - large-area gas flow detector- 1 item;
    - Handheld contamination monitors with thin-layer plastic scintillator detector- 1 item;
    - Fixed installation dose rate gamma meter with GM or proportional probe (3 items for dismantling areas, 1 item for reserv, other measurements will be more precisely executed with handheld equipment)- 4 items
    - Personnel contamination monitor, hand and foot- 3 items;
    - Personnel contamination monitor, Whole Body Surface Contamination Monitor (gate) – 1 item
  - **Free release measuring equipment procurement**:
    - Release measurement facility, measurement chamber designed for 220/420 l drums, iron-barred boxes (lxbxh 835x1240x970), palettes; Calibration equipment for Release measurement facility – 1 item
  - **Enviromental monitoring system for airbornes; equipment procurement**:
    - Aerosol monitor for continuous air probe, Alpha/Beta (tritium shall be monitored periodicaly and taken into acount in the balances if nessesary)- 2 items

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Characterisation survey – Methodology

For TRIGA:

- ✓ Is kept the history of any contamination.
- ✓ Routine measurements are made for radiation dose.

For VVR-S:

- ✓ A detailed Radiological Characterization Plan was approved by CNCAN (2007);
- ✓ The characterization activities from plan were performed after clean activities and prior to decontamination of reactor rooms, structures and environmental areas.
- ✓ A Radiological Characterization Report was done as a supporting document to DP (2007).
- ✓ Was acquired information necessary for preparing the cost estimates and the risks involved in clean-up and decommissioning activities as well as the amounts and the categories of waste arising from these activities.

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Characterisation survey – Methodology (cont.)

Methods:

- Portable and laboratory spectrometry
- Portable scanning dosimetry
- Concrete scarifying sampling
- Cutting and drilling sampling
- Sampling through stamping
- Soil and water sampling

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Characterisation survey – Methodology (cont.)

Summary of characterisation:

- A classification of contaminated areas from the basement of the Reactor Main Building was made;
- Laboratory area is clean.
- Primary circuit, ventilation system and radioactive leakage drainage, overflow and collecting system are contaminated.
- Radioactive leakage drainage, overflow and collecting system contains buried pipes and its decontamination must be analyzed.
- Expected radioactive inventory of Hot Cells: 5.5 10^{11} Bq.
- Calculated radioactive inventory of the Reactor Block: 6.0 10^{11} Bq

Further investigations are necessary for:

- Metallic store and underground construction for 30 m^3 buffer tank

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Cost estimates- Approach methods

- For TRIGA reactor was not carried out a cost calculation/estimation for decommissioning and management of radioactive waste. This aspect is a requirement for the next revision of DP in accordance with CNCAN's observations.
- For VVR-S nuclear research reactor:
  - The last feasibility study (2009) provided the costs of:
    - ✓ decommissioning and management of radioactive waste, inclusive disposal: 26,929,726 EUR
    - ✓ upgrading of radioactive waste treatment-conditioning facility: 7,405,070 EUR
  - Values of the decommissioning costs resulted considering:
    - ✓ Activity specific approach;
    - ✓ Unit cost factor method based on Romanian norms;
    - ✓ Multiplication factor (1.5 – 5) for labor (man-hour) in specific conditions;
    - ✓ Equipment and material supply;
    - ✓ Utilities;
    - ✓ Nuclear and industrial security;
    - ✓ Environment monitoring;
    - ✓ Documentation and taxes;
    - ✓ Expertise, inclusive final radiological survey;
    - ✓ Treatment, conditioning and disposal of LILW-SL;
    - ✓ Storing LILW-LL.
    - ✓ Contingencies;

    For every activity result: quantity of material (radioactive and non-radioactive), human resources, duration, estimated cost.
  - The funding and budgeting of decommissioning is made as an investment project approved by GD (2009).

Decommissioning technologies - Applied or expected to be applied

TRIGA

The next decommissioning plan of TRIGA nuclear research reactor should address:

- Technologies for decontamination;
- Techniques for dismantling to minimize the radioactive waste;
- Proper technologies for the management of radioactive waste.

VVR-S

- Decontamination technologies based on:
  - Vacuum HEPA cleaners;
  - Vacu-Blast-portable blast unit;
  - Scrablers;
  - Chemical reagents, local application;
  - Portable unit with carbon ice- Need to be procured;

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Decommissioning technologies - Applied or expected to be applied

VVR-S

- **Decontamination technologies based on:**
  - Other pieces of equipment from Radioactive Waste Treatment Plant, situated near VVR-S research reactor, in operation and up-graded until 2012, where materials resulted from decommissioning will be sent and decontaminated in accordance with material routes described in DP approved.

- **Dismantling technologies based on:**
  - Brokk 50, will be procured Brokk 300
  - Pick-hammer;
  - Portable hydraulic scissors, splitters;
  - Diamond wire saw;
  - Guillotine cutter.
  - Nibbler and mechanical saw

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Progress and Achievements

- Aspects of decommissioning successfully addressed to date for VVR-S:
  - ✓ A final decommissioning plan endorsed by ANDRAD and approved by CNCAN (2008).
  - ✓ A new updated feasibility study for cost calculation for implementation of decommissioning (2009).
  - ✓ GD for 11 years financing as an investment project (2009).
  - ✓ The repatriation of HEU spent fuel from VVR-S under the RRRFR project (2009).
  - ✓ The transition preparatory decommissioning work for VVR-S (2003-2009).
  - ✓ The application for decommissioning license for first phase (3 years) is under regulatory review.
  - Radioactive waste treatment-conditioning facilities from IFIN-HH (owner of VVR-S RR) and INR (owner of TRIGA RR) are now under refurbishment.

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THANK YOU FOR YOUR ATTENTION!

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