New issues in radioactive waste management legal frame and challenges for CNE-PROD Cernavoda NPP

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Abstract

This paper presents national legal frame governing radioactive waste management activities (including spent fuel), legislative newness, introduced during last two years, current status of radioactive waste management at CNE-PROD Cernavoda, as radioactive waste main producer and associated responsibilities and derived actions for CNE-PROD radioactive waste program.

Romania has only one nuclear power plant, Cernavoda NPP, equipped with five PHWR - CANDU-6 Canadian type reactors - with a 700 MW(e) gross capacity each, in different implementation stages. Unit 1 is in commercial operation since December 2, 1996, Unit 2 is under construction and Units 3, 4, 5 are under preservation.

Spent fuel management facilities at CNE-PROD consist of Spent Fuel Bays and The Intermediate Dry Spent Fuel Storage facility.

Radioactive waste management facilities at CNE - PROD consist of Solid Radioactive Waste Interim Storage Facility.

Objective of Romanian radioactive waste management policy is to assure safe management of radioactive waste, according to the principles stated in IAEA SS No. 111-F.
The Romanian radioactive waste management policy and strategy are fully taking into account the general and radioactive waste management specific IAEA requirements.

New legislative issues from last two years establish clear responsibilities for the different institutions involved in the different steps of spent fuel and of radioactive waste management.

1. ROMANIAN RADIOACTIVE WASTE CONTEXT

1.1 Main actors

Romania has only one nuclear power plant, Cernavoda Nuclear Power Plant, equipped with five PHWR - CANDU-6 Canadian type reactors - with a 700 MW(e) gross capacity each, in different implementation stages. Unit 1 is in commercial operation since December 2, 1996, Unit 2 is under construction and Units 3, 4, 5 are under preservation.

The legal representative of the nuclear power production sector in Romania is **"Nuclearelectrica" S.A**. **National Company (SNN)**.
SNN is a governmental owned company reporting to the Ministry of Industry and Trade. The company has its Headquarters in Bucharest and three subsidiaries:
• CNE-PROD Cernavoda (CNE-PROD), the operator of Cernavoda NPP - Unit 1;
• CNE-INVEST Cernavoda, in charge with the completion of Unit 2 and with the preservation of Units 3,4,5;
• Nuclear Fuel Plant in Pitesti (FCN).

The Nuclear Agency has been established through Governmental Decision no. 1425 / 2003 (on December 4th, 2003) as a national specialised organism of the Central Public Administration, under the Prime-Ministry Co-ordination through Prime Ministry Chancellery.

The Nuclear Agency has the main object:
- to provide Romanian Government with specialised technical assistance in order to establish nuclear policies,
- to promote and monitor nuclear activities in Romania.

The Nuclear Agency is responsible for setting up the National Nuclear Program and its public debate.

Radioactive Waste National Agency (ANDRAD) is the national competent authority for co-ordinating the safe spent fuel and radioactive waste management, including disposal.
ANDRAD was established under the Ministry of Industry and Trade as a competent authority for co-ordination, at national level, of the safe management of spent fuel and radioactive waste, including decommissioning.

This agency has co-ordinating role for the national process of spent fuel and radioactive waste management, including disposal, for the waste coming from:
- nuclear power and research reactors,
- nuclear and radiological facilities decommissioning,
- nuclear technologies applications in industry, agriculture, medicine,
- others socio - economic activities;

The co-ordinating activity is performed based on National Strategy.

Before **ANDRAD** was set up, the main role in establishing the policy and strategy for spent fuel management was played by the **CNCAN**.
After the establishing of **ANDRAD**, CNCAN shall have a more limited role in the establishing of radioactive waste and spent fuel management policy and strategy.

CNCAN's role will be to verify if the requirements for nuclear and radiological safety, safeguards, and physical protection are met by the policy and strategy, according to the provisions of Romanian laws and regulations.
The radioactive waste and spent fuel regulatory policy will remain exclusively under the CNCAN's responsibility also.

1.2 Types of radioactive waste

Cernavoda NPP has all operational arrangements including special designated facilities for proper current management of its gaseous, liquid and solid operational radioactive wastes, in order to assure the protection of the workers, the public and the environment.
The gaseous wastes are collected by ventilation systems, filtered and released through the ventilation stack under a tight control to minimise the environmental impact.
The aqueous liquid wastes are collected and after purification (if appropriate) are discharged into the environment by an approved "dilute and disperse" solution.

The solid and organic liquid radioactive waste management at Cernavoda NPP includes the initial basic step of pre-treatment of waste, as defined in the IAEA Safety Fundamentals No. 111-F "The Principles of Radioactive Waste Management". It consists of collection, segregation, compaction (if appropriate) and include a period of interim safe storage.
The operational solid radioactive wastes consisting in compactable and non-compactable solid waste and spent resins are safe managed within the plant facilities, designed, built and operated to meet internationally agreed standards.

During plant operation and as a consequence of maintenance and decontamination activities the following types of solid wastes are obtained and then handled, processed (if required) and temporarily stored:
- solid, low-active wastes: - compactable (paper, textiles, some plastics, glass, equipment,etc.)
  - non-compactable (wood, metallic parts, equipment, etc);
- solid, medium active wastes: - non-compactable (wood, metallic parts, equipment, used filter cartridges);
  - spent resins;

All types of solid wastes (except spent resins) are collected, processed and packed inside the plant and then temporarily stored within the Solid Radioactive Waste Interim Storage Facility from which they will be subsequently transferred to the Disposal Facility (when this facility will be available).
The used filter cartridges unloaded from the process systems, are directly carried to the Intermediate Storage Facility. Transportation of filter cartridges is performed by means of suitably shielded containers.
Processing method applicable includes inspecting, monitoring, drying and compaction.
Waste compaction is obtained by pressing the compactable wastes directly into standard metallic drums of 220 l using a Hydraulic Press.
The non-compactable wastes are broken into smaller pieces (if necessary) and also packed in standard drums of 220 l.
Packaging of sub-assemblies or large-sized contaminated components can be performed in various types of containers, as required, especially in case of solid medium-active wastes.
Current waste classification is based on the radiation dose measured at the outside surface of the packages with radioactive wastes, which are to be transported to the Intermediate Storage Facility.
The following types of waste packages can be distinguished:

- type 1 - packages, having a dose under 2 mSv/hour;
- type 2 - packages, having a dose between 2 mSv/hour and 125 mSv/hour;
- type 3 - packages, having a dose exceeding 125 mSv/hour.

Practically all containers filled up with various wastes, contaminated metallic parts or objects, which are considered packages of **type 1**, can be handled requiring no special shielding measures.
Packages of **type 2** contain filter cartridges, contaminated metallic parts, never compacted wastes. Depending on the dose, they are remotely handled, and suitable shields or additional containers are required.
Packages of **type 3** contain filter cartridges and activated reactor components. They are handled only by means of additional containers with suitable shielding capacity.
For spent resins a handling and storage process system has been provided.
Spent resins are obtained from the various purification systems of the process fluids. Due to high radiation contact dose rates, special protection and shielding measures have been provided for their transportation, handling and storage.
Organic liquid radioactive waste consist of spent radioactive oils, spent solvents, liquid scintillation cocktails, which cannot be processed through Liquid Radioactive Waste System because of their environmental impact.
The source of liquid organic wastes are from the decontamination area, lubricating oils from pumps and motors used in Zones 1 and organic solvents from the laboratories.
Organic liquid radioactive waste are temporarily stored in the Service Building basement in standard 220l stainless steel drums.

1.3 Waste management facilities

Spent fuel management facilities at CNE-PROD consist of Spent Fuel Bays and Intermediate Dry Spent Fuel Storage facility.

Underwater spent fuel storage facility was designed with a storage capacity of 50,000 spent fuel with a discharge rate of 5,000 fuel bundles annually.
After six years of plant operation in the spent fuel storage bay there were stored 30,344 fuel bundles.
Due to limited capacity of underwater spent fuel storage facility it was necessary to build an Intermediate Dry Spent Fuel Storage Facility (IDSFSF).
The design of the IDSFSF was developed by AECL and contains strength safety features to ensure the safety of operating personnel, of the public and the long-term integrity of the fuel.
The licensing process started in 2001 by getting the Sitting Licence followed by the Construction, the Commissioning and the Operating Licences (2003). The IDSFSF is the MACSTOR system designed for storing spent fuel cooled for a period of six years consisting of storage modules located outdoors in the storage site and equipment operated at the spent fuel storage bay for preparing the spent fuel for dry storage.

Radioactive waste management facilities at CNE - PROD consist of Solid Radioactive Waste Interim Storage Facility (SRWISF) located within Cernavoda NPP exclusion zone and security fence, with easy access of vehicles transporting radioactive wastes, minimizing the need for additional security mechanism to assure its integrity.
The SRWISF is designed for temporary storage of solid radioactive wastes (in standard 220l stainless steel drums) produced from Cernavoda NPP operation, except spent ionic resins, spent fuel and reactivity control mechanism bars.
The SRWISF is designed to take over and store solid radioactive wastes as they are produced, before transfer to the Disposal Facility (when this facility will be available); storage time is determined by disposal facility availability.

It contains separate structures required to store radioactive wastes from Cernavoda NPP – Unit 1 operation and is capable of expansion to accommodate wastes arising from other units operations.
All these structures (Warehouse, for stainless steel drums, Concrete structure, for large and highly contaminated pieces, Concrete structure, for spent filters cartridges) are built above ground and have a design life of 50 years.

2. EXISTING LEGAL FRAME

As Romania has decided to use the open fuel cycle, considering spent fuel as radioactive waste, the objective of Romanian radioactive waste management policy is to assure safe management of radioactive waste, according to the principles stated in IAEA Safety Fundamentals SS No. 111-F “The Principles of Radioactive Waste Management”.

The Romanian radioactive waste management policy and strategy are fully taking into account the general and specific radioactive waste management requirements presented in IAEA Requirements No. GS-R-1: Legal and Governmental Infrastructure for Nuclear, Radiation, Radioactive Waste and Transport Safety.

2.1 Romanian legislative framework

The Romanian legislative framework that governs safe management of spent fuel and radioactive waste includes the following:
• Law no. 111/1996 on safe deployment of nuclear activities (modified, completed and approved by Law 193 / 2003);
• Law no. 137/1995 on environmental protection (as amended)
• Law no. 98/1994 on public health
• Governmental Ordinance no. 47/1994 on defence against disaster
• Law no. 106/1996 on civil protection
• Law no. 105/1999 on ratification of Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

• Law no. 703/2001 on civil liability for nuclear damages

Law no.111/1996 establishes the regulatory framework for nuclear activities. According to this law the regulatory body, National Commission for Nuclear Activities Control (CNCAN), is empowered with the regulation, authorisation, and control of nuclear activities.

Beside the general requirements for nuclear safety, radiation protection, quality assurance, safeguards, physical protection, emergency planning, preparedness and implementation, Law no.111/1996 (as amended) has also specific requirements regarding radioactive waste management, including spent fuel, as such:

- The holder of authorisation is responsible for the management of radioactive waste generated by his own activity;
- The holder of authorisation shall bear the expenses related to the collection, handling, transport, treatment, conditioning, temporary storage and disposal of the waste produced in its activity;
- The holder of authorisation shall pay the legal contribution to the Fund for management of radioactive waste and decommissioning;
- On discontinuation of the activity or decommissioning of nuclear installation, as well as in case of transfer of sources or installations, the holder of authorisation shall obtain an authorisation to hold, decommission or transfer them, as applicable;
- An authorisation for a nuclear activity shall be granted only if the applicant disposes of material and financial arrangements adequate and sufficient for the collection, treatment, conditioning, and storage of radioactive waste generated from his own activity, as well as for decommissioning the nuclear installation when it will cease its authorised activity, and has paid his contribution to the Fund for management of radioactive waste and decommissioning;
- The import of radioactive waste shall be prohibited, except situations in which import follows directly from processing outside Romanian territory of a previously authorised export of radioactive waste, including spent nuclear fuel;

It has to be mentioned that the law on the Fund for Radioactive waste Management and Decommissioning shall be set-up in the next future, and the contributions to the fund shall start to be collected.

2.2 Recent legislative changes

Recent legislative changes from last two years establish clear responsibilities for the different involved institutions in the different steps of spent fuel and of radioactive waste management.

In this context the National Commission for Nuclear Activities Control (CNCAN) issued new regulations in the nuclear safety field, including radioactive waste, safe management of radioactive waste, radioactive waste transport activities, clearance, etc. as following:

- No. 56 / 25.03.04 Fundamental Norms on Safe Management of Radioactive Waste
- No. 62 /31.03.04 Norms on radioactive materials clearance
- No. 222 / 2.12.02 Norms for radioactive materials transport – licensing procedures
- No. 2 / 2004 Control and regulating for radioactive waste transport on Romanian territory

The Law no. 320/2003 **(on July, 8th 2003)** on the management of spent nuclear fuel and radioactive waste, including final disposal establishes the attributions of ***Radioactive Waste National Agency (ANDRAD)***.

The main tasks of **ANDRAD** are:

- to elaborate the "Medium and Long Term National Strategy on spent fuel and radioactive waste management, including disposal and decommissioning", to be aproved by Nuclear Agency;

- to elaborate the Yearly Activity Plan and to establish the financial resources necessary for the co-ordination at national level of the management of spent fuel and radioactive waste;
- to set up national disposal facilities for spent fuel and radioactive waste; national disposal facilities are in ANDRAD
- to create and maintain the national data base regarding the spent fuel and radioactive waste;
- to analyse the characteristics of spent fuel and radioactive waste in view of their management;
- to establish the spent fuel and radioactive waste inventory to be produced in each year, in view of elaboration of the Yearly Activity Plan;
- to elaborate technical standards and procedures for the management of the spent fuel and of the radioactive waste, including disposal and decommissioning
- to co-ordinate feasibility and siting studies, of design, construction, commissioning and operation of final disposals for spent fuel and radioactive waste;
- to co-ordinate the decommissioning process for the nuclear installations;
- to co-operate with similar foreign organisations to assure the use of the best available technologies for spent fuel and radioactive waste disposal.

The Nuclear Agency issued (on August 9th, 2004) **"Medium and Long Term National Strategy on spent fuel and radioactive waste management, including disposal and decommissioning"** as part of National Nuclear Plan.

"Medium and Long Term National Strategy on spent fuel and radioactive waste management, including disposal and decommissioning" includes IAEA recommendation and has the main objectives to:

- Manage radioactive waste and spent fuel according to international recommendations
- Reduce environmental impact
- Develop research programs for radioactive waste and spent fuel till disposal
- Continuous enhance of nuclear and radiological safety performance including for disposal phase;
- Assure physical security for radioactive waste, including during transport
- Environmental restoration after nuclear installations closure

3. IMPLEMENTATION OF THE " MEDIUM AND LONG TERM NATIONAL STRATEGY" AND ITS CHALLENGES

Under the Law no. 320/2003 **(on July, 8th 2003)** on the management of spent nuclear fuel and radioactive waste, including final disposal there are new responsibilities for the holders of authorisation:

- to report every year to ANDRAD the quantities and types of spent nuclear fuel and radioactive waste generated during the current year and those estimated to be produced in the next year, in order to allow the updating of the data base for co-ordination at national level of the process of management of the spent nuclear fuel and of the radioactive waste, including disposal and decommissioning;
- to bear (during entire lifetime and decommissioning of the installation) the direct responsibility for the management of the spent nuclear fuel and radioactive waste in view of their final disposal;
- to finance the own activities of collection, segregation, treatment, conditioning, intermediate storage and transport in view of final disposal of spent nuclear fuel and radioactive waste generated during operation, maintenance and repairing activities, including during decommissioning of the nuclear installations;
- to finance the own research and development activities regarding the management of the spent nuclear fuel and of the radioactive waste.
- the responsibility for the storage of the spent fuel and radioactive waste belongs to the operator of the NPP till it is transferred to the future organisation in charge with long term storage or disposal.

"Medium and Long Term National Strategy on spent fuel and radioactive waste management, including disposal and decommissioning" includes an Action Plan which emphasise short-term actions without neglecting the medium and long terms ones.

As radioactive waste main producer, SNN will be involved in activities requested by:
- proposed LILW –SL and LILW – LL Disposal Facility on medium term (6 – 10 years),
- proposed HLW Disposal Facility on long term (11 – 50 years).
- preparation of Unit 1 and 2 decommissioning plans (11 – 100 years)

New challenges for SNN (CNE-PROD) coming from the National Strategy are, on short term (3 – 5 years) for the safe management of radioactive waste LILW – SL and LILW – LL:
- characterisation of radioactive waste
- development and implementation organic liquid waste conditioning method;
- revision of actual process of solid radioactive waste interim storage;
- development of solid radioactive waste conditioning method;

To allow accomplishment of the above-mentioned short – term actions, CNE-PROD has, firstly, to revise Station's Radioactive Waste Management Program including new waste classification and criteria for clearance activities.

4. CONCLUSION

As Romania has decided to use the open fuel cycle, considering spent fuel as radioactive waste, the objective of Romanian radioactive waste management policy is to assure safe management of radioactive waste, according to the principles stated in IAEA Safety Fundamentals SS No. 111-F "The Principles of Radioactive Waste Management".

For an effective management of radioactive waste, from generation through disposal, taking into account interdependencies among all steps of radioactive waste management, in the last two years, in Romania there were established new institutions (Nuclear Agency and ANDRAD) and new responsibilities for different actors involved in waste management activities.

New issued **"Medium and Long Term National Strategy on spent fuel and radioactive waste management, including disposal and decommissioning"** emphasises short-term, medium and long terms actions for CNE-PROD, as radioactive waste main producer, started from radioactive waste characterisation, conditioning method, and continuing with LILW and HLW Disposal Facilities.

REFERENCES

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[5] CNE-PROD - RD-01364 – RP9, Radiation Protection Regulation for CNE-PROD CERNAVODA

[6] CNE-PROD – SI-01365-RP7, CNE-PROD Radioactive Waste Management Program