ROMANIA

JOINT CONVENTION
ON THE SAFETY OF SPENT FUEL MANAGEMENT
AND
ON THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT

ROMANIAN
THIRD NATIONAL REPORT

2008

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LIST OF ABREVIATIONS AND SELECTED TERMS

ACPR	*Annulus Core Pulse Reactor*
ADR, RID, ICAO, IMDG	*International agreements and convention for transport of dangerous goods*
AN	*Nuclear Agency*
ANCS	*National Authority for Scientific Research*
ANDRAD	*National Agency for Radioactive Waste*
ANM	*National Administration for Meteorology*
ANPM	*National Agency for Environmental Protection*
CNSU	*National Committee for Emergency Situations*
CNCAN	*National Commission for Nuclear Activities Control*
CNE Cernavoda	*Cernavoda Nuclear Power Plant*
CNU	*National Uranium Company*
COG	*CANDU Owner Group*
COSECC	*Cernavoda On-Site Emergency Control Centre*
DELs	*Derived Emissions Limits*
DFU	*Spent Filters Storage*
DICA	*Interim Dry Spent Fuel Storage Facility*
DIDR	*Solid Radioactive Waste Interim Storage Facility*
DNDR Baita Bihor	*National Repository For Radioactive Waste Baita – Bihor*
ERC	*Emergency Response Centre*
EU	*European Union*
FCN	*Nuclear Fuel Plant Pitesti*
FEP's	*List of Feature, Events and Processes*
Governmental Ordinance no. 11/2003	*Governmental Ordinance no. 11/2003 regarding the management of nuclear spent fuel and radioactive waste, including their disposal, with subsequent modifications and completions*
Governmental Ordinance no. 7/2003	*Governmental Ordinance no. 7/2003 regarding the use of nuclear energy in exclusive peaceful purposes, with subsequent modifications and completions*
HEU Fuel	*Highly Enriched Fuel*
IAEA	*International Atomic Energy Agency*
IFIN-HH	*National Institute of Research and Development for Physics and Nuclear Engineering "Horia Hulubei"*
IGSU	*General Inspectorate for Emergency Situations*
ISCIR	*National Authority for Pressured Vessels and Hoisting Equipment*
JRTR	*Job Related Training Requirements*
Law no. 111/1996	*Law no. 111/1996 on the safe deployment, regulation, authorization and control of nuclear activities, republished*
LEU Fuel	*Low Enriched Fuel*
LEPI	*Post Irradiation Examination Laboratory*
MIRA	*Ministry of Interior and Administrative Reform*
NCE	*National Committee for Emergencies*
NPP	*Nuclear Power Plant*
OCE	*Operative Centre for Emergencies*
PSAR	*Preliminary Safety Assessment Report*
SAT	*Systematic Approach to Training*

SCN Pitesti	*Subsidiary for Nuclear Research Pitesti (subsidiary of the Autonomous Company for Nuclear Activities)*
SITON	*Centre for Design of Nuclear Facilities*
SNN	*National Company "Nuclearelectrica"*
SSR	*Steady State Reactor*
SSRS	*Spent Sealed Radioactive Sources*
STDR Pitesti	*Radioactive Waste Treatment Station which belongs to SCN Pitesti*
STDR Magurele	*Radioactive Waste Treatment Station which belongs to IFIN-HH*
TQI	*Training Qualification Index*
QMS	*Quality Management System*

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SECTION A. INTRODUCTION

In the late of 1970's, Romania chose CANDU type reactor for its first nuclear power plant. The main reasons of the choice were the high safety features of this technology and the possibility to manufacture in Romania the nuclear fuel and the heavy water as well as part of the equipment for this type of NPP.
Nowadays in Romania there are three mining districts: Bihor in the NW, Banat in the SW and Suceava in the NE area of the country. The uranium ore mined in these areas is transported to a single processing plant in the central area of the country (Feldioara).

The fabrication of the CANDU nuclear fuel started in 1980, through the commissioning of a CANDU type Fuel Pilot Plant operating as a department of the Nuclear Research Institute Pitesti (SCN Pitesti). The separation of the Nuclear Fuel Plant from SCN Pitesti, as a distinct branch, occurred in 1992. In 1994, AECL and Zircatec Precision Industries Inc. Canada qualified the Nuclear Fuel Plant (FCN) Pitesti as a CANDU 6 fuel manufacturer. The plant has a capacity of 90 tons per year, respectively 23 bundles per day. It supplies the fuel necessary for the Cernavoda Unit 1 and 2 operations. In 2004 FCN Pitesti extended the capacity and increased gradually the production that means 200 tons of natural uranium per year, production that assure the operation of Unit 1 and Unit 2 from CNE Cernavoda.

The high quality of the domestic nuclear fuel produced in Romania was proven by its behavior and performance during the reactor operation period: the failure rate was of 0.04% at an average burn up factor of 170 MWh/kgU.
The issue of managing spent fuel and radioactive waste started to be considered in Romania in the nineteen fifties, when the first nuclear research reactor was put in operation, and the number of applications using radioactive sources rapidly increased.

The technical and social issues of safe management of spent fuel and radioactive waste were not sufficiently assessed at the beginning. As the radiation practices developed, and science and technology progressed, the awareness of the above mentioned issues increased in Romania as well. After the starting in 1996 of operation of CNE Cernavoda Unit 1 - the first Romanian nuclear power plant, the spent fuel and radioactive waste management issue became more complex.

However, by ratifying the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management, Romania has shown its willingness to undertake all the necessary steps for achieving the required level in the safe managing of the spent fuel and radioactive waste.

The report presents the situation of spent fuel and radioactive waste management activities in Romania, showing the existing situation, the safety issues of concern and the future actions to address these issues. The inventories of spent nuclear fuel and radioactive waste are as 31 December 2007.

The presentation follows the content proposed by IAEA in scope of reporting the conformity with the provisions of Joint Convention on the Safety of the Spent Fuel Management and on the Safety of Radioactive Waste Management.
This report was produced by the National Commission for Nuclear Activities Control (CNCAN), which was responsible for its coordination.
The conclusions of the report show that generally, the spent fuel as well as radioactive waste are managed safely in Romania. However, there are issues of concern, which are summarized in Section K of this report.

The National Commission for Nuclear Activities Control in its capacity of Romanian regulatory body will continue to monitor closely the solving of the issues of concern identified in this report.

SECTION B. POLICIES AND PRACTICES *(Article 32)*

B1. Radioactive waste and spent fuel management policy

Under the current legislative and regulatory framework, spent fuel is considered to be another form of radioactive waste. The legislative and regulatory policies that govern radioactive waste in Romania implicitly include spent fuel. As a result, legislation and policies on managing radioactive waste apply equally to spent fuel as they do to other forms of radioactive waste.

The objective of Romanian radioactive waste management policy is to assure safe management of radioactive waste.

The main general aspects of radioactive waste management policy are presented below:

- The radioactive waste management, including the transport, shall be authorized, and shall be performed according to the provisions of the applicable laws and regulations, assuring safety of facilities, protection of human health and environment (including protection of future generations);
- The licensees have the responsibility for management of radioactive waste arising from operation and decommissioning of their own nuclear and radiological facilities, up to disposal. They shall bear the expenses related to the collection, handling, transport, treatment, conditioning, storage and disposal of the waste they have produced;
- The licensees shall pay the legal contribution to the Fund earmarked for management of radioactive waste and to the Fund for decommissioning of nuclear installations;
- CNCAN has the responsibility for radioactive waste regulatory policy;
- National Agency for Radioactive Waste (ANDRAD) has the responsibility for disposal of the radioactive waste;
- The import of radioactive waste is prohibited;
- The timing for decommissioning and radioactive waste disposal shall assure, as far as applicable, the requirements for not imposing undue burden on future generations;
- Spent fuel produced by NPPs shall not be reprocessed;
- According to international agreements signed with neighbor countries, the protection of human health and environment beyond national borders shall be assured in such a way that the actual and potential health effects will be not more detrimental that those accepted for Romania.
- The discharge of gaseous and liquid radioactive effluents from any nuclear facility shall be limited, according to derived emission limits approved by CNCAN, and further reduced, according to optimization principle.
- By conditions set in the operating authorization, and by regulatory dispositions, the holder of authorization is requested to transfer the radioactive waste (including the spent sources) for treatment and disposal or long term storage at dedicated facilities.
- Any nuclear and major radiological facilities shall have a decommissioning generic plan; for new facilities, this requirement applies from the design stage, when the application for the siting authorization is submitted to CNCAN.

B2. Spent fuel practices

B.2.1. Spent fuel from the NPP

Romania has one nuclear power plant, CNE Cernavoda , equipped with five PHWR - CANDU-6 Canadian type reactors with a 705 MW(e) gross capacity each, in different implementation stages. Unit 1 and 2 are in commercial operation since December 1996, respectively November, 2007. The electricity annually generated by CNE Cernavoda Units 1 and 2 represents approximately 18% of the overall electricity production of Romania leading to approximately 5400 tHM to be unloaded during 30 years of operation. Units 3, 4 and 5 are under preservation, since 1992.
The legal representative of the nuclear power production sector in Romania is National Company “Nuclearelectrica” . (SNN). SNN is a government owned company reporting to the Ministry of Economy and Finance. The company has its Headquarters in Bucharest and two subsidiaries:

- CNE Cernavoda, the operator of Cernavoda NPP – Units 1&2;
- Nuclear Fuel Plant in Pitesti (FCN).

After minimum 6 years storage in the spent fuel bay the spent nuclear fuel from operation of CNE Cernavoda is transferred to Intermediate Dry Storage Spent Fuel Facility (DICA) that has a designed lifetime of 50 years. The DICA was designed to accommodate the spent fuel generated from 30 years operation of the 2 CANDU units, respectively 324.000 fuel bundles. The first module of DICA was put in operation in 2003, the second and the third modules are in operation since 2006.
The Romanian strategy for the management of the back end of the fuel cycle is the disposal in geological repository of spent nuclear fuel from nuclear power plant.

B.2.2. Spent fuel from the research reactors

Besides spent fuel from commercial power reactors, there is also a small amount of spent fuel resulting from research reactors at Subsidiary for Nuclear Research Pitesti (SCN Pitesti) - TRIGA reactor as well as at the National Research & Development Institute for Physics and Nuclear Engineering “Horia Hulubei” (IFIN-HH) -VVR-S.

The TRIGA reactor is owned by the Autonomous Company for Nuclear Activities through its SCN Pitesti. The VVR-S reactor is owned by IFIN-HH, which is under the coordination of the National Authority for Scientific Research - Ministry of Education, Research and Youth (ANCS).

The TRIGA reactor is a pool type reactor with 2 cores: Steady State Reactor (SSR), operated at maximum 14 MW and Annulus Core Pulse Reactor (ACPR), that can give a pulse of 20.000 MW or can be operated as a steady reactor at maximum 500 KW. The fuel originally used for SSR was HEU type (93% enrichment). In present the full conversion of the core to use LEU type (20% enrichment) is accomplished with support from IAEA TC project ROM/4/024, “Full Conversion of TRIGA 14-MW”. The ACPR fuel is a LEU type one (20% enrichment). The spent fuel removed from the TRIGA reactor can be stored for one year in the reactor pool, in 6-bundle racks. After this time delay the spent fuel bundles are transferred in the spent fuel storage pool. Storage conditions are similar to those in the TRIGA pool. The storage time can be 20 to 30 years. Romania has adhered to the US Government policy with respect to return to the country of origin the HEU type spent fuel in American research reactors abroad. According to the agreement signed by Romania, in 2006, all the HEU type fuel has been removed from the SSR. This fuel was returned to USA. The first shipment to USA of HEU spent fuel has been performed in 1999 and the second in July 2008, so all HEU type fuel has been repatriated in USA.

The VVR-S research reactor was operated at a power of max. 2 MW, from 1957 until December 1997 when has been shut-down. In 2002, a government decision for decommissioning of the reactor was issued. The original fuel, having the reference name EK-10, was made up of rods with 10% enriched uranium dioxide-magnesium alloy in aluminium cladding. All the EK-10 type fuel was delivered from the USSR manufacturer as complete assemblies and after use these have been stored underwater. In 1984, a fuel version of 36% enrichment was introduced, having as fuel uranium dioxide aluminium matrix. This fuel type, designated C-36, was used initially together with EK-10 fuel and then used exclusively from 1993 to December 1997. During the operation of the reactor, the spent fuel unloaded from the core, was stored for cooling for at least 1 year in the Cooling Pond, sited in the reactor hall. After this cooling time, the spent fuel was transferred in 3 of the 4 storage ponds (1 is still empty), sited in a separate building, close to the reactor building. At present, the fuel assemblies of the last charge of the core are still stored in the cooling pond, waiting for transfer, while the rest of spent fuel is stored in the storage ponds. In present, the Safety Analysis Report for the spent fuel ponds including the assessment of the fuel status is under revision.

The back-end policy for the spent nuclear fuel from these reactors is to return it in the origin countries. For the EK-10 spent nuclear fuel from VVR-S a decision will be taken in the near future.

B3. Radioactive waste management practices

B 3.1. Radioactive waste from NPP

CNE Cernavoda has the designated facilities for proper current management of its gaseous, liquid (aqueous and organic) and solid operational radioactive wastes, in order to ensure the protection of the workers, public and environment.

Therefore, the gaseous and aqueous liquid wastes are collected, filtred/purified by designed systems and then safely released/discharged into environment in accordance with international agreed standards for protection of public and environment.

The organic liquid wastes are pretreated (collection and segregation by interim storage criteria), treated (absorption into polymeric structure), packaged in stainless steel drums and stored in interim storage.

The solid radioactive waste management at CNE Cernavoda includes the pretreatment (collection; segregation), treatment (volume reduction by compaction or shredding) and safe storage of waste.

B.3.2. Institutional radioactive waste

The processing and conditioning of institutional radioactive waste is done by IFIN-HH and SCN on the sites of the research reactors at Bucharest and Pitesti, in their Treatment and Conditioning facilities. Storage of radioactive waste is done in surface storage buildings at the IFIN-HH site. The storage facility is a ground floor building divided into 5 rooms with total storage capacity of 3000 drums. (see also section D). IFIN-HH is responsible for the transports of conditioned institutional radioactive waste, towards the National Repository for Radioactive Waste (DNDR) which is located at Baita Bihor. The Baita Bihor repository was designed to accommodate about 5000 m^3 of conditioned wastes disposed in about 21,000 standard containers (220 liter carbon steel drums). The first waste disposals were made in 1986 and the current estimate is that disposals will continue until 2040. The repository is operated by IFIN-HH.

B3.3. Fuel cycle radioactive waste

The Nuclear Fuel Plant (FCN) in Pitesti has the designated facilities for proper current management of its gaseous, liquid and solid wastes, in order to ensure protection to the workers, public and environment.

Therefore, the gaseous wastes are collected, filtred by designed systems and then safely released into environment in accordance with international agreed standards for protection of public and environment.

The aqueous liquid wastes, including radioactive waste waters for uranium recovery and residual waters are collected, stored for a while and then, based on administrative arrangements, are transferred to SCN Pitesti, for appropriate treatment and discharge.

The organic liquid wastes are collected and safely stored on site.

The solid wastes, containing uranium for recovery are collected, packaged and transferred to SCN Pitesti for further treatment and/or conditioning.

The solid waste, containing waste for which no any recovery is intended, are transferred to the Feldioara for disposal, based on administrative arrangements approved by CNCAN.

B3.4. Uranium mining and milling radioactive waste

The National Uranium Company (CNU) is responsible for uranium mining and milling activities as following:

- Feldioara Subsidiary:
    - Sett and store the radioactive tailings resulted from milling process
    - Final set of fines
    - Store the solid radioactive materials
- Bihor Subsidiary:

    - Store and environment restoration/ remediate of sterile and radioactive rocks dumps resulted from research and uranium mining activities
- Suceava Subsidiary:
    - Store and environment restoration/ remediate of sterile and radioactive rocks dumps resulted from research and uranium mining activities
- Banat Subsidiary:
    - Store and environment restoration/ remediate of sterile and radioactive rocks dumps resulted from research and uranium mining activities.

The Radioactive Mineral Magurele Company is responsible for the restoration of environment from the old uranium mining practices that are not under the responsibility of National Uranium Company (see above).

Geolex S.A. is a small company, dedicated for geological field work and exploration. The activities related to uranium and thorium is now closed, and the company shall bear the responsibility for environmental restoration.

B4. Criteria to define and categorize radioactive waste

According to the definition presented in the Law no. 111/1996 on the safe deployment, regulation, authorization and control of nuclear activities, republished, the radioactive wastes are those materials resulted from nuclear activities for which no use was foreseen, and which contain or are contaminated with radionuclides in concentration above the exemption limits.

According to the provisions of Order 156/2005 of CNCAN President for approval of regulation on the classification of radioactive waste the general classification of radioactive waste is the following:

- excluded radioactive waste
- transitional radioactive waste
- very low level radioactive waste
- low and interim level short lived radioactive waste
- low and interim level long lived radioactive waste
- high level radioactive waste

The general classification refers to the requirements for assuring the isolation from biosphere of the radioactive waste during its disposal.

The excluded radioactive waste is waste containing radionuclides with an activity concentration so small that the waste can be released from regulatory control (conditionally or unconditionally).

The transitional radioactive waste is waste having activity concentration above clearance levels, but which decays below clearance levels within a reasonable storage period (not more than 5 years).

The very low level radioactive waste is short lived waste in which the activity concentration is above the clearance levels, but with a radioactive content below levels established by CNCAN for defining the low level waste. The disposal of very low level waste requires less complex arrangements than the disposal of short lived low level waste.

The low and interim level radioactive waste is radioactive waste in which the activity concentration is above the levels established by CNCAN for the definition of very low level waste, but with a radioactive content and thermal power below those of high level waste. Low level waste does not require shielding during handling or transportation. Intermediate level waste generally requires shielding during handling, but needs little or no provision for heat dissipation during handling or transportation.

The long lived radioactive waste is a waste containing radionuclides with half life above 30 years in quantities and/or concentrations of activity above the values established by CNCAN, for which isolation from biosphere is necessary for more time than the institutional control duration.

The short lived radioactive waste is a radioactive waste that is not long lived.

The high level radioactive waste is:

a) liquid radioactive waste containing the most part of fission products and actinides existing initially in the spent fuel and forming the residues of the first extraction cycle of reprocessing;
b) the solidified radioactive waste of letter a) and the spent fuel;
c) any other radioactive waste with activity concentration range similar to the waste mentioned at letter a) and b).

According to the above mentioned regulation, each producer and each processor of radioactive waste shall establish an operational classification of the waste that it produces or processes. Operational classification means the classification of radioactive waste having the purpose of conducting predisposal activities.

B4.1. Categorization of radioactive waste from NPP

At present, the CNE Cernavoda has its own classification system of radioactive waste that was established for operational and/or interim storage purposes.

a) Solid waste is categorized:
  - From pretreatment point of view:
    - Collection (source producing): Reactor Building; Service Building
    - Segregation (material type): cellulosic; plastic; glass; metallic etc.
    - Handling:
      - T1(contact gamma dose rate < 2 mSv/h);
      - T2 (contact gamma dose rate between 2 mSv/h and 125 mSv/h)
      - T3 (contact gamma dose rate higher than 125 mSv/h).
  - From treatment point of view: compressible; non-compressible

b) Liquid Radioactive Waste is categorized as follows:

- Level 1- low activity wastes, resulted from laundry, showers, some laboratories and drainages of Service Building, and having the gamma activity between 3.7×10^{-1} Bq/l – 3.7×10^{2} Bq/l;
- Level 2 - medium activity wastes, resulted from the system of upgrading heavy water, decontamination of equipments and washing of plastic objects, other laboratories and drainages of Service Building, and having the gamma activity between 3.7×10^{2} Bq/l – 3.7×10^{4} Bq/l;
- Level 3 - medium activity wastes, resulted from the drainage system of the Reactor Building, and from the drainages of spent fuel ponds, and having the gamma activity between 3.7×10^{4} Bq/l – 3.7×10^{6} Bq/l.

c) Organic liquid waste (oil; scintillation cocktail and solvent) is categorized
- From pretreatment point of view:
  Collection (source producing): Reactor Building; Service Building
  Segregation: each category is sorted by H3 activity

d) Mix solid-organic liquid (flammable solid and sludge)
- From pretreatment point of view:
  Collection (source producing): Reactor Building; Service Building

B4.2. Categorization of institutional radioactive waste

- **IFIN-HH Magurele**

At IFIN-HH Magurele the solid radioactive wastes are categorized in:
- Combustible;
- Compactable, non-combustible;
- Non-compactable, non-combustible type;
- Spoilage, putrefying type;
- Short-lived spent sources;
- Long-lived spent sources and radioactive waste;
- Operational waste from VVR-S reactor.

- **SCN Pitesti**

At SCN Pitesti radioactive wastes are categorized in:
- Solid low-active radioactive waste;
- Spent ion exchangers;
- Solid combustible radioactive waste containing natural uranium (produced in the FCN Pitesti);
- Liquid low - active radioactive waste;
- Liquid radioactive waste containing natural uranium (produced in FCN Pitesti);
- Organic liquid radioactive wastes from CNE Cernavoda.

It has to be mentioned that uranium wastes produced in FCN Pitesti are treated in STDR Pitesti for uranium recovery; consequently, all the wastes resulted from the STDR activity are short-lived, and can be disposed at DNDR Baita-Bihor.

In the LEPI facility are stored:
- Short lived radioactive waste with high activity (SSRS);
- Long lived radioactive waste resulted from the reactor TRIGA.

B4.3. Categorization of fuel cycle radioactive waste

The radioactive waste of FCN Pitesti is categorized in:
- Solid;
- Liquid.

The solid radioactive wastes are categorized in:
- Containing U;
- Low activity combustible;
- Low activity noncombustible.

The liquid radioactive wastes are categorized in:
- Recyclable;
- Non-recyclable;
- Combustible.

SECTION C. SCOPE OF APPLICATION

Article 3.

Article 3.1: Romania does not reprocess spent fuel, as it was decided to use open fuel cycle. By consequence Romania does not declare reprocessing to be part of spent fuel management.

Article 3.2: Romania does not declare as radioactive waste for the purposes of the Convention any waste that contains only naturally occurring radioactive material and does not originate from the nuclear fuel cycle.

Article 3.3: Romania does not have military or defense programs that produce spent fuel. The very low amounts of radioactive waste that result from radiological practices in military area, are transferred permanently to and managed within exclusively civilian programs. By consequence Romania does not declare spent fuel or radioactive waste within military or defense programs as spent fuel or radioactive waste for the purposes of the Convention.

SECTION D. INVENTORIES AND LISTS *(Article 32)*

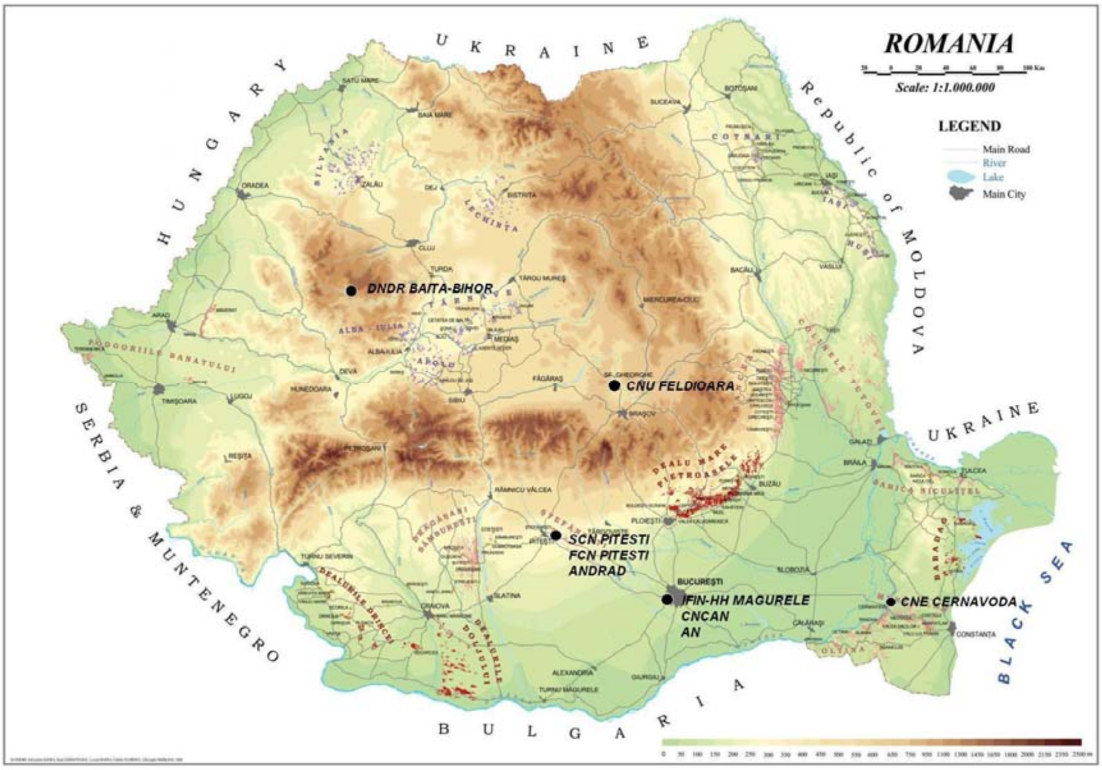


Figure D1: Romanian map – Location of the main organizations involved in nuclear field

D1. Spent Fuel Management Facilities

Table L-1 (Section L) lists the Romanian Spent Fuel Management Facilities.

D1.1. CNE Cernavoda

CNE Cernavoda is located at 1 km distance of town Cernavoda, close to Danube River. CNE Cernavoda, the operator of Cernavoda NPP-Units 1&2, has the following spent fuel management facilities:

- The Spent Fuel Handling System (for each unit);
- The Interim Spent Fuel Dry Storage Facility - DICA (one facility for both NPP units).

The facilities are located at NPP site, Cernavoda.

a) *The Spent Fuel Handling System*

A wet spent fuel management facility, specifically named Spent Fuel Handling System, was provided for each reactor as part of the NPP project. This system includes the following:

- Discharge and Transfer Equipment located in the Reactor Building;
- Spent Fuel Reception and Storage Equipment located in the Service Building;
- Spent Fuel Reception Bay located in the Service Building;
- Spent Fuel Bay (main storage bay) and Defective Fuel Bay, located in the Service Building.

The transfer of spent fuel between Reactor Building and Service Building is underwater through a Transfer Channel.

According to design data, the Spent Fuel Bay has a capacity of 50,000 CANDU fuel bundles and the Defective Fuel Bay has a capacity to store for thirty years plant operation the canned defected fuel. Sixteen cans are initially provided, each with capacity of one bundle.

b) *The Interim Spent Fuel Dry Storage Facility (DICA)*

Due to a limited capacity of the wet storage facility, three modules of a dry spent fuel facility were constructed on CNE Cernavoda site. After at least six years in the Spent Fuel Bay, the spent fuel is transferred to the dry facility.

DICA *(Figure D1.1-1)* is located at around at 700 m SW-W from the first reactor, closed to the envelope of the initially fifth planned reactor on-site. Its designed storage capacity will be expanded gradually from 12,000 to 324,000 spent fuel bundles. It can accommodate the spent fuel inventory of two reactors in 27 spent fuel modules.

The dry storage technology is based on the MACSTOR System. It consists 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. The spent fuel is transferred from the preparation area to the storage site in a transfer flask. The transportation is on-site.

Figure D1.1-1: DICA

D1.2. SCN Pitesti

SCN Pitesti, the operator of TRIGA reactor, has the following spent fuel management facilities:

- The Spent Fuel Storage Pool;
- The Dry Storage Pits.

The facilities are located at SCN site in Mioveni, near Pitesti.

a) The Spent Fuel Storage Pool

The spent fuel removed from TRIGA core can be temporally stored in a special rack, situated inside reactor pool or it can be directly transferred in the Spent Fuel Storage Pool, situated in a niche of the underwater transfer channel between reactor pool and LEPI hot cell area. The storage time can be as long as 30 years. Eventually defective fuel will be double encapsulated, and interim storage will be ensured by the spent fuel storage pool. The dimensions of the spent fuel storage are 1 x 4 x 8 m^3.

b) The Dry Storage Pits

Solid radioactive waste generated in the hot cells, during the fuel post irradiation examination, can be stored in 15 dry storage pits *(Figure D1.2-1)*. These pits are stainless steel tubes, located in the experimental cell basement, closed with superior end plugs. Storage racks inside pits can accommodate spent fuel rods or fragments stored in stainless steel cans.

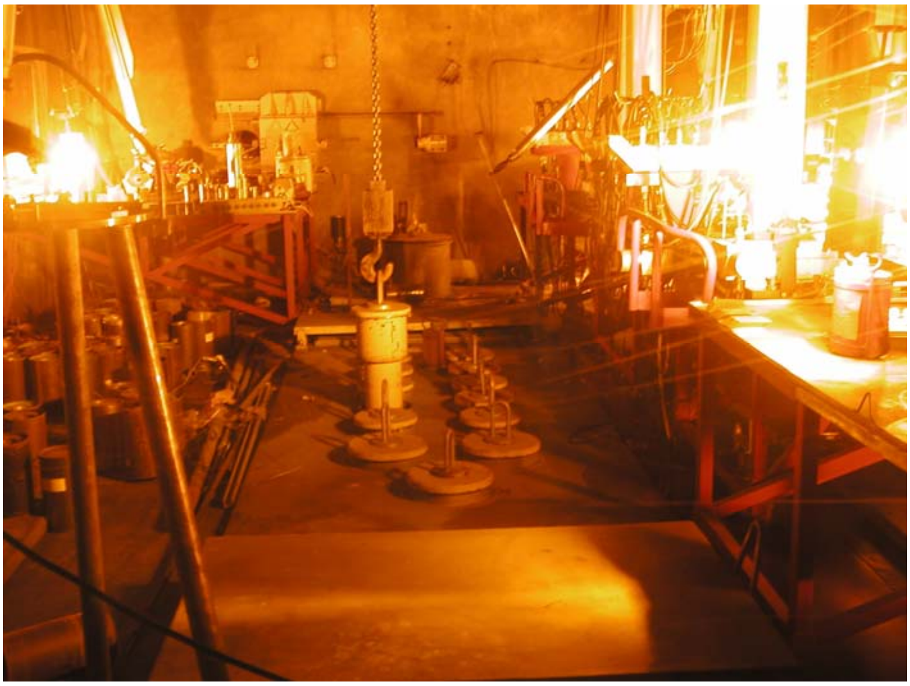


Figure D1.2-1: The Storage Pits at LEPI for Irradiated Experimental Fuel Rods and Fragments

D1.3. IFIN-HH

IFIN-HH, the owner and former operator of VVR-S reactor, has the following spent fuel management facilities:

- The Spent Fuel Cooling Pool;
- The Spend Fuel Storage Ponds.

The facilities are located at IFIN-HH site in Magurele, near Bucharest (at approx. 8 km distance).

During the operation of the reactor, the spent fuel unloaded from the core, was stored for cooling for at least 1 year in the Cooling Pool, sited in the reactor hall.

After cooling period, the spent fuel was transferred into the Spent Fuel Storage Ponds *(Figure D1.3-1)*. The storage facility consists of 4 ponds sited in a separate building, close to the reactor building. At present, the fuel assemblies of the last charge of the core are still stored in the cooling pool, waiting for transfer, while the rest of spent fuel is stored in the storage ponds.

The transport of the spent nuclear fuel assemblies from the cooling pool (placed in the reactor main hall) to the spent fuel storage ponds, is carried out by using a special container for spent fuel removal.

Figure D1.3-1. Spent fuel storage ponds at the VVR - S Reactor of IFIN-HH

D2. Spent Fuel Inventory

Table L-2 (Section L) shows the inventory of spent nuclear fuel in ***storage at CNE Cernavoda*** at the end of 2007.

Table L-3 (Section L) shows the inventory of spent fuel in ***storage at Nuclear Research Centers*** at the end of 2007.

D3. List of Radioactive Waste Processing and Storage Facilities

Table L-4 (Section L) lists the Romanian Radioactive Waste Processing Facilities.

D3.1. CNE Cernavoda

a) The Solid Radioactive Waste

After pretreatment (collection, segregation, decontamination) and treatment (compaction or shredding, as appropriate) the solid wastes are confined in 220L stainless steel drums and transported to the Solid Radioactive Waste Interim Storage Facility - DIDR *(Figure D3.1-1)*.

Figure D3.1-1: DIDR – outside view

DIDR is located within the inner security fence of the plant site and is designed for storage of low and intermediate wastes. It has a storage capacity of 1408m^3, covering the radioactive waste produced by operation of CNE Cernavoda Unit1 and Unit 2 , except spent resins, reactivity control rods and spent fuel.

It consists of three above ground structures with a designed life of 50 years, as follows:

- The Structure no. 1 (concrete warehouse)
- The Structure no. 2 (concrete cylindrical cells)

- The Structure no. 3 (concrete cubes).

The structure no. 1 – a warehouse (Figure D3.1-2) is a concrete building with a net storage capacity of 1,408 m^3. Inside this structure 220L stainless steel drums containing compactable and non-compactable solid radioactive waste (T1 and T2 type) can be stacked on four levels.

Figure D3.1-2: DIDR - The structure no. 1 – warehouse inside view

The structure no. 2 – is a concrete structure which consists of cylindrical concrete cells dimensioned to accommodate spent filter cartridges resulted from plant operation. Its designed storage capacity is of 57.77 m^3. Inside the concrete cells there are metallic cells with bottom and cover designed to avoid spreading of contamination.

The Structure no. 3 – is a concrete structure for large and highly contaminated pieces with a total storage capacity of 41 m^3. It consists of eight concrete cubes which can be removed together with the waste content. Currently, the structure does not contain any waste.

b) The Spent Resins

The Spent Resins Handling System includes storage tanks for spent resins from the plant's purification circuits.

The spent resins are stored in three vaults made of reinforced concrete lined with epoxy, located in the basement of the Service Building, in the proximity of the Reactor Building. The capacity of each vault is of 200 m^3.

c) The Gaseous Radioactive Waste

Potentially contaminated air is circulated through four ventilation systems:

- *Central Contaminated Exhaust System*: the air from this system is filtered through a High Efficiency Particulate Air (HEPA) filter.
- *Reactor Building Exhaust System*: the air from the Reactor Building is passed through a pre-filter, a HEPA filter, an activated charcoal filter (to retain radioiodine) and a final HEPA filter.
- *Spent Fuel Bay Exhaust System*: filtration of this air is similar to that of the Reactor Building.
- *Upgraded Tower Exhaust System*: the air from this system is unfiltered since it contains small tritium quantities, only.

In areas of the reactor building where heavy water systems are located, a Closed Cycle Vapours Recovery System recovers the majority of released tritium vapours.

All potentially contaminated exhausted air is routed to the exhaust stack, which discharge it.

d) The Aqueous Liquid Radioactive Waste

The radioactive liquid wastes (aqueous) are collected in five liquid effluent hold-up tanks. They are located in the basement of Service Building. Each tank has a capacity of 50 m^3.

A decontamination unit is provided to minimize the radioactive particles in any effluents if necessary. It includes filtering and ionic exchange by means of a pre-coat type filter using as filtering material ionic micro-resins and a special fiber material adequate for the colloidal filtration since the main contaminants consists of a combination of colloidal particles and ionic materials within deionization water medium.

D3.2. FCN Pitesti

a) The Gaseous Radioactive Waste System

Air from potential contaminated indoors (areas dedicated to the fuel manufacturing and laboratories' rooms) is collected, filtered with high efficiency filters and discharged through the plant's stack.

b) The Liquid Radioactive Waste Temporary Storage Tanks

The storage of the liquid radioactive wastes is made inside the basement of the Plant Building. Facilities for storage are: 3 stainless steel tanks of 10 m^3 for radioactive liquid wastes (LLW-LL) and 3 tanks of 60 m^3 each for radioactive liquid effluents.

They collect and store the different categories of liquid wastes.

c) The Solid Radioactive Waste Temporary Storage Platform

Storage of low contaminated solid radioactive waste is realized on The Solid Waste Temporary Storage Platform. This is a platform on the ground located in the vicinity of the building of fuel manufacturing.

It is dedicated to temporary storage of different categories of solid waste collected in the plant and further, in short term, transferred to different waste operators mentioned before in Section B.

The platform can store about $50m^3$ radioactive solid wastes. It has a security fence with a physical protection system.

D3.3. SCN Pitesti

a) Radioactive Waste Treatment Station (STDR)

The Radioactive Waste Treatment Station has the following facilities:

- Installation for treatment of low - active β-γ liquid wastes;
- Installation for conditioning in concrete of the radioactive concentrate obtained during the evaporation treatment of liquid radioactive waste. The installation is used also for conditioning in concrete the solid radioactive waste;
- Installation for conditioning into bitumen of spent ion exchangers from the TRIGA reactor;
- Installation for treatment, with uranium recovery, of liquid radioactive waste resulting from the fabrication of CANDU-type nuclear fuel;
- Installation for the incineration of solid radioactive waste contaminated with natural uranium from FCN Pitesti;
- Installation for treatment/conditioning of organic liquid radioactive waste with tritium content from CNE Cernavoda;
- Installation for decontamination of sub-assemblies and spare parts;
- An Industrial-type laundry washing machine for decontamination of individual protective clothes.

b) Post Irradiation Examination Facility (LEPI*)*

In the precinct and in the hot cells of LEPI facility are stored:

- Short-lived radioactive waste with high activity (a few high activity spent sources);
- Long-lived radioactive waste resulted from the reactor TRIGA.

D3.4. IFIN-HH

The management of the non-fuel cycle radioactive wastes from all over Romania is centralized at IFIN–HH in the STDR Magurele.

Disposal is carried out at the National Repository of Radioactive Wastes (DNDR) at Baita-Bihor.

a) STDR Magurele

Radioactive wastes including spent sealed radioactive sources are collected and radiologicaly characterised. The radioactive waste which meets the waste acceptance criteria of DNDR Baita Bihor is treated and conditioned. The radioactive wastes which do not meet waste acceptance criteria of DNDR are stored on site.

The STDR basically consists of solid waste treatment and conditioning facilities, a radioactive decontamination center, a laundry and an intermediate storage area as well as a storage of liquid waste.

STDR Magurele has available the following facilities for the treatment, conditioning and storage of radioactive wastes:

- Installation for incineration of solid combustible radioactive waste;
- Installation for compaction of solid non-combustible radioactive waste;
- Installation for cement conditioning;
- Storage facility for radioactive waste;
- Storage facility for spent filters;
- A laundry for decontamination of individual protective clothes.

The storage facility is a ground floor building, divided into 5 rooms. The storage building is not fitted with either a ventilation system or special systems for handling the containers.

The total storage capacity is about 3,000 drums. At the end of 2007 in the storage facility there are stored approximately 265 drums with historical waste, more than 20 years old. The drums are damaged by corrosion. A part of these 220L drums will require repackaging in 420L drums before being transferred to the national repository. There are stored a number of 195 drums containing low specific activity radioactive waste with Thorium-Magnesium alloy. For this kind of waste no conditioning techniques is foreseen, disposal in CNU – Feldioara subsidiary may be an option.

Also, at STDR there is The Spent Filters Storage Facility (DFU) *(Figure D3.4-1)*. This is a construction with 5860 mm × 5000 mm × 3000 mm dimensions done by heavy concrete, built in 1957-1958 having as destination the long term storage of the filters from VVR-S research reactor, and other materials resulting from reactor processes. In DFU were stored aluminum devices with lead (Pb) used for radioisotope irradiation and irradiation devices from the reactor experiments. At DFU were not stored any Spent Filters from primary cooling system (with ion exchange resins) either damaged fuel assemblies.

DFU is composed by a concrete platform on which are placed 4 closed wells with concrete corks, three of them are empty, one being partially filled with aluminum devices used in the past for radioisotope irradiation. For the future, IFIN-HH intends to develop a conditioning technology to manage them. DFU is equipped with a lifting crane.

STDR Magurele includes a storage building for depleted uranium. The total storage capacity is 30m^3.

Figure D3.4-1: Spent Filters Storage Facility (DFU)

b) National Repository for Low and Intermediate Level Wastes Baita - Bihor

In 1985 was built and given in operation the National Repository for Low and Intermediate Level Radioactive Waste (DNDR) – Baita, Bihor county, sited in Apuseni Mountains, in an old exhausted uranium mine. The repository is dedicated to institutional waste. Using the existing concepts at the 80' ies level concerning the final disposal of the low and intermediate level radioactive wastes, and relying on internal standards and international recommendations, the underground constructions were dimensioned to dispose about 5,000 m^3.

At the end of 2007 in the DNDR galleries *(Figure D3.4-2)* are disposed more than 7,900 standard drums, which mean about 37% of the repository's capacity.

In the technological disposal process is used bentonite, wood and cement brick. Bentonite is used as engineered barrier. Between the drums ranges are placed wood shuttering. When a gallery is filled up, it is tighten with cement bricks.

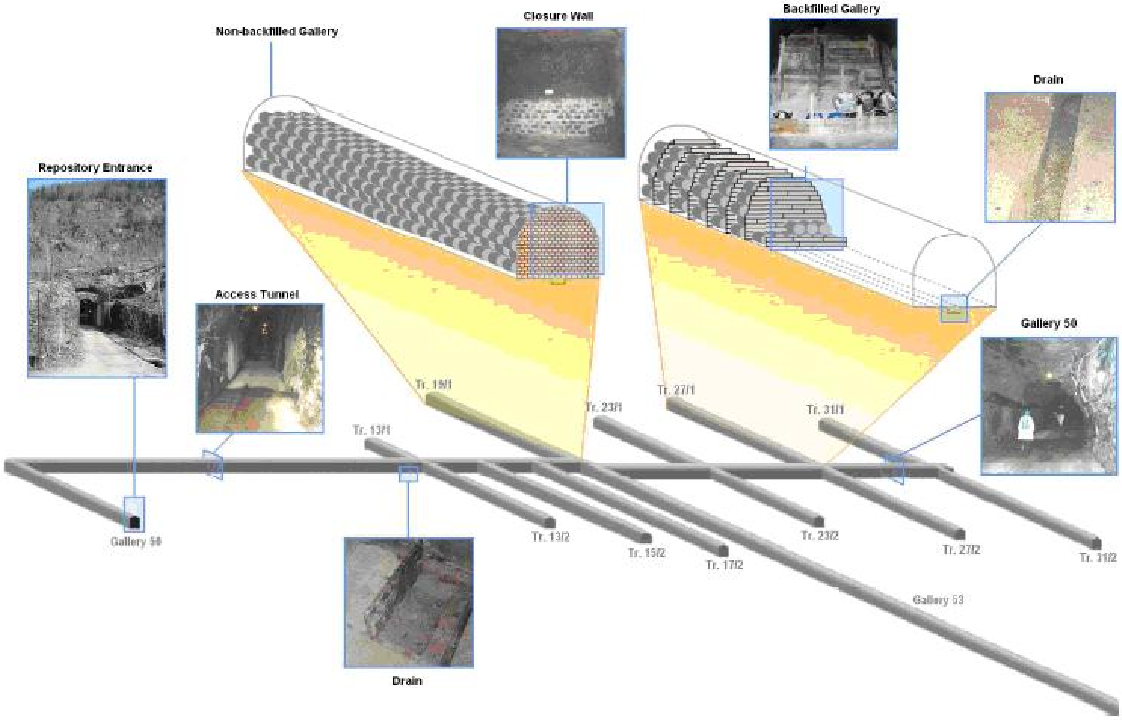


Figure D3.4-2: Disposal Galleries at DNDR Baita - Bihor

D3.5. CNU - Feldioara Subsidiary

CNU Feldioara Subsidiary is located at about 30 km from the Brasov town (250,000 inhabitants). Since the commissioning of the plant, the tailings resulted from the milling process were discharged in 2 special insulated tailings ponds, under a variable water strata, located at 600 m from the plant area.

The location and insulation system were realized taking into account the "National safety standards for geological research, radioactive raw materials mining and milling", issued in 1975. The geographic criteria were the presence of a clay deposit within the area, enhancing the possibilities for a good insulation, and also the presence of the Cetatuia natural valley, suitable for building a long and stable pond. The 2 tailings ponds are named Cetatuia II and Mittelzop.

The Cetatuia II have as aim the settling and storage of radioactive tailings, and was built in 3 parts, due to high investment costs for insulation of the concerned surfaces. The present state of this pond is the following, in present:

- the first part, is now in a closing out process, being used for tailings discharging in the 1978 - 2001 period. The total estimated tailings discharged were about 4,500,000 tons and the total surface of this first part is 368,000

m^2. The closure of the pond will transform it in a repository, provided that the closure solution satisfies the regulatory safety requirements;

- the second part of the Cetatuia II pond was commissioned in October 2001, after completion of complex insulation work. The discharging capacity is estimated at 880,000 tones of tailings, on a 133,000 m^2;
- the third part of the Cetatuia II pond, located upside the two other parts on the Cetatuia valley, is planned to be commissioned after 2011, after the closing of the second part of the Cetatuia II pond.

The Mittelzop pond has as aim the final tailings settling of fines, receiving the inflow from the Cetatuia pond waters. This pond was commissioned in 1978, at the same date with Cetatuia pond and the milling plant. The volume is about 300,000 m^3, on an 87,000 m^2 surface. The dam of this pond has 5 m height. From the pond the clear waters are pumped to the decontamination plant (where the remaining traces of uranium are removed) and then to the Olt river.

After closure, all the tailing ponds will be transformed in repositories, provided that the closure solution satisfies the regulatory safety requirements.

For the ponds the main insulation works were as follows:

- the bottom of ponds was insulated with two layers, 30 cm thick, of clay.
- the right slope of the ponds was protected by two layers of polyethylene (plastic) foil, and a sandwich of special bitumen - rubber materials;
- the left slope, being located on a clay deposit;
- it was built a rain water drainage system used also for draining the surroundings of the ponds.

In 1996, a channel was built between the Cetatuia and Mittelzop ponds, enabling the natural flowing of pond water, without using pumps.

Between the two mentioned ponds there is a radioactive solid material discharge area, composed by two old trench type storage facilities and a new storage facility that is surrounded by concrete walls.

On an area of 3 km around the plant and tailing ponds there are no inhabitants to be exposed to radiological hazard due to radioactive materials discharge.

The new storage for contaminated solids is located between two older trench type storage areas, which were used and authorized in past according to the former law for nuclear activities within the country.

Within these older storage surfaces the radioactive waste was buried into the existing clay layer and also was covered by clay. Around the surfaces was built a wire fence.

The new storage area for radioactive waste has a trapezoidal shape protected by 3 concrete walls, 5 m high. The maximum storage volume is 6,560 m^3 on a surface of 1,640 m^2. The fourth wall will be built in future, ensuring larger storage capacity when needed.

D4. Radioactive Waste Inventory

Table L-5 (Section L) shows the inventory of ***RW in storage at CNE Cernavoda*** at the end of 2007.

Table L-6 (Section L) shows the inventory of ***RW in storage at FCN Pitesti*** at the end of 2007.

Table L-7 (Section L) shows the inventory of ***RW in storage at Nuclear Research Centers*** at the end of 2007.

Table L-8 (Section L) shows the inventory of ***RW in storage at CNU*** at the end of 2007.

Table L-9 (Section L) shows the inventory of ***RW disposed at DNDR – Baita Bihor*** at the end of 2007.

D5. Decommissioning

In Romania there is only one nuclear facility under decommissioning, namely the VVR-S research reactor from IFIN-HH Magurele. The reactor was shut down in 1997, being in present under a conservation authorization.
The detailed decommissioning plan was approved by CNCAN in 2008. The adopted decommissioning strategy for VVR-S Research Reactor is defined as immediate dismantling.
The detailed decommissioning plan was elaborated by IFIN-HH, under IAEA technical assistance.
IFIN-HH, under the existing conservation authorization of the reactor, is performing the radiological characterization and clean-up activities.

SECTION E. LEGISLATIVE AND REGULATORY SYSTEM

E1. Implementing measures *(Article 18)*

Romania has ratified by the Law no. 105 / 1999 the Joint Convention on the safe management of spent fuel and on the safe management of radioactive waste.
In 2005 the European Commission issued “Romania - 2005 Comprehensive Monitoring Report” (COM (2005) 534 final). The Report assessed the situation up to the end of September 2005 and presented the results of the Commission’s assessment on Romania’s preparations for accession. As regard the area of nuclear energy and nuclear safety, the findings of this Report were: “All administrative structures are in place (the nuclear regulatory authority CNCAN, the national agency for radioactive waste ANDRAD and a newly created Nuclear Agency for the promotion of nuclear energy), but all need to continue efforts to strengthen their capabilities and independence. In particular, CNCAN should increase its efforts to recruit additional staff and fill the vacant posts. Attention should be paid to the clear separation of responsibilities between the different institutions. Romania should further reinforce its efforts to improve the management of institutional radioactive waste, and generally ensure a high level of nuclear safety, in particular in the commissioning process for unit 2 of the Cernavoda nuclear power plant. The absence of a dedicated fund for decommissioning and waste management is a concern and the requirement for national legislation in this area should be addressed.”

Consequently, in 2006 Romanian Government decided to improve the legislation into force at that time. The following legislation was improved:

- Law no.111/1996 on the safe deployment, regulation, authorization and control of nuclear activities, republished
- Governmental Ordinance no. 11/2003 regarding the management of nuclear spent fuel and radioactive waste, including their disposal, with subsequent modifications and completions
- Governmental Ordinance no. 7/2003 regarding the use of nuclear energy in exclusive peaceful purposes, with subsequent modifications and completions.

The main modifications and completions of Governmental Ordinance no. 11/2003 were related to allocation of responsibilities and assurance of the financial resources necessary for the management of radioactive waste resulting from operation and decommissioning of nuclear and radiological installations. Based on these modifications, the Government adopted in September 2007 the Government Decision No. 1080 establishing the financial contributions for setting up the financial resources for decommissioning and disposal of radioactive waste.

E2. Legislative and regulatory framework *(Article 19)*

E2.1. Establishing and maintaining of legislative and regulatory framework

In Romania the regulatory framework is pyramidal one and consists of three levels. In the top of pyramid there are laws, on the second level there are fundamental regulations on radiological safety and on the third level there are specific regulations.

Laws:

- Law no.111/1996 on the safe deployment, regulation, authorization and control of nuclear activities, republished
- Law no.105/1999 on the ratification of Joint Convention on the safe management of nuclear fuel and on the safe management of radioactive waste
- Government Ordinance no. 195/2005 on environmental protection
- Law no. 481/2004 on civil protection
- Law no. 43/1995 on ratification of Nuclear Safety Convention
- Law no. 703/2001 on civil liability for nuclear damages
- Governmental Ordinance no. 11/2003 regarding the management of nuclear spent fuel and radioactive waste, including their disposal, with subsequent modifications and completions
- Governmental Ordinance no. 7/2003 regarding the use of nuclear energy in exclusive peaceful purposes, with subsequent modifications and completions
- Law no. 15/2005 for approval of Governmental Ordinance no. 21/2004 on national system of emergency situations management.

Fundamental regulations on radiological safety:

- Order no. 14/2000 of CNCAN President on the approval of Radiological Safety Fundamental Regulations; this regulation is based on the Council Directive 96/29/EURATOM of 13 May 1996 laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiation.
- Order no. 381/2004 of Health Minister for approval of Fundamental sanitary regulations on the safe deployment of nuclear activities.
- Order no. 56/2004 of CNCAN President for approval of Fundamental regulations on the safe management of radioactive waste.

Specific regulations:

- Order no. 62/2004 of CNCAN President for approval of regulation on the clearance of materials
- Order no. 156/2005 of CNCAN President for approval of regulation on the classification of radioactive waste
- Order no. 400/2005 of CNCAN President for approval of regulation on general requirements for near surface disposal
- Order no. 221/2005 of CNCAN President for approval of regulation on limiting of effluents release
- Order no. 181/2002 of CNCAN President for approval of regulation on the decommissioning of nuclear facilities
- Order no. 127/2002 of CNCAN President for approval of Radiological Safety Regulation on Operational Radiation Protection in Mining and Milling of Uranium and Thorium Ores
- Order no. 192/2002 of CNCAN President for approval of Radiological Safety Regulation on Management of Radioactive Waste from Mining and Milling of Uranium and Thorium Ores

- Order no. 207/2003 of CNCAN President for approval of Radiological Safety Regulation on decommissioning of installations of mining and/or processing of uranium and thorium ores - Criteria for release from licensing regime, for use for other purposes of buildings, materials, installations, dumps and lands contaminated from the activities of mining and/or processing of uranium and thorium ores
- Order no. 184/2006 of CNCN President for approval of Regulations for decommissioning of uranium and thorium mining and milling facilities
- Order no. 353/2001 of CNCAN President for approval of the Radiological Safety Regulation of Operational Radiation Protection of outside Workers
- Order no. 228/16.12.2002 of the CNCAN President for approval of Radiological Safety Regulation - Acceptance Procedures for external undertakings
- Order no. 363/2001 of CNCAN President for approval of regulation on Safeguards in nuclear field
- Order no. 382/2001 of CNCAN President for approval of regulations on Physical Protection in Nuclear Field
- Order no. 366/2001 of CNCAN President for approval of Radiological Safety Regulation - Licensing Procedures
- Order no. 73/2002 of CNCAN President for approval of Regulations for licensing of use of radiation sources outside protected areas
- Order no. 274/06.08.2004 of CNCAN President for approval of Regulations for notified bodies in nuclear field
- Order no. 356/2005 of CNCAN President for approval of Regulations for high activity sources and orphan sources
- Order no. 421/2004 of CNCAN President for approval of Regulations for individual protective clothes
- Order no. 106/2002 of CNCAN President for approval of Regulations on Requirements for Guards and Security Personnel Qualification
- Order no. 180/2002 of CNCAN President for approval of Regulations on individual dosimetric monitoring
- Order no. 202/2002 of CNCAN President for approval of Regulations on issuing of exercising permits for nuclear activities and designation of radiation protection qualified experts
- Order no. 65/2003 of CNCAN President for approval of Regulations on authorization of the quality management systems applied to the setting-up, operation and decommissioning of nuclear installations
- Order no. 66/2003 of CNCAN President for approval of Regulations on general requirements for the quality management system applied to the setting-up, operation and decommissioning of nuclear installations, with subsequent modification and completion
- Order no. 67/2003 of CNCAN President for approval of Regulations on specific requirements for the quality management systems applied to the evaluation and selection of the nuclear installations sites
- Order no. 68/2003 of CNCAN President for approval of Regulation on specific requirements for the quality management systems applied to the research-development activities in nuclear field

- Order no. 69/2003 of CNCAN President for approval of Regulations on specific requirements for the quality management systems applied to the design of nuclear installations
- Order no. 70/2003 of CNCAN President for approval of Regulations on specific requirements for the quality management systems applied to supplies activities dedicated to nuclear installations
- Order no. 71/2003 of CNCAN President for approval of Regulations on specific requirements for the quality management systems applied to the manufacturing activities of products and providing services dedicated to nuclear installations
- Order no. 72/2003 of CNCAN President for approval of Regulations on specific requirements for the quality management systems applied to the constructions and assembling activities dedicated to nuclear installations
- Order no. 73/2003 of CNCAN President for approval of Regulations on specific requirements for the quality management systems applied to commissioning activities of nuclear installations
- Order no. 74/2003 of CNCAN President for approval of Regulations on specific requirements for the quality management systems applied to the operation of nuclear installations
- Order no. 75/2003 of CNCAN President for approval of Regulations on specific requirements for the quality management systems applied to the decommissioning activities of nuclear installations
- Order no. 76/2003 of CNCAN President for approval of Regulations on specific requirements for the quality management systems applied to the “software” used in the scientific and design activities dedicated to nuclear installations
- Order no. 213/2006 of CNCAN President for approval of Guide on the technical requirements for design, siting, construction, operation, closure and decommissioning for storage facilities of uranium and thorium ores and of the waste resulted from milling of uranium and thorium ores
- Order no. 407/2005 of CNCAN President for approval of Regulations of the licensing of buildings in nuclear field
- Order no. 275/2005 of CNCAN President for approval of Regulations on monitoring of radioactivity around nuclear and radiological facilities
- Order no. 276/2005 of CNCAN President for approval of Regulations on the monitoring of releases from nuclear and radiological facilities
- Order no. 303/2007 of CNCAN President for approval of Guide on the physical protection during transport of radioactive materials
- Order no. 357/2005 of CNCAN President for approval of Regulations on the transport of radioactive materials
- Order no. 274/2005 of CNCAN President for approval of Regulations on supervising and control of international shipments of radioactive waste involving Romanian territory
- Order no. 329/2006 of CNCAN President for approval of Instructions for application of Council Regulation no. 1493/93 on the international shipment of radioactive substances between Member States.
- Order no. 141/2006 of CNCAN President for approval of regulation on the fire protection of nuclear power plants.

There are still in force some old regulations related to spent fuel and radioactive waste management:

- Republican nuclear safety regulations for nuclear reactors and nuclear power plants /1975
- Regulations for prevention and extinguishing of fire and for providing vehicles, installations, devices, apparatus, protection equipment and chemical substances for preventing and extinguishing of fires in nuclear field / 1978.

In order to fill the gap, till the new Romanian regulations will be issued, international regulations are used (e.g. IAEA recommendations and guides, Canadian Standards, and USNRC Regulatory Guides and NUREGs).
The most recent case was the licensing of the siting, construction and operation of CNE Cernavoda Spent Fuel Dry Storage where the review of the Initial Safety Analysis (required for siting authorization), the Preliminary Safety Analysis Report (required for construction authorization) and Final Safety Analysis Report (required for operation authorization) were performed using as a reference the applicable requirements of the following documents:

- Canadian Standard N292.2-96 Dry storage of irradiated fuel
- 10 CFR 72 Licensing requirements for the independent storage of spent nuclear fuel and high level radioactive waste
- NUREG -1567 Standard review plan for spent fuel dry storage facilities

For pressure vessels, CNCAN and ISCIR (National Authority for Pressured Vessels and Hoisting Equipment) have jointly established a set of technical standards by adopting the most relevant ASME codes applicable to CANDU reactor.
For pressure tubes the Canadian standards were accepted. Consequently the following Romanian Nuclear Codes were published by ISCIR:

- Requirements for design, manufacturing, installation, operation, maintenance and control of the pressurized vessels belonging to safety related systems (NC 1-81)
- Requirements for design, manufacturing, installation, operation, maintenance and control of the pressurized pipes and pipe elements of safety related systems (NC 2-83);
- Requirements for design, manufacturing, installation, operation, maintenance and control of the pumps of safety related systems (NC 3-86);
- Requirements for design, manufacturing, installation, operation, maintenance and control of the valves of safety related systems (NC 4-88).

Supplementary, the Romanian industry has produced within the frame of Romanian Institute for Standardization a set of technical/industrial standards.

A similar procedure has been followed for the electrical component standards, the result of which is very similar to American Standard IEEE 344.

E2.2. Provisions of legislative and regulatory framework

Analyzing in detail the existing legislative and regulatory framework, it can be clearly seen that it provides for:

- the establishment of applicable national safety requirements and regulations for radiation safety (this is done by updating the existing system of regulations);
- a system of licensing of spent fuel and radioactive waste management activities (Law no.111/1996 requires the authorization of all nuclear activities);
- a system of prohibition of the operation of a spent fuel or radioactive waste management facility without an authorization (the system of sanctions establishes penal sanctions for such situations);
- a system of appropriate control, regulatory inspection and documentation and reporting (Law 111/1996 establishes the regulatory inspection rules, while the regulations and authorization conditions establish the requirements for control, documentation and reporting);
- the enforcement of applicable regulations and of the terms of the authorizations (the CNCAN inspectors have the right to fill an inspection report and impose sanctions if they find violations of the legal requirements, in special cases CNCAN can suspend or withdraw an authorization, and for some violations can ask the prosecution, as the violations are punished with imprisonment);
- a clear allocation of responsibilities of the bodies involved in the different steps of spent fuel and of radioactive waste management (Law no.111/1996, Governmental Ordinance no.11/2003 and the Government Ordinance no. 7/2003 establish the responsibilities of the bodies involved).

E2.3. Consideration of the objectives of the Joint Convention

The provisions of:

- Law no.111/1996 on the safe deployment, regulation, authorization and control of nuclear activities, republished;
- Governmental Ordinance no.11/2003 regarding the management of nuclear spent fuel and radioactive waste, including their disposal, with subsequent modifications and completions
- Governmental Ordinance no. 7/2003 regarding the use of nuclear energy in exclusive peaceful purposes, with subsequent modifications and completions
- regulatory requirements established by CNCAN

take due account of the objectives of the Joint Convention.

Thus it can be concluded that the obligations under article 19 of the Joint Convention are met by Romania.

E3. Regulatory body *(Article 20)*

E3.1. Responsibilities of National Commission for Nuclear Activities Control (CNCAN)

According to the provisions of Law no. 111/1996, CNCAN is the regulatory body, empowered with the regulation, authorization, and control of nuclear activities. At present, CNCAN is an independent body, reporting to the Prime Minister through the Chief of the Prime Minister’s Chancellery.

The organizational diagram of CNCAN is presented in Figure E1.

The general responsibilities of CNCAN are stipulated in the Chapters I and V of the Law no. 111/1996, and are further detailed in the Rules for Organisation and Functioning of CNCAN, approved by Governmental Decision.

The mandate of CNCAN can be summarised as follow:

- CNCAN is the national authority competent in exercising regulation, licensing and control in the nuclear field, for all the activities and installations under the scope of the Law.
- CNCAN elaborates the strategy and the policies for regulation, licensing and control with regard to nuclear safety, radiological safety, non-proliferation of nuclear weapons, physical protection of nuclear installations and materials, transport of radioactive materials and safe management of radioactive waste and spent fuel, as part of the National Strategy for the development of the nuclear sector, approved by Governmental Decision.
- CNCAN is responsible to ensure, through the regulations issued and the dispositions arising from the licensing and control procedures that an adequate framework is in place for the deployment of activities under the scope of the Law.
- CNCAN is responsible for revising the regulations whenever necessary for the correlation with the international standards and ratified conventions in the nuclear field and for establishing the necessary regulatory measures for their application.

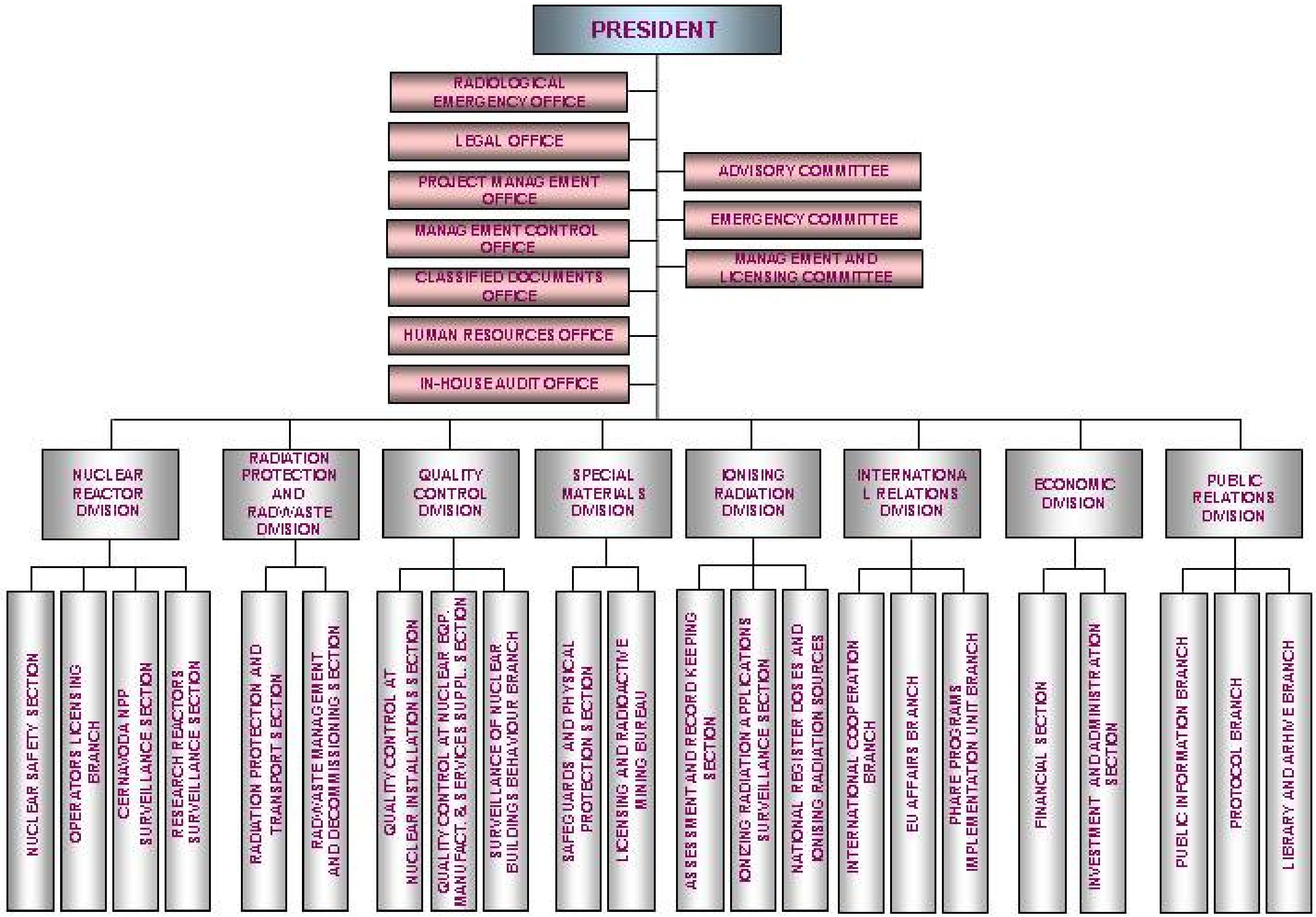
CNCAN has the following duties and responsibilities:

a) Initiates projects for legislative acts in its area of competence and issues regulations in the nuclear field, consulting as necessary the other authorities with attributions in this domain, according to the Law;
b) Reviews and consents to all the legislative acts with implications for the nuclear field, prior to their coming into force;
c) Approves, in accordance with the Law, the intervention plans in case of nuclear accident and participates in the intervention;
d) Collaborates with the central authority for environmental protection and controls the implementation of the activities of the environmental radioactivity monitoring network;
e) Requests to the competent authorities in the field of national security to perform the necessary checks for the persons with responsibilities in the field of nuclear activities, in compliance with the specific regulations;
f) Initiates, with the consent of the Ministry of Foreign Affairs, activities for cooperation with IAEA and with other international organisations specialised in the nuclear field;
g) Cooperates with similar institutions/authorities from other states;
h) Controls the implementation of the provisions of international treaties and agreements in force, with regard to safeguards, physical protection, illicit traffic, transport of nuclear and radioactive materials, radiation protection,

quality assurance in the nuclear field, nuclear safety, safe management of spent fuel and radioactive waste, and the intervention in case of nuclear accident;

i) Establishes and coordinates the national system for evidence and control of nuclear materials, the national system for evidence and control of radiation sources and of nuclear and radiological installations, and the national registry of radiation doses received by the occupationally exposed personnel;
j) Cooperates with other authorities that have, according to the Law, attributions with regard to the safe operation of nuclear and radiological installations, correlated with the requirements for the protection of the environment and the population;
k) Ensures public information on matters that are under the competence of CNCAN;
l) Organises public debates on matters that are under the competence of CNCAN;
m) Represents the national point of contact for nuclear safeguards, for the physical protection of nuclear and radiological materials and installations, for the prevention and combating of the illicit traffic of nuclear and radioactive materials, and for nuclear and radiological emergencies;
n) Orders the recovery of orphan sources and coordinates the recovery activities;
o) Licences the execution of nuclear constructions and exercises control over the quality of constructions for nuclear installations;
p) Carries out any other duties stipulated by the Law, with regard to the regulation and control of nuclear activities.

Figure E1: The organizational diagram of CNCAN



E4. Independence of Regulatory Body

Independence of regulatory body is ensured as follow:

- According to the Law no. 111/1996 on the safe deployment , regulation, authorization and control of nuclear activities, republished CNCAN is regulatory body for nuclear activities
- According to the Governmental Ordinance 11/2003 regarding the management of nuclear spent fuel and radioactive waste, including their disposal, with subsequent modifications and completions, ANDRAD is responsible for disposal of spent nuclear fuel and radioactive waste and for coordination of predisposal activities.
- According to the Governmental Ordinance no. 7/2003 regarding the use of nuclear energy in exclusive peaceful purposes, with subsequent modifications and completions, Nuclear Agency is an organization dealing with promotion of nuclear energy as well as is working as consultancy body for Romania Government.

As shown in *Figure E2*, the companies and organisations that operate or own the main nuclear and radiological installations are subordinated to the Ministry of Economy and Finances and to the Ministry of Education and Research. The main organisation responsible for the promotion of nuclear activities for peaceful purposes is the Nuclear Agency (AN), which is subordinated to the Ministry of Economy and Finances. The organisation responsible for disposal of spent nuclear fuel and radioactive waste and for coordination of predisposal activities is ANDRAD which is also subordinated to the Ministry of Economy and Finances.

CNCAN exercises its functions independently from the ministries and other authorities of the central administration, being subordinated to the Government.

CNCAN reports annually or as requested to the Prime Minister, through the Chief of the Prime Minister’s Chancellery, on the status of the regulation, licensing and control activities. In addition, whenever the situation requires, CNCAN presents reports on:

- Events that may affect the safe operation of nuclear facilities.
- Situations that may affect national interests or the radiological protection of population and environment on the Romanian territory.

For ensuring transparency of its activities and decision making process, CNCAN routinely consults with and ensures information of all the organisations that have an interest in its regulatory activities, including licensees and other nuclear industry representatives, governmental, local and municipal authorities, departments and agencies as well as interest groups and individual members of the public.

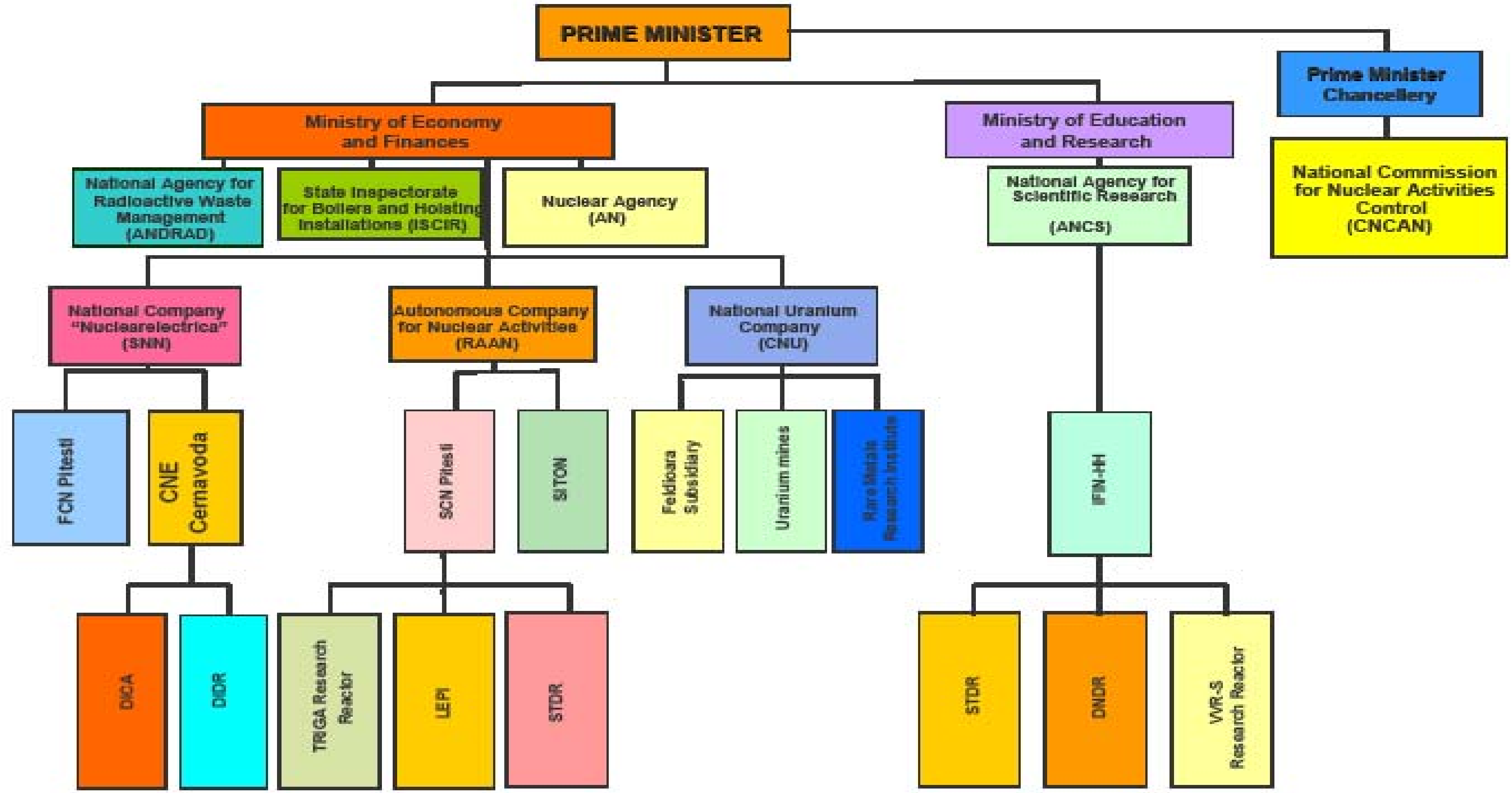


Figure E2: Main organizations in the nuclear field in Romania

SECTION F. OTHER GENERAL SAFETY PROVISIONS

F1. Responsibility of the license holder *(Article 21)*

According to the Law no.111/1996 the prime responsibility for the safety of a nuclear or radiological installation rests with the authorization holder. This general responsibility includes the responsibility for the management of the spent fuel and of the radioactive waste generated within the practice, and the responsibility for decommissioning of the facility. The main responsibilities of the authorization holder for any spent fuel or radioactive waste management facility are the following:

- ensure and maintain nuclear safety, protection against ionizing radiation, physical protection, emergency plans in case of nuclear accidents, quality assurance for the licensed activities, and records of nuclear and radioactive materials;
- observance of the technical conditions and limits included in the authorization and reporting of any violation, in accordance with specific regulations;
- development of its own system of requirements, regulations, and instructions ensuring the implementation of the licensed activities without unacceptable risks of any kind;
- bear the expenses related to the collection, handling, transport, treatment, conditioning, storage and disposal of its wastes;
- ensure adequate staff to carry on the licensed activities.

CNCAN carries out preventive and operative control on the observance of laws and regulations, at the authorization holder’s facilities. Any failure of the authorization holder to follow the requirements is followed by corrective actions, which may include sanctions or even authorization suspension.

Other means to ensure that the authorization holder meets its responsibilities is the reporting system. For CNE Cernavoda, CNCAN includes specific reporting requirements in each authorization, such as:

- Quarterly Reports;
- Environmental Monitoring Reports
- Event Assessment Reports
- Reliability Reports.

Similar requirements regarding operation annual report, environmental monitoring annual reports and event assessment reports are established by CNCAN for the research reactors, including their spent fuel management facilities, for the Nuclear Fuel Plant and for the radioactive waste management facilities. For the CNU Feldioara Subsidiary and for uranium mining activities, CNCAN requires annual report for radiation protection, radioactive waste management and for the environmental monitoring.

According to the Governmental Ordinance no.11/2003 in case that a licensee cease to exist legally, or is unable to continue its activity, the responsibility for spent fuel and radioactive waste management rests with ANDRAD, till a new holder of authorization is established.

According to the Fundamental Regulations on the Radiological Safety, for the past activities that have generated contamination or radioactive waste, CNCAN can impose intervention measures. The owner of the site has the responsibility to implement these measures.

F2. Human and financial resources *(Article 22)*

According to the Romanian Law no.111/1996 the authorization for any facility is granted only if the applicant meets the following requirements:

- can prove the professional qualification for each position of its staff;
- has insurance or any other financial guarantee to cover his responsibility for nuclear damages;
- has financial arrangements for safe management of its own radioactive wastes and for decommissioning of its installation.

The law mentioned above imposed a system of individual permits for each person employed for works with radioactive materials or in radiation fields. The permits are issued based on training and examination by the competent authorities or, by licensee, as approved by CNCAN.

The Final Safety Analysis Report for CNE Cernavoda Unit 1 and Unit 2 which are periodically updated during plant lifetime must contain special provisions with respect to plant organizational structure, experience and training for the key plant personnel, assurance that minimum plant complement (operations, technical, maintenance, etc.) is always in place; the plant training programs are also extensively assessed by CNCAN through periodic audits.
Adequate human and financial resources to support the plant safety are prerequisites to obtain and maintain the operating authorization.

Similar requirements for getting an operation authorization are established by CNCAN for reactors and for other facilities, including spent fuel and radioactive waste management facilities.

In addition, CNE Cernavoda has to pay yearly legal contributions to the Fund earmarked for management of radioactive waste and to the Fund for decommissioning of nuclear installations. This contribution shall be paid for each unit The small producers pay to IFIN HH for the services of disposal.

F2.1. Qualified staff availability as needed for safety related activities during the operating lifetime of a spent fuel and radioactive waste management facility

Romania has taken contact with Nuclear Technology before starting construction of its first nuclear power plant, and regulations related to staff Training and Qualification have been in place since 1975.

Meantime Romania has bought the CANDU technology and constructed its first NPP, a CANDU 600 MW design. Training issue have been considered during early phase of the contract negotiation, so that initial training for Management, Operation, Technical and Maintenance key personnel was provided in Canada. That means, around 100 persons were trained in an operational CANDU-600 MW (in Canada) prior to be assigned to any commissioning/operation activities, in order to allow them to fulfill their position responsibilities safely, effectively and efficiently.

Together with technical design Romania has bought the NPP personnel training concept and training and qualification programs for licensed / non-licensed operation staff, technical, maintenance and training staff as well. These programs have been adopted but continuously adapted based on IAEA Guides related to NPP Personnel Training & Qualification, and INPO/WANO recommendations related to Training Programs -Development. In this way the Systematic Approach to Training (SAT) has been implemented in CNE Cernavoda training activities. Reference Documents as Station Instructions and Internal Department Procedures have been put in place to establish a structural Training Concept for NPP Personnel.
However, because the organizational structure and position responsibilities at Romanian NPP are similar to those used at other CANDU stations, training needs derived from these functions have been used to prepare standard training programs & courses.

In addition, each NPP department performed a job and task analysis, identifying training needs required for effective job performance (the first SAT stage – Analyses).

Each NPP department must document its training needs by preparing a generic Job Related Training Requirements (JRTR) for each position, or group of similar positions. At this time any training program in the plant is based on positions JRTR's. The technical engineering may be considered an exception from the above. For each technical engineer is prepared a Qualification Guide which contains the training and qualification requirements for its duty areas.

Training Objectives for each Training program have been produced by application of the second stage (Design) of the SAT system. The third SAT stage has been applied (Development) and training materials have been produced, based on previous determined training objectives.

Having the JRTR's and Qualification Guides for each position, the training objectives have been established and the training materials developed. Based on this, it was possible to design and implement a career path for main positions. Based on generic JRTR of each chart organization position, a Training Qualification Index (TQI) can be calculated for each individual. The individual TQI is a performance evaluation criteria so all departments have the TQI value for a certain period of time as performance indicator.

A system of Individual Performance Evaluation has been put in place mostly for Personnel Performances Annual Evaluation. A better system for Training Effectiveness and Personnel Performance Evaluation at the work place is going to be established, based on the last recommendations and theories.

In addition to standard training described above, a non-standard training is considered for NPP personnel qualification. In this category is included the personnel training through the co-operation with other organization (IAEA, WANO, COG, Suppliers etc.). This is a very important part of key personnel development through courses, fellowships, workshop participation, and development programs participation, organized and sponsored by above-mentioned organization. Co-operation with these organizations didn't mean only participation of Romanian personnel in abroad training activities but also organizing courses in Romania.
In order to support the internal and external training activities and to ensure continue SAT application a Training Organization has been established and a Training Center has been constructed.

CNCAN is closely supervising the training activity in the plant. It is involved not only in the licensed staff training and evaluation process but also in other staff training and plant training policy as well. In this respect CNCAN is periodically auditing plant training activity and it is directly involved in the licensing training programs approval and evaluation.

CNCAN ensures that the utility allows only high qualified, competent staff to perform the following functions and tasks which are critical to nuclear safety:

- Recognize if a proposed action (or any changes to equipment, procedures or staffing) is threatening a layer of defense;
- Monitor, operate and maintain safety and safety related systems;
- Identify incipient equipment failures, so that corrective action can be taken;
- Properly execute emergency response procedures to mitigate and accommodate consequences of potential accidents.

Based on the qualification, training and retraining requirements for all operation positions, CNCAN required a similar training approach for the individuals performing tasks critical to nuclear safety and belonging to other plants' departments such as Station Health Physics, Station Engineering Support, Maintenance Support etc. These positions also have detailed qualification, training and retraining requirements, according to their duties.

Management Personnel must also be authorized by CNCAN before they are fully appointed to the job, as follows:

- Station Manager
- Production Manager
- Technical Manager
- Health Physics Senior Superintendent
- Operation Senior Superintendent (Unit 1 &Unit 2)
- Safety & Compliance Senior Superintendent
- Training Senior Superintendent
- Quality Assurance Senior Superintendent

Continuing training and retraining for any chart organization position is also established.

Refreshing training for any chart organization position is also established or at least is counted that is necessary to be established. At this time refreshing training is for sure established for Licensed Operation Staff. The other personnel are in general under continuous training to get their 100% qualification. Retraining for special skills or abilities is established and done as required.
The shift supervisors (i.e. main reactor operators), reactor operators and the senior staff with responsibilities in radiation protection (i.e. the qualified experts) have to pass a CNCAN examination in order to receive the permit to operate the reactor, respectively the practice permit.
Finally it could be considered that CNE Cernavoda has the nuclear world wide accepted training approaches and standards, ensuring a qualified, competent staff for CNE Cernavoda operation and maintenance.

Regarding the research reactors, a training system that assures the safe management of reactors operation, including spent fuel management, is in place. The reactor main operators and operators, and the staff with responsibilities related to radiation protection, including the qualified experts, are tested by CNCAN, in order to get the permit to operate the reactor, respectively the practice permit.

For all other facilities, the qualified experts and the staff with responsibilities related to radiation protection have to be trained and retrained and have to pass CNCAN examination in order to get the practice permit.

F2.2. Financial resources for operation of spent fuel and radioactive waste management facilities

At CNE Cernavoda, the costs of current spent fuel and radioactive waste management activities including the costs associated with the commissioning of the Intermediate Spent Fuel Dry Storage Facility are included in the CNE Cernavoda operational costs.

For the costs associated to the long term management: disposal of spent fuel and radioactive waste management including the decommissioning costs, SNN / CNE Cernavoda must pay financial contributions to the Fund earmarked for management of radioactive waste and to the Fund for decommissioning of nuclear installations.

The financial resources for operation and decommissioning of research reactors and institutional radioactive waste, in present they are assured from:

- the state budget ;
- economic contracts with radioactive waste producers from all over the Romanian territory.

F2.3. Financial provision for institutional controls and monitoring arrangements after closure of disposal facility

The financial provisions for institutional control as well as for monitoring arrangements shall be included in the financial resources needed for final disposal of radioactive waste.

F3. Quality assurance *(Article 23)*

The Romanian regulation on the general requirements for Quality Management Systems (QMS) applied to the realization, operation and decommissioning of nuclear installations", approved by Order no.66 / 2003 of CNCAN President, requires that the owner of a nuclear facility shall establish, develop and maintain a quality management system for all phases of the lifecycle of the nuclear installation. This is following the articles 18, al. k) and 24 of the Law no.111 / 1996.

In 2003 CNCAN developed a set of 12 regulations establishing the requirements on the quality management systems as licensing and general requirements, and on specific activities as siting, design, research and development, procurement, manufacturing of goods and services, construction-installation, commissioning, operation, decommissioning, and development and use of software products in nuclear field. This set was completed in 2005 with the thirteenth, the regulation establishing the gradual appliance class of the quality management systems.

The regulations were issued in order to equally comply with UE and IAEA requirements, international practices, and also Romanian conditions and reality, being a comprehensive collection and optimal mixture of requirements inspired from the following standards:

- IAEA Guide, Quality assurance for safety in nuclear power plants and other nuclear installations;
- ISO 9001 version year 2000;
- Canadian series standards code 286, the last revision;
- Reporting of defects and noncompliance, code 10CFR21;
- ASME code, subsection 3800 and 4000.

Complying with these requirements, CNE Cernavoda, FCN Pitesti, SCN Pitesti, IFIN – HH, and CNU – Feldioara Subsidiary have established and implemented Quality Management Systems in their facilities. These systems are in fact (Integrated) Management Systems, one unit that integrate the provisions related to radioactive waste management, emergency preparedness, radiological protection, safeguards, nuclear safety, and physical protection, and the entire range on interaction between them at individual and organizational level, an entity that has to ensure the promotion of safety culture.

The main participants and contractors involved in the project of nuclear facilities shall have implemented a quality management system authorized in accordance with CNCAN regulations.
According to specific requirements for the quality management systems for operation of nuclear facilities the responsible organization shall perform the control of radioactive contamination in order to prevent its spreading and to implement an effective contamination monitoring system.

The responsible organization for the operation shall control the activities related to the handling and storage of the liquid and solid contaminated waste and shall ensure the measures required to maintain the volume of radioactive waste to a minimum.

All organizations involved in the realization project of the facility shall have a authorized QMS for the activities in their field of responsibility. All organizations shall have implemented their own QMS, which will be applied during the activities performed. The QMS is designed to satisfy all requirements of radiological safety of the facility, in all phases of the project. All required procedures shall be developed by the involved organizations and documented properly, for each activity. Some of the procedures shall be approved by CNCAN and revised periodically.

The owner have to define the requirements and responsibilities for a program of inspection which provides assurance that fabrication, installation, modification, and repair activities affecting safety-related components, systems, and structures conform to the applicable specifications, instructions, procedures, drawings, or other pertinent technical requirements. The independent or regulatory quality inspections are not intended to diminish the responsibility of personnel performing the activities for the quality of the work.
In order to assure safe and reliable operation, programs of inspections have to be established at the spent fuel and waste management facilities, which include the following provisions:

a. The requirements for inspections are identified and documented based on procedures, instructions, drawings, and other documents for an activity prior to the start of the activity.
b. Inspections are accomplished in accordance with a combination of approved procedures and instructions.

F4. Operational radiation protection *(Article 24)*

F4.1. Exposures of workers and public

F4.1.1. Optimization of exposures

For operational radiation protection CNCAN issued the Fundamentals Regulations on the Radiological Safety approved by Order 14/2000 of CNCAN President. This regulation is a Romanian transposition of the Council Directive 96/29/EURATOM laying down basic safety standards for the protection of the health of workers and the general public against the danger arising from ionizing radiation.

The operators have developed policies, regulations and procedures for operational radiation protection, based on Romanian regulations and ICRP / IAEA recommendations. The policy of these licensees is to keep the radiation exposure of workers and the public as low as reasonable achievable.

F4.1.2. Exposure limits

The legal effective dose limits for the workers and for the public are 20 mSv / year and 1 mSv / year, respectively. In order to minimize exposure, the operators have to optimize the doses and to develop processes for dose control for radiation workers, using special work plans and procedures for high hazard works.

F4.1.3. Control of releases

The operators have implemented procedures to control the gaseous and liquid releases to the environment, based on derived emission limits approved by CNCAN.

For release of materials from regulatory control, IFIN-HH developed procedures for clearance.

The operators have established environmental monitoring programs, in order to assess the effect of their activities on the environment.

F4.2. Discharges

F4.2.1. Optimization of discharges

According to the Fundamentals Regulations on the Radiological Safety approved by Order no. 14/2000 of CNCAN President, derived emissions limits (DELs) approved by CNCAN shall be used to quantify the relationship between releases of radioactivity and doses to critical groups (the most exposed) from the public.

F4.2.2. Limitation of doses in normal operation

According to the Fundamentals Regulations on the Radiological Safety approved by Order no. 14/2000 of CNCAN President, CNCAN shall establish in the licensing process the dose constraints of activities. The operators shall assure that the exposure limits are controlled during normal operation. For the public doses, CNCAN has established dose constraints for licensed activities in the range of 0.1-0.3 mSv/year for the member of critical groups.

F4.3. Uncontrolled releases and mitigation of consequences of unplanned and uncontrolled releases

In order to control the release, design features and emergency procedures are in place, according to the provisions of the laws and regulations.
According to the provisions of Law no.703 / 2001 on civil liability for nuclear damages, the holder of authorization for a nuclear installation shall have an insurance policy covering the nuclear damages. This assures that in case of an unplanned or uncontrolled release funds are available for mitigate the effects.

F5. Emergency preparedness *(Article 25)*

F5.1. Emergency planning for Romanian facilities

In the process of authorization, all practices needing an emergency intervention are identified by CNCAN. For practices which need emergency interventions, the Radiological Safety Report of the licensee shall include an Emergency Intervention Plan.
Basically, all licensees in Romania have to present to the regulator their emergency arrangements as part of the authorization process. Further on, requirements for the

setting in operation of the Emergency Plan and for the notification of the regulator are specifically given in their license.

There is a national plan for intervention in case of nuclear accident and there are county plans for intervention for specific nuclear risk areas (emergency planning zones as per IAEA TEC DOC 953).

a) Legal requirements for on-site and off-site emergency preparedness

Emergency preparedness and response in Romania was re-organized according to Governmental Ordinance no. 21/2004, regarding the National System for the Management of Emergencies. Also other regulations were issued in this regard.

According to these new regulations, the National System for the Management of Emergencies is composed from three types of structures:

- the decisional structure – the committees for emergencies,
- the executive structure – the General Inspectorate for Emergencies (IGSU) and the county and local inspectorates for emergencies (as public professional emergency services), and
- the operational structure – the operative centers for emergencies.

All the decisional, executive and operational structures are established on three levels: national, county and local.

By law, the Ministry of Interior and Administrative Reform (MIRA) is responsible for the management of nuclear and radiological emergencies.

As a decision structure, at national level is organized the National Committee for Emergencies (CNSU). CNSU is set-up under the co-ordination of the Prime Minister and managed by the Minister of Interior and Administrative Reform. All the ministerial, county and local Committees are subordinated to the CNSU.

As an executive structure, at national level is established IGSU, a specialized organization in the Ministry of Interior and Administrative Reform. IGSU has the responsibility of permanent co-ordination of the prevention and management of emergency situations, at national level.

Inside each Inspectorate for Emergencies is set-up an Operative Centre for Emergencies (COSU), with permanent activity, ready to activate the emergency organization in case of an accidental event. These COSU's are receiving notifications for all types of emergency, including radiation events. Also, the responsible organizations at national level are operating such COSU's, in accordance with the legal provisions in their field of activity. As an operational structure, at national level is functioning the National Operative Centre of IGSU.

IGSU – MIRA and CNCAN are, according to the new legislation, the national competent authorities in case of nuclear accident or radiological emergency.

At the county/local level there are established County/Local Committees for Emergencies, which are directed by the county Prefect/ local mayor.

Specific regulations are in place in the field of radiation emergency preparedness and response:

- Ministerial Order no.242/1993, “Nuclear safety republican regulations on the planning, preparedness and intervention in case of nuclear accidents and radiological emergencies”, issued by CNCAN in1993;
- Order no.14/2000 of CNCAN President for approval of Fundamental Regulations for Radiological Safety,
- Governmental Decree no. 223/1990 for the Romania’s accession to the IAEA’s Conventions on Early Notification of a Nuclear Accident and on Assistance in the Case of a Nuclear Accident or Radiological Emergency;
- Bilateral early notification agreements with Bulgaria, Greece, Hungary, Slovakia, Russian Federation and Ukraine.

The Ministerial Order no. 242/1993 is establishing requirements for the operator, for the regulator and for the public authorities for planning, preparedness and intervention in the following cases:

- nuclear accidents at nuclear installations;
- radiological emergencies as a result of authorized activities in nuclear field;
- radiological emergencies as a result of some transboundary effects or as a result of other cases, such as cosmic objects falling.

The regulation provides that any nuclear facility has to make preparations, in conjunction with national, regional and local governmental organizations and with other organizations, to cope with nuclear accidents.

The Ministerial Order no. 242/1993 on emergency preparedness and response in case of nuclear accidents and radiological emergencies is in present in the process of being revised as “*Fundamental regulations on preparedness, planning and intervention in case of nuclear accidents and radiological emergencies*” and completed by other specific regulations, as part of the process of harmonization of the national legislation with the new recommendations of EU and IAEA.

As nuclear regulatory authority, CNCAN controls, evaluates and approves the on-site emergency plans of the licensees.

The authority which controls, evaluates and approves the emergency plans of public authorities is IGSU – MIRA.

b) The implementation of emergency preparedness measures, including the role of the Regulatory Body and other entities

As national competent authority in the nuclear field, CNCAN is the national contact point as per IAEA Conventions for Early Notification and Assistance (Law no.111/1996 and IAEA letter EPR/CP(0100) from 16/11/2000), with the following functions (as defined in ENATOM, 2000):

- National Warning Point;
- National Competent Authority for a Domestic Accident;
- National Competent Authority for an Accident Abroad.

CNCAN is operating its own Emergency Response Centre (ERC), as part of the National System for the Management of Emergencies. CNCAN – ERC is one of the national contact points in relation to any type of radiation emergency, including accidental events at scrap metal processing facilities and at national borders. CNCAN – ERC acts as a support centre performing technical analysis and prognosis of the emergency situations with focus on the nuclear safety, radiation protection and radiological consequences, in nuclear and radiological emergency situations.

County Emergency Plans for Radiological Accidents were elaborated in the last years, with clear specifications on notification and intervention actions for the first responders. Training and exercises were performed for the intervention personnel of some responsible organizations, but more training and equipment is necessary.

All the authorization licenses holders have in place Emergency Plans. CNCAN has its own Emergency Intervention Plan. The Plans are written and/or revised in accordance with the international recommendations.

The notification system is established in the Emergency Plans of the authorization holders and public authorities. Exercises and communication tests are performed between the operative centers of the National System.

There are two distinct zones in the Emergency Plans of nuclear installations: one for the short term "plume exposure pathway", and the other for the long term "ingestion exposure pathways". The size of the zones depends on the hazard posed by the nuclear facility.

Based on the Emergency Planning Zones, the Off-site Radiation Emergency Plans describe the external organizations and their responsibilities during an accident at nuclear facilities, which may have an off-site impact. The Plans also contain a description of essential steps for off-site emergency response activation, the protective action levels, and the protective measures for the emergency personnel and population. The protective actions, and the organization in charge to implement these actions, are identified for each emergency-planning zone.

Emergency Procedures are in place, at all levels, in order to perform the response functions declared in the Emergency Plans.

c) On-site and off-site emergency plans of nuclear installations

The On-site Radiation Emergency Plan for Cernavoda NPP along with its supporting documents is describing in general terms the measures required to control and mitigate the radiological accident consequences within the site and to minimize the off-site effects. The On-site Radiation Emergency Plan emphasizes the immediate on-site response actions. However, it does cover the off-site emergency for the first few hours of the radiation accident, which has an impact on the public and the environment. The length of time necessary to set up the off-site organization to function effectively is estimated to be 2-4 hours.

The On-site Radiation Emergency Plan includes the classification of radiation incidents and accidents, the evaluation of on-site incidents and the response actions. It identifies also the material and human resources necessary to implement these actions, and defines the organization and the responsibilities for the personnel involved for each phase of an incident or accident. The On-site Radiation Emergency Plan is implemented through the On-site Radiation Emergency Procedures.

Arrangements are in place for the selection of personnel and training in all the organizations of the National System. Important training courses and exercises (national and international) were conducted in the last years in the field of radiation emergency preparedness and response.

The effectiveness of the response is tested and enhanced through carrying out periodical radiation emergency drills and exercises for all areas and facilities.

The frequency of the training and exercises became constant in the last 3 – 4 years with at least one major international exercise and one major national exercise being organized by CNCAN in partnership with national and international institutions.
General exercises are organized by all nuclear facilities in collaboration with the public authorities and include the activation of the emergency personnel and of the appropriate resources and organizations, in order to verify the response capability in emergencies. The general exercises simulate an emergency which results in radioactive releases outside the facility and which requires the intervention of county with or without the support of national public authorities.

The general exercises are organized at Cernavoda NPP at least once in three years and are based on various scenarios in order to verify and test various parts of the emergency plan. The exercises are followed by a post-exercise report (Exercise Evaluation Report) in order to evaluate the ability of the various organizations involved and to recommend measures for improving the response. The nuclear facility organizes annual exercises and quarterly drills in order to verify the On-Site Emergency Plan.

The main international exercise in which CNCAN and other responsible organizations of the National System were involved in the last three years was Convex – 3(2005) International Emergency Response Exercise, IAEA – Romania organization, May 11 – 12, 2005. The exercise was organized by Inter – Agency Committee for Response to Nuclear Accidents (IACRNA) and International Atomic Energy Agency (IAEA), in collaboration with CNCAN, IGSU and Cernavoda NPP. It was hosted by Romania, during May, 11 - 12, 2005 and lasted for 39 hours.

During the exercise, the international organizations and IAEA Member States tested the international and bilateral arrangements and capabilities dedicated to the nuclear and radiological emergencies. 62 Member States and 8 international organizations participated in Convex-3 exercise.
Deficiencies were identified during the exercise and corrective actions were implemented, in the field of communication, information exchange, management of emergency situations, and public information.

F5.2. Planning for radiation emergencies in the vicinity of Romanian territory

Romania is a signatory of the following international emergency response agreements:

- Convention on Early Notification of a Nuclear Accident
- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency
- Convention Regarding the Liability for Nuclear Damages

Concerning the liaison across national borders, Romania has signed the Agreements for Early Notification of Nuclear Accidents with Russian Federation, Bulgaria, Greece, Hungary, Slovakia, and Ukraine.
These agreements contain provisions for:

- taking all appropriate and effective measures to prevent, reduce and control adverse trans-boundary environmental impacts of major nuclear activities;
- ensuring that the Parties are notified in case of nuclear accidents which could affect them.

The Romanian General Emergency Plan includes provisions for transboundary emergencies according to the provisions of national regulations.

F6. Decommissioning *(Article 26)*

F6.1. General requirements related to decommissioning

According to the provisions of the Law no. 111/1996, the licensee shall:

- elaborate a program for preparing the decommissioning and to present it for approval to CNCAN
- pay the contribution for setting up the financial resources for decommissioning.

Based on these provisions of the law, CNCAN has issued the regulations on general requirements for decommissioning of nuclear facilities, approved by Order no 181/2002 of CNCAN President, which apply for decommissioning of: research reactors, subcritical assemblies, radioactive waste treatment installations, spent fuel intermediate storages, radioactive waste intermediate storages.

The content of Order no.181/2002 of CNCAN President for approval of regulations on the decommissioning of nuclear and radiological facilities is the following:

- General considerations;
- The phases of decommissioning process;
- The authorization requirements for decommissioning;
- The assessment and approval of the decommissioning plan by CNCAN;
- The final shut-down of the installation;
- The decommissioning stages;
- The implementation of decommissioning activities;
- Reporting and record keeping requirements;
- Modifications of the decommissioning plan;
- Finalizing the decommissioning authorized stage;
- Release from the authorization regime;
- Transitional dispositions;

- Annexes:
  - Definitions
  - The documents needed for getting the decommissioning authorization of a nuclear installation;
  - The decommissioning plan (i.e.: the content of the plan);
  - The general content of the Final Radiological Assessment Report;
  - The documents needed to be submitted to CNCAN for getting the possession authorization for nuclear installations under decommissioning;
  - The documents needed to be transmitted to CNCAN for getting the certificate for ending the nuclear activities and release from the authorization regime;
  - The general content for the Final Radiological Assessment Report of the Nuclear Fuel Storage

According to the above mentioned regulations the Decommissioning Plan shall be revised every 5 years.

According to the same regulations:

- for all future nuclear objectives and installations for which the regulation applies, the decommissioning plan shall be part of authorization documentation, starting with the siting authorization;
- for the nuclear objectives and installations for which the regulation applies that already are in the design, construction, or operation stage, the decommissioning plan (at various levels of detail, from conceptual to detailed) has to be submitted by the holder of authorization to CNCAN.

F6.2. Fulfillment of the requirements of article 26 of Joint Convention

All requirements of Article 26 of the Joint Convention are detailed by Order no.181/2002 of CNCAN President for approval of regulations on the decommissioning of nuclear and radiological facilities.

F6.2.1. Qualified staff and adequate financial resources

According to the Order no. 181/2002 of CNCAN President for approval of regulations on the decommissioning of nuclear facilities, in order to get the decommissioning authorization, the applicant shall prove in the decommissioning plan that qualified staff and adequate resources are available.
These requirements shall be mentioned in the following subparagraphs of the Decommissioning Plan:

- 1.2.2. Cost Estimations
- 1.2.3. Availability of Financial Funds
- 2.4. Responsibilities for decommissioning
- 2.5. Training program
- 2.6. Assistance of the contractors.

F6.2.2. Operational radiation protection, discharges, unplanned and uncontrolled releases

The requirements related to radiation protection shall be detailed in the Decommissioning Plan in Chapter 3 “Radiological Protection of Workers, Public and Environment”, according to the provisions of the above mentioned regulations. The requirements for radiation protection, discharges, and for the unplanned and uncontrolled releases during decommissioning are similar to the requirements during the operation.

F6.2.3. Emergency preparedness

According to the provisions of the above mentioned regulations, the applicant for a decommissioning authorization shall submit to CNCAN the emergency plan. If necessary, the General Emergency Plan and the local public authorities’ plans will take into consideration the decommissioning activities.

F6.2.4. Records of decommissioning operations

According to the provisions of the above mentioned regulations the Decommissioning Plan shall present in Chapter 7 “Record keeping” the records to be kept related to decommissioning activities.

F6.3. Design requirements related to decommissioning

The spent fuel and radioactive wastes facilities in operation or under construction of CNE Cernavoda are designed taking into account recommendations for safe decommissioning.

F6.4. NPP decommissioning plan

The conceptual decommissioning plan for CNE Cernavoda Unit 1 and 2 is in progress.

F6.5. Status of VVR-S reactor decommissioning

At this moment the research reactor VVR-S of IFIN-HH Magurele is permanently shut down, under a conservation authorization.
In 2008 the detailed decommissioning plan 9th edition was approved by CNCAN. The adopted decommissioning strategy for VVR-S Research Reactor is defined as immediate dismantling.
The detailed decommissioning plan was elaborated by IFIN-HH, under IAEA technical assistance.
IFIN-HH, under the existing conservation authorization of the reactor, is performing the radiological characterization and clean-up activities.

SECTION G. SAFETY OF SPENT FUEL MANAGEMENT

G1. General safety requirements *(Article 4)*

G1.1. Criticality and removal of heat

In the authorization process for siting, construction and operation of NPP and of research reactors, CNCAN pays special attention to:

- criticality control (not applicable for spent fuel of CNE Cernavoda, because fuel is made of natural Uranium);
- assurance of adequate heat removal;
- control of water parameters in wet storages, and control of confinement and of the isolating air parameters for dry storage, in order to ensure optimum storage conditions (control of corrosion) and control of radioactivity levels.

G1.2. Minimization of waste

Generation of radioactive waste associated with spent fuel management is minimized through

- the quality of fuel
- online fueling (this allows through the systems for detecting the failed fuel and immediate replacement)
- canning of the failed fuel.
- the control of water parameters for wet storages
- control of confinement and of the isolating air parameters for dry storage.

G1.3. Interdependencies among different management steps

The Romanian strategy for spent fuel management takes into consideration both the present and future storage capabilities, and the actual status of the fuel cladding. Efforts are made by the regulatory body to enforce the observance of the storage conditions for the VVR-S aluminum cladding fuel, in order to extend the wet storage period.

In the licensing of the new NPP dry storage for spent fuel, the relations between the intermediate storage stage and the following stage, when the fuel will be removed for transfer in the geological repository, were taken into consideration.

G1.4. Effective protection of individuals, society and environment

In the authorization process, CNCAN pays due attention to the effective protection of workers, public and environment. The authorization is granted only if the internationally recognized criteria and standards are observed.

In order to protect adequately the public health and the environment during the normal operation of the spent fuel management facility, the dose estimate and monitoring are based on the analysis of the external effective doses and of the (internal) committed effective doses for members of critical groups for all radiation pathways. These analyses are performed according to methods and procedures recommended in IAEA and in other western regulations. The result of the analyses leads to derived emission limits for the effluents, and the monitoring program of the environment shall demonstrate that the derived emission limits are observed both in normal operation and during events with relative high probability of occurrence.

Regarding the assumed accident scenario and the scope of the emergency plan it shall be mentioned that the Initial Nuclear Safety Analysis Report, the Preliminary Nuclear Safety Analysis Report, and the Final Safety Analysis Report for a spent fuel management facility have chapters regarding the assessment of natural effects (e.g. earthquakes, natural fire, flooding, snow) and of the man made effects (e.g. explosions, air plane crashes).
The above documents include accident analyses, according to the requirements of the IAEA applicable recommendations and to the applicable requirements of the other international regulations that are used in the licensing process, like US Regulatory Guides and NUREGs, as well as to the supplementary requirements issued by CNCAN. For the Design Basis Accidents, the doses shall remain below specified values, while, in order to prepare the emergency plan, Beyond Design Basis Accidents are analyzed. For example CNCAN asked that the Preliminary Safety Analysis Report for the authorization of the construction of the Spent Fuel Dry Storage of CNE Cernavoda addresses an air plane crash on the storage and this requirement was implemented.

G1.5. Biological, chemical and other hazards

The criteria and standards mentioned in paragraph G1.4 take into consideration biological, chemical and other hazards that may be associated with spent fuel management.

G1.6. Impact on future generations

The authorization process for transport and storage of spent fuel, and, when it will be the case, for its geological disposal requires the demonstration that the impact on future generations will not be higher than it is now accepted for the current generation.

G1.7. Avoidance of undue burdens on future generations

Regarding the principle of avoiding undue burdens of spent fuel management on the future generations, it shall be noted that Romanian authorities, fully accept and promote this principle.
In this respect, based on Governmental Ordinance no.11/2003 were approved the Fund earmarked for management of radioactive waste and the Fund for decommissioning of nuclear installations.

G2. Existing facilities *(Article 5)*

G2.1. Review of the safety of the wet spent fuel management facility of CNE Cernavoda

The general safety requirements implemented in design, construction and operation of the CANDU Nuclear Power Plant are applicable for the fuel handling system,

including spent fuel bay of CNE Cernavoda. The safety assessment reports prepared for nuclear licensing of the CNE Cernavoda include specific safety assessment for the spent fuel management.
During the licensing process, CNCAN paid a special attention to evaluation of the following safety and safety related functions of the spent fuel bay:

- removal of the residual heat generated by the spent fuel;
- control of water chemical and physical parameters, in order to ensure optimum storage conditions and radiation levels control.

The spent fuel bay of CNE Cernavoda was designed to meet adequate safety standards used in Canada and in other five countries.
The Spent Fuel Bay of CNE Cernavoda – Unit 1 and Unit 2 design meets the general requirements as described in the IAEA Safety Series 116 – Design of spent fuel storage facilities by including the following:

  - measures to limit radioactive releases and radioactive exposures of workers and the public (including detection of leakage through the bay walls and floor);
  - measures to prevent anticipated operational occurrences and accident conditions from developing into unacceptable severe accident conditions;
  - provision for ease of operation and maintenance of essential equipment;
  - provision through equipment and procedures for retrieving spent fuel from storage.

G2.2. Spent Fuel Bay and dry storage of spent fuel elements and fragments at SCN Pitesti

The general safety requirements implemented in design, construction and operation of the TRIGA reactor are applicable for the spent fuel bay of SCN Pitesti. The safety assessment reports prepared for nuclear licensing of the TRIGA reactor include specific safety assessment for the spent fuel bay.
During the licensing process, CNCAN paid a special attention to evaluation of the following safety and safety related functions of the spent fuel bay:

- criticality control;
- removal of the residual heat generated by the spent fuel;
- control of water chemical and physical parameters, in order to ensure optimum storage conditions and radiation levels control.

The revised Final Safety Analysis Report of LEPI includes the review of the safety of the reactor spent fuel storage in the pool, that in fact is sited in LEPI building (actually the pool is sited between the reactor building and LEPI building, in an area belonging to LEPI). The revised Final Safety Analysis Report improves the chapters related to accident analyses.
The Final Safety Analysis Report of LEPI includes also the review of the safety of storage of spent fuel elements and fragments that resulted from destructive examination.

G2.3. Spent fuel management at IFIN-HH Magurele

The spent fuel of IFIN-HH VVR-S reactor, under decommissioning, is actually stored in three of the four spent fuel storage ponds, except the fuel assemblies of the last charge of the core that are still stored in the reactor cooling pool.

The spent fuel is old, and during the years, it was stored in conditions that were not fully observing the limits and conditions of the facility. Some Cs-137 activity was detected in the ponds, resulting either from a few damaged fuel elements (damage occurred during handling of the spent fuel) or from corrosion.

In order to control the corrosion of aluminum-cladded spent fuel, a program to improve the water quality was issued and the main parameters were improved, pH between 5.5 and 6 and conductivity below 5 μS/cm were obtained.
An optimum management of aluminum alloys in water environments can result in satisfactory durability of irradiated fuel cladding and the functionality of the storage ponds could be further extended.

CNCAN has asked the owner to assess the status of the fuel, to improve the storage conditions and to find solutions for long term storage or transfer of fuel to country of origin. Till now, a system for water filtering was put in place, and a contract regarding the shipping of the spent fuel C-36 back to Russia was initiated. For the EK-10 fuel, it is generally accepted that, if the repatriation in Russian Federation will be performed in 2-3 years, the actual condition of the fuel shall not create any problem, provided that the water parameters are kept under control. However, the situation is closely monitored, and supplementary control measures will be decided if the storage will continue in the future.

Regarding the Final Safety Analysis Report of the spent fuel storage ponds, it has to be mentioned that during the last 10 years, the report was revised, more than once. The modifications, required by CNCAN, were related to water parameter limits and technical conditions, and to control of criticality.
The last revision of the report was made in 2006 taking in consideration the new regulation on decommissioning of research reactors and other facilities, which present the requirements for the Final Safety Analysis Report. The revised report contains information regarding:

- general presentation of the installation;
- characteristics of the site;
- status of the storage ponds;
- cooling system;
- instrumentation and control;
- dosimetric control and assurance of the biological protection;
- ventilation system;
- utilities for distilled (demineralized) water supply and discharge;
- auxiliary systems;
- fuel handling system;
- control of operation;
- emergency plan;
- accident analyses;
- criticality control;
- deviations from the requirements of Preliminary Safety Analysis Report
- quality assurance;
- limits and technical conditions;
- records and reports;
- records and documentation management;

- physical protection.

G3. Siting of proposed facilities *(Article 6)*

G3.1. Procedures for safety evaluation, public information and neighbor countries consultancy

G3.1.1. Site related factors likely to affect the safety of the facility

As mentioned before, any proposed facility needs a siting authorization issued by CNCAN based on Law no. 111/1996. The siting process for Cernavoda Interim Spent Fuel Dry Storage Facility was implemented based on IAEA guidance and NRC – 10 CFR Part 72.

The following issues were addressed in the Initial Safety Analysis Report submitted to CNCAN for sitting authorisation :

- General description
- Characteristics of the site (these includes: geography and demography, nearby human activities - including man made events -, meteorology, hydrology, hydrogeology, geology, seismology, ecology, use of land and waters)
- Design criteria
- Description of the project
- Description of the functioning of the installation
- Waste management
- Radiological and nuclear safety
- Accident analyses
- Decommissioning
- Conclusions

The Initial Safety Analysis Report and its supporting documents are evaluating all the relevant site factors likely to affect the safety of the Spent Fuel Dry Storage Facility and the likely safety impact of the facility on individuals, society and environment, as presented in the paragraph on article 4.

The siting authorization was issued by CNCAN in August 2001, and contains the conditions related to the constructive solution, the confirmation of seismic entry data, and the completeness of list of Design Basis Accidents. It was also required for the Preliminary Safety Analysis Report, requested in support of the application for construction authorization, to demonstrate the observance of dose constraint for the members of the public during normal operation (0.1 mSv/year) and to demonstrate the observance of Romanian regulations related to dose limits in case of Design Basis Accidents (the exclusion zone and the reduced population zone shall remain inside the area established for CNE Cernavoda site). It was also required that the Preliminary Safety Analysis Report present also the doses for Beyond Design Basis Accident.
For future siting of reactors, if it will be the case, the siting authorization process will cover in a similar manner the spent fuel management, as the requirements for NPPs or research reactors siting are covering the field of spent fuel handling and storage.

The siting of spent fuel deep geological repository was not yet addressed by Romanian regulations, as the existing strategy takes into consideration at least 50 years of dry storage.

G3.1.2. Safety impact of the facility on individuals, society and environment

The chapter on accident analyses of the Initial Safety Analysis Report addresses the safety impact of the facility on individuals, society and environment, in case of accident.
For normal operation, the safety impact is assessed in the chapter on radiological and nuclear safety.

G3.1.3. Public consultancy

When selecting a site, the future licensee has to consult the public. The Environment Agreement is issued by the Environmental Protection Authority, after analyse of the Environmental Impact Study. Public consultancy of this study is required, and the decision for issuing the Environment Agreement takes into account the opinion of the members of the public. The Environment Agreement is a prerequisite for issuing by CNCAN of the Construction Authorization.
The above mentioned consultancy process is done based on the transposition of the Directive 85/337/EEC on Environmental Impact Assessment, amended by the Directive 97/11/EC. The transposition is realized through the Emergency Governmental Ordinance no. 195/2005 on Environmental Protection, modified and approved by the Law no. 265/2006 and the Orders of the Minister of Waters and Environment Protection no. 860/2002, no. 863/2002 and no. 864/2002.

G3.1.4. Consultancy of Contracting Parties in the vicinity of the spent fuel management facilities

Romania has ratified the ESPOO Convention. Consequently, any country (not only a Contracting Part), that could be affected by a spent fuel management facility sited on Romanian territory will be announced, and will receive, upon request, the general data relating to the facility to enable it to evaluate the likely safety impact of that facility upon its territory.

G.3.2. Avoidance of unacceptable effects on Contracting Parties in the vicinity of the spent fuel management facilities

The Initial Safety Analysis Report, as well as the latter Preliminary Safety Analysis Report and Final Safety Analysis Report, for any new nuclear facility (not only for spent fuel management facilities) shall prove that the national requirements, which are in line with the internationally endorsed criteria and standards, are met for individuals, society and environment, at the same level for national territory and for neighbor countries.

This requirement is obviously fulfilled for fuel handling and storage facilities. When siting a spent fuel deep geological repository, due consideration will be given to the assessment of the impact on neighbor countries.

G4. Design and construction of facilities *(Article 7)*

G4.1. Construction of Spent Fuel Handling and Storage Systems at CNE Cernavoda Unit 2

The design and construction of the spent fuel handling and storage facilities at NPPs and research reactors are part of the design and construction of the plants, respectively of the reactors. As all of the requirements of Article 7 of the Joint Convention are required by the Romanian legislation for all nuclear installations (for all the installations, not only for spent fuel management systems), the authorization of construction of a NPP or research reactor is granted by CNCAN only if, inter alia:

i. the design and construction of the spent fuel handling and storage system provide for suitable measures to limit possible radiological impacts on individuals, society and environment;
ii. at the design stage, conceptual plans and, if necessary, technical provisions for the decommissioning of spent fuel management facility are taken into account;
iii. the technologies incorporated in the design and construction of spent fuel management facility are supported by experience, testing or analysis.

For CNE Cernavoda Unit 2, the construction was stopped in 1990, and the construction remained under conservation till 2001. The restart of the construction was decided in 2001 and the plant was successfully placed in operation in 2007.
As it was presented in the paragraph on article 6, the spent fuel system of CNE Cernavoda Units 1 and 2 were designed to meet adequate safety standards used in Canada.
The Spent Fuel Bay of CNE Cernavoda – Unit 2 design meets the general requirements as described in the IAEA Safety Series 116 – Design of spent fuel storage facilities by including the following:

- measures to limit radioactive releases and radioactive exposures of workers and the public (including detection of leakage through the bay walls and floor);
- measures to prevent anticipated operational occurrences and accident conditions from developing into unacceptable severe accident conditions;
- provision for ease of operation and maintenance of essential equipment;
- provision through equipment and procedures for retrieving spent fuel from storage.

It should be mentioned that, prior the restarting of the construction of Unit 2, a review of the nuclear safety of the unit under construction was performed through a PHARE project. In one of the ten tasks of this project, entitled Task - 6 Evaluation of Adequacy of Engineered Provisions for Radiation Protection, it is recommended to review the suitability and application of the spent fuel pool surface finish and to consider the installation of a suitable metallic liner, to fulfill the secondary containment requirement. This design change was applied for the construction of Unit 2.

G4.2. Construction of Cernavoda Interim Spent Fuel Dry Storage Facility (including handling systems)

i. The design of Cernavoda Interim Spent Fuel Dry Storage Facility provides measures to limit the possible radiological impact on people and environment:

- double confinement barriers
- massive reinforced concrete construction
- low temperature on spent fuel cladding

ii. Decommissioning is adequately addressed by the Preliminary Safety Analysis Report.
iii. The Cernavoda Interim Spent Fuel Dry Storage facility uses a well-proven technology that is in use since the mid 70's.
It has been licensed and is being used in Canada for the Whiteshell, Gentilly 1, Douglas Point, NPD (Chalk River), Point Lepreau and Gentilly 2 spent fuel storage needs. It has also been licensed in South Korea and is used at the Wolsong NPP.

The design of the Cernavoda facility specifically uses the best features of two operating dry storage facilities at Point Lepreau and Gentilly 2 in Canada. The dry storage system has proved to be safe, simple to use, and has successfully limited doses of radiation to workers to very low values at each of the above facilities.

The content of the Preliminary Safety Analysis Report is presented below:

- General description
- Characteristics of the site (these includes: geography and demography,

nearby human activities -including man made events-, meteorology, hydrology, hydrogeology, geology, seismology, ecology, use of land and waters)

- Design criteria
- Description of the project
- Description of the technological flux
- Waste management
- Radiological protection
- Conduct of operation
- Accident analyses
- Technical limits and conditions
- Quality Assurance
- Decommissioning program
- Conclusions

The Physical Protection and Safeguards are addressed separately. Emergency Planning is covered by the general NPP emergency plan that integrates emergencies related to dry storage activities.
The construction of the first module of the facility was done under 2 different authorizations issued by CNCAN.

First authorization was given in the form of a "Modification of Plant Approval" for Unit 1, in the area of the Spent Fuel Storage Bay, including the construction of an extension of the building. The modifications related to this area were approved only after demonstration that construction work will not affect the safety of the operation of the plant.
The construction authorization of the first module of spent fuel dry storage was issued in May 2002, and contains conditions related to the constructive solution, and to the reconsideration of the air crash severe accident (it is requested that the Final Safety Analysis Report improve the scenario, justify the emission height, and

presenting the support documentation for radionuclide concentrations and dose calculations, for all meteorological conditions and all distances and heights relevant for emergency planning).
Also it was requested to be analysed the situation of a critical group inside the exclusion zone, and to demonstrate that in normal operation, the dose constraint for members of the public is not exceeded, and, in case of Design Basis Accidents, the doses for public will in principle not exceed the dose limits applicable for workers during normal operation).
All these requirements have been addressed in the Final Safety Analysis Report that was submitted to CNCAN in order to obtain the operating license of module 1 of the Spent Fuel Dry Storage Facility.
In 2005, the Preliminary Safety Analysis Report of the modules 2 and 3 was performed and the construction license was obtained for these modules.
The Final Safety Analysis Report was subsequently revised in order to obtain operating licence of the module 2 in 2006 and of the module 3 in 2007.

G5. Assessment of safety of facility *(Article 8)*

G5.1. Initial safety assessment

According to the Romanian laws and regulations, for siting a nuclear facility, including a spent fuel management facility, a siting authorization shall be issued by CNCAN. This authorization is issued based on a Initial Safety Analysis Report, as it was presented in the paragraph related to article 6.

As it was presented in the paragraphs related to articles 6 and 7, before construction of any nuclear facility, including a spent fuel handling and storage facility, an environmental agreement issued by the Environmental Protection Authority and a construction authorization issued by CNCAN are required. The environmental agreement is issued based on an Environmental Impact Study while the CNCAN authorization is issued on the basis of a Preliminary Safety Analysis Report.

G5.2. Updated and detailed safety assessment

According to the Romanian laws and regulations, for issuing by CNCAN of a commissioning authorization for a nuclear facility, including a spent fuel handling and storage facility, a Final Safety Analysis Report is required. The amended Final Safety Analysis Report is then necessary for trial operation authorization and for the operation authorization.

Operation requires also the issuing by the Environmental Protection Authority of an operating authorization. This last authorization is issued after starting of the operation, based on the Environmental Report that includes measurements of environmental parameters.
The operating authorizations are issued by CNCAN and by the Environmental Protection Authority for a limited period of time and have to be renewed periodically. That requires the update of supporting safety and environmental assessments.

Systematic impact assessment according to internationally recognized criteria and standards are required for completion of the Environmental Impact Study and of the Environmental Report.

The Initial Safety Analysis Report, Preliminary Safety Analysis Report, Final Safety Analysis Report and their supporting documents are containing systematic assessments of the nuclear safety and of the environmental impact, in accordance with the internationally accepted criteria and standards. This is obviously the case for the spent fuel facilities inside the NPP or reactors, where the safety of the handling and storage of spent fuel are assessed in the general context of the safety of the entire installation.

CNCAN has and will continue to assess the authorization documents based on USNRC NUREG-1567 “Standard Review Plan for Spent Fuel Dry Storage Facilities”, adapted taking into account the characteristics of CANDU spent fuel, the local geographic and climatic conditions and the regulatory requirements. This approach was communicated to the utility from the beginning of the licensing process.

For the case of the VVR-S reactor under decommissioning, the content of the revised Final Safety Analysis Report for spent nuclear fuel storage as per 2006 was presented in the paragraph related to article 5. According to the regulation on decommissioning of research reactors and other facilities, which requires the review of the Final Safety Analysis Report for spent fuel storage at reactor site, it was requested that IFIN-HH reviews that report for its spent fuel storage ponds.

The handling of spent fuel in TRIGA pool, at SCN Pitesti, is covered in the Final Safety Analysis Report of TRIGA reactor. The revised Final Safety Analysis Report of LEPI covers the storage of the spent fuel in the spent fuel storage pool of LEPI and of the spent fuel fragments and experimental fuel elements in the dry pits of LEPI hot cells. The report covers handling and storage of spent fuel in LEPI, according to the requirements of IAEA SS No. 118.

G6. Operation of facilities *(Article 9)*

G6.1. Licensing

The spent fuel bays operated by CNE Cernavoda Unit 1 and Unit 2 are nuclear power plant systems. The CNE Cernavoda operation was licensed by CNCAN following the legal procedure and based on appropriate assessment of safety. All safety analyses to support the five-formal licensing stages (site authorization, construction authorization, commissioning authorization, trial operation authorization and operation authorization) were performed as parts of the safety analyses for Unit 1 and Unit 2.

The trial operation authorization was issued based on the amended Final Safety Analysis Report, which includes the commissioning test and control program results. The Operation authorization was issued based on the amended Final Safety Analysis Report (phase II) which was structured in accordance with the provisions of

the NRC Regulatory Guide 1.70. The amended report contains information derived from the results and conclusions of the trial operating period.
The operation authorization is renewed every two years.
The authorization for operation of the first module of the Spent Fuel Dry Storage was issued in 2003 based on Final Safety Analysis Report. The operation authorization was renewed in 2006 and 2007 in order to include the operation of modules 2 and 3 respectively.

Similar processes were in place for authorization of operation of the 2 research reactors. Also the authorization for operation of LEPI was issued in similar conditions.

For VVR-S spent fuel storage, the Final Safety Analysis Report of 2006 is under revision. The decommissioning authorization for the reactor will include the spent fuel storage activities. Prior to get from CNCAN authorization to start the decommissioning, IFIN-HH shall assess the impact of these activities on spent fuel management. CNCAN also asked IFIN-HH to perform characterization of fuel cladding status and to take upgrading measures for the spent fuel management, including for more strict observation of technical limits and conditions. Any modification of the spent fuel handling and storage systems shall be done only with the prior approval of CNCAN.

G6.2. Operational limits and conditions

For the new Cernavoda Spent Fuel Dry Storage Facility, a set of technical limits and conditions were proposed in the Preliminary Safety Analysis Report, and were finalized in the Final Safety Analysis Report and approved by CNCAN by issuing the operating authorization for the module 1 in the year 2003 and of modules 2 and 3 in 2007. These limits and conditions are replacing, as an exception, the reference document "Operating Polices and Principles" that is used for all the rest of CNE Cernavoda.

For TRIGA reactor and LEPI Pitesti facilities as well as for the spent fuel storage of the under decommissioning VVR-S reactor, technical (operational) limits and conditions are established, based on assessments, tests and operational experience. These technical limits and conditions are revised as necessary.
As an example, below are presented the technical limits and conditions for the spent fuel storage ponds of VVR-S reactor:

- water level in the ponds: minimum 4.2 m
- water temperature: maximum 60º C
- air depression (before removing the plugs of the ponds) minimum 5 mm water column
- the ventilation of the building shall function minimum ½ h before the entering into the storage area, and all the time during the presence of persons in the storage area
- a reserve of at least 10 m^3 of distilled water for compensating in case of water loss shall exist
- water characteristics: pH = 5.5 – 6, conductivity 2 - 3.3 μS/cm^2 fixed residuum = 1 mg/l, Cl = 0.02 mg/l, O = 8 mg/l

- maximum activity in the water 25,000 Bq/l

These values will be revised, as the filtering of water allows lower limit for water specific activity.

G6.3. Operation, maintenance, monitoring, inspection and testing

As parts of CNE Cernavoda, the spent fuel facilities operation, maintenance, monitoring, inspection and testing activities are performed according to Station regulations: Operating Policies and Principles, Maintenance Philosophy, Quality Managment Manual.
All these documents include, directly or by reference to appropriate procedures, rules that must be followed in performing activities related to operation, maintenance, monitoring, inspection and testing.
As these documents are sustaining the operating authorization, the compliance with their requirements is mandatory for the Station and any deviation must be reported to CNCAN.
Similar requirements do exist for TRIGA reactor, for LEPI and for VVR-S spent fuel storage facility.

G6.4. Engineering and technical support

The station organization chart for CNE Cernavoda documents the general areas of responsibility. The structure of the organization considers the needs for engineering and technical supports and for this reason it includes a strong Technical Unit covering System Performance Monitoring, Design Engineering and Component Engineering.

Also, it should be mentioned that a strong link is maintained with Romanian research institutes and with designer of the plant, Atomic Energy Canada Limited, Romania being member of CANDU Owners Group.
SCN Pitesti and IFIN-HH consider also needs for engineering and technical supports. Their organizational chart includes also staff for operation, maintenance, monitoring, inspection and testing of spent fuel handling and storage systems.

G6.5. Incidents reporting to CNCAN

Incidents significant to safety are reported in a timely manner by the CNE Cernavoda to CNCAN, according to established procedures. These reports and procedures are requested by CNCAN according to authorization conditions.

Abnormal Condition Reports are prepared to report those events that could have significant adverse impact on the safety of the environment, the public or the personnel, such as: serious process failures, violations of the Operating Policies and Principles, release of radioactive materials in excess of targets, doses of radiation which exceed the regulatory limits, events which interfere with the IAEA safeguards system. For each reportable event a notification is made to CNCAN immediately after the discovery of the reportable event or within one working day depending on the gravity of the event and a report is prepared to document the event. For the events that are significant or complex, more detailed reports are prepared as Abnormal Condition Reports and submitted to CNCAN within the required time period.

Similar reporting systems are established in the authorization conditions and are precised in internal procedures of the licensee, in the case of SCN Pitesti and of IFIN-HH.

G6.6. Collection and analyzing of relevant operating experience

For CNE Cernavoda the station goal for operating experience is to effectively and efficiently use lessons learned from other plants and station operating experience to improve plant safety and reliability.

Station events and human performance problems often result from weaknesses or breakdowns in station processes, practices, procedures, training and system or component design that were not previously recognized or corrected. This is the reason why CNE Cernavoda considers, as the main topic of the Operating Experience Program, the Event Analysis System, comprising identification, evaluation and analysis of operational events (both internal and external) in order to establish and implement corrective actions to avoid re-occurrence.

The external information regarding operating experience proved to be a very important tool in improving station performance. Therefore, the second main topic of the operating experience program is the Information Exchange Program, with bi-directional use:

- collecting of external information and distribution to the appropriate station personnel;
- submitting the internal operating experience information to external organizations.

The basis for Operating Experience Program was set in place since the early stage of the commissioning phase (1993), with the objective to ensure:

- the reporting, reviewing, assessing of the station abnormal conditions and establishing of the necessary corrective actions;
- information exchange within CANDU Owner Group (COG), regarding abnormal conditions, technical problems, research and development projects, etc.

For the information exchange program, the relation between CNE Cernavoda and COG is covered by a COG contact officer, appointed by the station management, with the following general responsibilities:

- serving as a liaison between COG and the station;
- reviewing the incoming messages and distributing them to the appropriate persons;
- ensuring the transmittal of the required information/reports to COG;
- ensuring optimum participation by the station personnel.

Programs to collect and analyze relevant operating experiences are established also for SCN Pitesti and IFIN-HH.

G6.7. Decommissioning plans for spent fuel management facilities

According to the provisions of Law no. 111/1996 any NPP or research reactor need to prepare decommissioning plans. This is valid also for the spent fuel management facilities that in Romania are sited at reactor sites. The requirements related to decommissioning programs from the design and construction phases are applied for the Spent Fuel Dry Storage Facility at Cernavoda site, as presented before.

G7. Disposal of spent fuel *(Article 10)*

ANDRAD is setting up a knowledge database for siting, by gathering existing information (from archives) on geological, hydrogeological and seismic characteristics of the preferred investigation areas (PIAs). The PIAs resulted from previous desk siting studies, conducted between 1993-2007. Specifically, ANDRAD supported by the IAEA's technical cooperation programme is investigating the feasibility of the green schist formation as host rock for the geological repository. Based on the acquired information, starting with 2010 ANDRAD will issue site investigation programs on preferred sites, for three geological formations such as granite, salt and, probably, green schist.

SECTION H. SAFETY OF RADIOACTIVE WASTE MANAGEMENT

H1. General safety requirements *(Article 11)*

H1.1. Control of criticality and heat generation

The requirements regarding the control of criticality and heat generation during radioactive waste management are generally related, in Romanian case, to the spent fuel management. The CNCAN requirements and the measures taken by the licensees were presented in Section G.

Regarding the sealed sources of high activity, the storage authorization requirements take into consideration heat dissipation. When the sources are stored in the dedicated transport, storage or operation container, the conditions related to heat removal are mentioned also in the type approval of the equipment.

H1.2. Minimization of waste

Waste minimization is considered by Order No. 56/2004 of CNCAN President for approval of Fundamental regulations on the safe management of radioactive waste. According to this regulation, the generation of radioactive waste is to be kept to the minimum practicable level in terms of both its activity and volume through appropriate design measures, facility operation and decommissioning practices. In order to meet this requirement, the operator must ensure: a) selection and control of materials; b) recycling and reuse of materials, including clearance of materials; c) implementing adequate operating procedures, including those referring to the physical, chemical and radiological characterization of the waste and sorting of different type of materials.
The operators of the main nuclear and radiological installations have started to develop characterization programme of the waste before clearance which should decrease the volume of waste arising.

H1.3. Interdependencies among different management steps

In the regulatory process, CNCAN requires that due attention be given to interdependencies among the different steps in radioactive management.
According to the Order no.56/2004 of CNCAN President for approval of Fundamental regulations on safe management of radioactive waste, the interdependencies among all steps in radioactive waste generation shall be appropriately taken into account. The fulfillment of this condition shall be checked by CNCAN during the authorization process of radioactive waste management activities. Also, while assessing the regulatory compliance of the national radioactive waste management strategy to be elaborated by ANDRAD, CNCAN shall verify if the interdependencies among different radioactive waste management strategy were correctly taken into consideration.

H1.4. Effective protection of workers, public and environment

In the authorization process of radioactive waste management facilities, CNCAN pays due attention to the effective protection of workers, public and environment.

The authorization is granted only if the national criteria and requirements are observed.

In order to protect adequately the public health and the environment during the normal operation of the facility, the off-site dose estimate and monitoring are based on the analysis of the external effective doses and of the (internal) committed effective doses for members of critical groups for all radiation pathways. These analyses are performed according to methods and procedures recommended in IAEA safety standards and in other western regulations. The result of the analyses leads to derived emission limits for the effluents, and the monitoring program of the environment shall demonstrate that the derived emission limits are observed both in normal operation and during events with relative high probability of occurrence. Of a particular interest is the assessment (based on the FEPs list) and the monitoring of the doses resulted from a repository during both the operation and the post closure (institutional control) period. For this purpose, depending on the characteristics of the radioactive waste, the immobilization matrix, the engineered barriers of the facility, and of the surroundings of the facility (near field and far field), various monitoring activities for radioactivity of air, water, soil, vegetal and animal organisms are performed. For a surface repository, accepting short lived radionuclides, the institutional control period is established in the authorization.
Regarding the radiation protection criteria for the workers and for the public, they are similar to the criteria defined in the 1990 publication of ICRP 60, as the Order no.14/2000 of CNCAN President for approval of Fundamental regulation on Radiological Safety is transposing the Council Directive 96/29/EURATOM.
In the case of the radioactive waste disposal facility, altered evolution scenarios, including the intrusion scenarios are considered, according to IAEA recommendations. Also operation and transport accidents are considered for such facilities. The loose and the theft of radioactive waste are also considered. The emergency plan is dimensioned according to the maximum credible accident.

For the low level radioactive waste treatment plants and for the low and intermediate level radioactive waste and spent sources storages the operation and transport accident scenarios, including loose and the theft of radioactive waste, are also considered.

H1.5. Biological, chemical and other hazards

The internationally accepted criteria and standards used for assessing and authorizing the radioactive waste management facilities take into consideration biological, chemical hazards.

H1.6. Impact on future generations

The authorization process for pretreatment, treatment, storage and disposal of radioactive waste, requires the demonstration that the impact on future generations will not be higher than it is now accepted for the current generation. This is done for long term storage and disposal by requiring that the dose be assessed both for normal and altered scenarios of evolution of the facility, including the intrusion in the repository, for all the period of time for which the waste has significant radioactivity.

The results shall be below the constraints established by CNCAN that are expressed in terms of yearly dose or dose/event, which are the same as for the current generation.

H1.7. Avoidance of undue burdens on future generations

Regarding the principle of avoiding undue burden of radioactive waste management on the future generations, it shall be noted that Romanian authorities, and particularly CNCAN, fully accept and promote this principle. The Governmental Ordinance no.11/2003 with subsequent modifications and completions requires that the producers of radioactive waste pay financial contributions to the Fund earmarked for management of radioactive waste and to the Fund for decommissioning of nuclear installations.

The Order no. 56/2004 of CNCAN President for approval of Fundamental regulations on safe management of radioactive waste requires the radioactive waste to be managed in such a way that will not impose undue burdens on future generations. The radioactive waste management strategy to be revised by ANDRAD shall observe this principle.

H2. Existing facilities and past practices *(Article 12)*

H2.1. Safety of radioactive waste management

a) CNE Cernavoda

The review of the safety of radioactive waste management systems at CNE Cernavoda is done periodically, as the authorization of the plant is renewed every 2 years.

The generation of radioactive waste resulting from plant operation is kept to the minimum practicable. Station references documents and procedures are focused on waste minimization. Operational target for waste volume is 30 m^3 per year, except spent resins.

Radiation exposure of the operating staff and members of public during processing and storage is maintained as low as reasonably achievable – ALARA (social and economic factors taken into account).
The contamination control, temporary accumulation and storage of radioactive waste within the plant are avoided by proper planning and scheduling. Temporary accumulations are prohibited except at locations designed for that purpose.

The whole set of procedures dealing with waste generation and waste management is under regulatory control.

Qualified and trained personnel operate facilities. Training is subject to periodical refreshment.

The plant has the capabilities to control, collect, handle, process, interim store wastes that may contain radioactive materials and are produced as a consequence of plant operation.

The design of the radioactive waste management facilities is such that radiological exposure of operating staff and the public is well within the limits established by CNCAN.

The solid radioactive waste which result from either normal or abnormal operation of the nuclear power plant are stored for a limited period of time. The waste will be transferred for disposal at the moment when the disposal facility will be available.

The radioactive waste management facilities are located within CNE Cernavoda exclusion zone and security fence, with easy access of vehicles transporting radioactive wastes, minimizing the need for additional security mechanism to assure its integrity. No any off-site transportation is involved.

The description of radioactive waste management at CNE Cernavoda is presented in section D.
The conclusions of the review of the safety of radioactive waste management at CNE Cernavoda are that, in general, the requirements of the Joint Convention are met. However, CNCAN asked for supplementary work, in order to characterize in detail the radioactive waste produced in the plant. This requirement is important, as CNE Cernavoda shall select the treatment and conditioning technologies according to the near surface disposal concept of radioactive waste.

b) FCN Pitesti

The review of the safety of radioactive waste management at Nuclear Fuel Plant (FCN Pitesti) is done periodically, as the authorization of the facility is renewed. The description of radioactive waste management at FCN Pitesti is done in Section D.
The conclusions of the review of the safety of radioactive waste management at FCN Pitesti are that this is done properly, in accordance with the requirements of the Joint Convention.

c) SCN Pitesti

The review of the safety of radioactive waste management facilities at SCN Pitesti is done periodically, as the authorization of this facilities is renewed.
STDR Pitesti is provided with installations for safe management of all short lived radioactive waste arising from the operation of the SCN Pitesti facilities, including. LEPI facility is used for storage of long-lived radioactive waste and of the highly active short lived radioactive sources.

The generation of radioactive waste resulting from STDR and LEPI operation is kept to the minimum practicable.
Radiation exposure of the operating staff and members of public during processing and storage of radioactive waste is maintained as low as reasonably achievable – ALARA (social and economic factors taken into account).

The contamination control, temporary accumulation and storage of radioactive waste within the STDR are avoided by proper planning and scheduling. Temporary accumulations are prohibited except at locations designed for that purpose. The conditioned solid radioactive wastes are transferred to IFIN-HH for disposal at Baita-Bihor repository.

The whole set of procedures dealing with waste treatment and conditioning is under regulatory control.

Qualified and trained personnel operate facilities. Training is subject to periodically refreshment.

The design of the radioactive waste management facilities is such that radiological exposure of operating staff and the public is well within the limits established by CNCAN.
The conclusions of the review of the safety of radioactive waste management at SCN Pitesti are that this is done properly, in accordance with the requirements of the Joint Convention.

d) IFIN-HH

The review of the safety of radioactive waste management at STDR Magurele is done periodically, as the authorization of this facility is renewed.
STDR Magurele is provided with installations for safe management of all short lived radioactive waste arising from the operation of the IFIN-HH facilities, including the former VVR-S reactor, under decommissioning, as well as of the institutional radioactive waste produced all over the country. The radioactive wastes, including spent sources, are treated at STDR. Here are stored also long lived spent sources, waiting for treatment, in view of long term storage.
Due to ageing of the installation, problems are encountered regarding the liquid treatment; for that reason CNCAN has withdrawn the authorization for the liquid waste treatment plant. Also, the facility for incineration of solid waste is out of operation.

CNCAN has required a program for refurbishment of STDR Magurele, as well as for establish of technologies for long term storage of long lived radioactive waste. In this respect, the waste management department of IFIN-HH has developed a program for reconditioning of Ra-226 sources, in accordance with IAEA recommendations.
At the beginning of 2005 there were 800 corroded packages containing historical waste in the storage facility of IFIN-HH. Under a contract with the Department of Trade and Industry of Great Britain, STDR Magurele was equipped with a characterization system as well as with 377 pieces of 420 l packaging needed for reconditioning the corroded packages containing historical waste. At present only 263 packages with historical waste are in storage facility of IFIN-HH. The rest of packages were transferred to DNDR Baita Bihor.
IFIN-HH has under development a Phare 2006 project - PHARE RO 2006/018-411.03.04- in which, one of the main tasks is the acquisition of a mobile liquid treatment installation.

The DNDR Baita-Bihor (the short lived radioactive waste national repository for institutional waste) was put in operation in 1985. Following the evolution of radioactive waste disposal concept, CNCAN has asked IFIN-HH to perform an Initial Safety Analysis Report, followed by a Preliminary Safety Analysis Report, and a Final Safety Analysis Report.
The first step was achieved in 2002, based of know-how transfer through a PHARE project. A continuation of the PHARE project was conducted in 2005-2006. As result, the Preliminary Safety Analysis Report was produced in 2006.

In parallel, another PHARE 2006 project is under development having as main task the upgrading of the Baita-Bihor Repository for Institutional Waste in Romania. Under this project, a number of urgent upgrading measures will be implemented (i.e. replacement of the electric, ventilation, drainage and transport systems, waterproofing of the galleries, a new and modern physical protection system, a technological building for the workers, improvement of radiological monitoring).

Also, under a contract with Department of Trade and Industries of Great Britain, the transport of the conditioned waste to the repository was improved by the acquisition of a truck able to transport a larger number of packages.

e) CNU

In accordance with the new regulations issued by CNCAN the Feldioara branch has decided new safety measures for the radioactive waste management:
- the entire area around both new and old radioactive waste storage surfaces was surrounded by wire fence to avoid people's access;
- the surrounding area is radiologicaly monitored and ground and underground water samples are taken and analyzed within the plant laboratory;
- to avoid radionuclides migration around the storage area the stored radioactive waste is compacted and covered by a 10 cm thick layer of clay (according to the procedures “Location and storage of low level radioactive waste” and “Conditioning of radioactive waste material easily removed by wind”).

Having as aim the increasing of radioactive waste safety management, for the near future the Feldioara branch foreseen the following:
- improvement of the access road at the radioactive waste storage facility;
- supplementary drillings around the radioactive waste storage facility in order to ensure more underground water samples for contamination assessment;
- radiometric monitoring of the access road to the radioactive waste facility.

Remote access will be ensured to the storage area.

After filling completely the radioactive waste storage facility, the stored material will be equalized and covered by a 50 cm thick compacted clay to avoid any radioactive contamination of the surrounding environment (according to the procedure “Insulating the area of the full capacity storage facility“). In this way, the storage will be transformed in a repository.

If required, a higher storage capacity may be developed in future, within the same area, after obtaining the necessary CNCAN authorization. For the first two solid radioactive waste storage areas that are closed and covered, it is also necessary to assess the safety prior to get the authorization for transforming the storage areas in repositories.

H2.2. Past practices

a) Former radioactive waste storage "Magurele Fort"

The development of the nuclear techniques in Romania as well as the commissioning of the VVR-S research reactor, demand to deal with the storage and disposal of radioactive waste. The institute decided to store the radioactive waste inside a building that belonged to the Defense of Capital City System (the Army) called "Fort" which is located on the Magurele site. This building was used by the institute as a storage facility for radioactive waste and sealed spent sources since the 1950's. At that time sealed sources were imported by Romania and consisted of Ra-226 and Cs-137 sources. The first attempt to decommission the Fort building was made in 1975, the same year when STDR was commissioned. A large quantity of wooden radioactive waste stored in the surrounding area was incinerated; the other radioactive waste and the spent sealed radioactive sources remained in the Fort building. After the adjacent area was cleaned -up, all windows and doors of the Fort building were closed.
In 1977 the Fort building was broken and a lot of containers, some containing spent sealed radioactive sources were spread in the surrounding area. After this event IFIN-HH decided to decommission the Fort building and to transfer all radioactive waste and spent sealed radioactive sources to the STDR. The decommissioning process resulted in about 1500 packages containing the radioactive waste and the spent sealed radioactive sources conditioned in cement.
A part of the total number of the packages could be transferred to disposal facility because the limits of the activity per package established by regulatory authority allowed this. In the storage facility of STDR there are still some corroded packages. IFIN-HH developed a program for repackaging of corroded packages and transferring them to DNDR.
The Fort area was cleaned-up and monitored and in 2007 regulatory authority issued the conditional clearance certificate. In the area of Fort there are not allowed the building of resident houses as well as growing-up cereal crops for a period of 10 years.

b) Sterile rock and low radioactive rock dumps resulted from geological research and mining activities for uranium ores production within the CNU sites

The uranium geological research and mining activities have produced sterile rock and radioactive rock dumps. These deposits shall be assessed, and where necessary, intervention shall be applied, in order to reduce the radiological risks. The sites and their actual status are presented below.

- *Crucea – Botusana mines , Suceava county*

There are 14 sterile rock dumps with a total volume of 574 000 m^3 on a 116 000 m^2 surface, on mountain slopes, having a 13 – 40 m height. The gamma dose rate at 1 m from surface is 0,11 – 0,80 µSv/h. Some dumps are covered by natural vegetation on 15 – 70 % of their surface.

- *Objective Tulghes – Grintiesi, Neamt county*

The objective has 3 main areas. The Primatar area has 15 old sterile rock dumps covering a total surface of 46 300 m^2 and having a total volume of 160 370 m^3 . The Prisecani area has 5 old sterile rock dumps covering a total surface of 21 588 m^2 and having a total volume of 89 999 m^3 .The Bradu area has 6 sterile dumps with a 28 390 m^2 surface and a 122 463 m^3 volume. All the sterile dumps are located on mountain slopes, in forest covered areas.

At 1 m height from the surface, the gamma dose rate is 0,30 µSv/h with peaks of 0,70 µSv/h; the mine waters flowing from few adits show low concentration of uranium and radium, except one adit which has low water flow rate and concentration up to 2 mg/l.

G24 Primatar dump has a 3,900 m^2 surface and gamma dose rates vary from 0,10 to 0,60 µSv/h.

The G26 Primatar dump has a 12,000 m^2 surface, an inclination angle of about 30^0 , the measured gamma dose rates have 0.16-0.30 µSv/h.

The G27 Primatar dump has a 7,740 m^2 surface, an inclination angle of about 30^0 , and the measured gamma dose rates have 0.10-0.35µSv/h.

- *Objective Baita Plai , Bihor county*

The Baita Plai open pit was the first mine in Romania for uranium ore exploitation. There 3 dumps of sterile and low grade rocks, having a total volume of 2,800,000m^3 on a surface of 135,000 m^2. These dumps are located on low slopes and have a height of 20 to 100 m. The gamma dose rate measured at 1 m height from the soil is 0.26-0.46 µSv/h, radon exhalation was measured being 20-60 Bq/m$^{3.}$

- *Objective Avram Iancu – Bihor county*

There are 9 sterile rock dumps with a total volume of 1,245,500 m^3 located on a 116,950 m^2 surface. The dumps contain hard rocks, 8 have a height under 30 m and one has 100 m. All dumps are located near old forests. The gamma dose rate at 1 m from soil up to 0,31µSv/h.

- *Objective Ciudanovita mine – Banat county*

In the Ciudanovita area 7 sterile rock and low grade dumps are located on slopes having a height between 3 – 25 m. The total volume of rock is 564,500 m^3 on a 82,000 m^2 surface.

The gamma dose rate at 1 m from soil is 0,10 – 0,60 µSv / h.

Mine waters pumped from underground mine have uranium concentration up to 1.6 mgU/l and radium up to 0.4 Bq/l.

- *Objective Dobrei mine – Banat county*

Within this mine there are 6 dumps having 1,269,000 m^3 located on a total surface of 81,800 m^2. Gamma dose rate has a low average value of 0,25 µSv/h. Higher values are found for low grade rock on Dobrei South dump. Mine waters are pumped from underground works at a flow rate of 1,500 m^3 / day and are treated within a plant where the uranium is removed to a residual concentration of 0,1 mgU/l.

- *Objective Natra mine – Banat county*

There are 2 dumps having 223,500 m^3 on a 81,800 m^2 surface.

Maximum gamma dose rate at 1 m from soil is 0,25 µSv / h.

c) Sterile rock and low radioactive rock dumps resulted from geological research and mining activities for uranium ores production within the Radioactive Mineral Magurele Company sites

The objectives are former geological sites searched by drilling and underground mining works during 1952 – 2002 period. All works are closed in present and proposed for final remediation.

- *Objective Milova, Arad county*

There are 9 dumps located on slopes which have a total volume of 104,490 m^3 on a 23,250 m^2 surface.

- *Objective Gradiste de Munte, Alba county*

There are 5 dumps with sterile rock and low radioactive rock which have the total volume of 182,700 m^3 on a surface of 40,000 m^2. The dumps are located on slopes.

- *Objective Ranusa, Alba county*

There are 5 sterile rock and low radioactive rock dumps which have a total volume of 283,000 m^3 on a surface of 37,600 m^2. The main dump has an average uranium content of 100 grams/ton. Studies for mine closing out and environmental remediation are completed.

- *Objective Zimbru Valley, Bihor county*

There are 2 sterile rock dumps located on mountain slopes have a 70,000 m^3 volume on a 1,600 surface m^2.

- *Objective PIetroasa Padis, Bihor county*

There are 4 sterile and low radioactive rock dumps have a total volume of 17,200 m^3. One dump is completely re-vegetated and naturally stabilized.

- *Objective Vacii Valley – Leucii Valley, Bihor county*

There are 5 sterile rock dumps which have a total volume of 250,000 m^3 on a surface of 43,400 m^2. Gamma dose rate a 1 m from soil has values of 0.09 – 0.18 μSv/h.

- *Objective Arieseni, Bihor county*

There are 4 dumps with a 29,000 m^3 volume located on a 6,395 m^2 surface. The larger dump has 42,000 m^3. The gamma dose rate is 0,33 - 1 μSv/h.
Mine waters have 0.024 – 0.200 mgU/l but dilution is important downside the mine in the Arieseni River.

- *Objective Mehadia, Caras Severin county*

A single dump with a 12,750 m^3 volume and 5,000 m^2 is located on slope. A very low flow of mine water is flowing into Sfardin brook.

- *Objective Rapsag, Caras Severin county*

Within this mine, closed for 30 years , there is 1 dump having a 6,500 m^3 on a 700 m^2 surface and a 9 m height.
Gamma dose rate at 1 m height from the soil has an average value of 0.12 μ sv /h.

- *Objective Stoenesti, Dambovita county*

There are 19 small dumps which have a total volume of 43,640 m^3 with the largest one, G 5 Danis at 16,900 m^3

- *Objective Bicazu Ardelean, Neamt county*

There are 4 low radioactive rock dumps have a total volume of 62,900 m^3 on a 20,932 m^2 surface.

- *Objective Ilisova, Mehedinti county*

There are small 18 sterile rock dumps with a total volume of 12,750 m^3 covering 8,500 m and 10 dumps having 71,500 m^3 and a 51,500 m^2.

- *Objective Puzdra-Lesu , Suceava county*

There are 3 sterile rock dumps having a total volume of 95,600 m^3. The largest dump has 78,00 m^3 on a surface of 10,050 m^2 and a height of 15-50 m.
The average gamma dose rate, measured at 1 m from the soil , is 0.07-0.15 µsv/h.A very low mine water flow rate is present , with an average of 0.3 l/s.

- *Objective Hojda Magura, Suceava county*

There are 2 series of small dumps, having a total volume of 87,000 m^3 on a 15 ,600 m^2 surface. The height is 10-35 m. The average gamma dose rate, measured at 1 m from the soil, is 0.07-0.12 µSv/h.

- *Objective Repedea Poienile , Maramures county*

There are 3 small dumps having a total volume of 11,250 m^3 on a 2,600 m^2 surface. The maximum gamma dose rate value is 0,29 µSv/h.

- *Objective Venetia , Brasov county*

There are 3 sterile rock dumps having a total volume of 14,345 m^3.

- *Objective Barzava , Arad county*

There is a single dump with a 20,000 m^3 volume, 3,000 m^2 surface and a maximum height of 13 m. The gamma dose rate varies from 0,20 to 0,67 µSv/h and radon exhalation is 36 – 110 Bq/m^3. The sterile rock dump is close to houses of the Bârzava village.

d) Sterile rock and low radioactive rock dumps resulted from geological research and mining activities for thorium ores production within GEOLEX Company

- *Objective Jolotca , Harghita county*

The Jolotca objective is sited at approximately 3 km distance from the village Jolotca.

The mining works were digged for research of rare earth mineralization associated with thorium.
During approximately 40 years, a number of around 40 galleries were digged, most of them of small dimensions.
The works, stopped more than 10 years ago, have produced approximately 40 rock dumps, most of them of small dimensions. From these dumps, only on 4 were found some areas where the dose rate measured at 1 m height was around 2 µSv / h. These dose rates are produced by rocks with a content of maximum 0.02 % thorium. The thorium content in the mine waters is below 0.04 mg/l.

The radiological risk for the critical group is not significant. The approximately 300 m^3 of rocks with higher content of thorium will be used for filling the mine shaft.

H3. Siting of proposed facilities *(Article 13)*

H3.1. Procedures for safety evaluation, public information and neighbor countries consultancy

H3.1.1. Site related factors likely to affect the safety of the facility

As mentioned before, any proposed facility needs a siting authorization issued by CNCAN based on Law no.111/1996.

It has to be mentioned that till now, the siting of radioactive waste treatment, conditioning and temporary storage plants was realized according to the requirements for the siting of NPP or research reactors. This is coherent with the fact that actually, STDR Magurele, STDR Pitesti, LEPI Pitesti are sited at reactors site, so the requirements for reactor siting are covering the requirements for radioactive waste management facilities. Also FCN Pitesti was sited at the TRIGA reactor site.
The regulations for general requirements (including siting) for near surface repositories were issued in 2005 by Order no. 400/2005. For the siting of future treatment and conditioning plants the regulations will be issued in the next future.

It has to be mentioned that the siting process for a surface repository of short lived radioactive waste from CNE Cernavoda started in 1992. CNCAN asked that the requirements of 10 CFR Part 61 “Licensing requirements for land disposal of radioactive waste” be observed, with modifications related to dose constraints.
In the mean time in 2005 CNCAN issued a new regulation on the general requirements for near surface repositories. This regulation is based on the IAEA safety requirements WS-R-1 -Near surface disposal of radioactive waste. The regulation contains general requirements for near surface repositories as well as the authorization procedure and a guide which helps the licensee to develop the safety assessment report. The guide is based on the IAEA safety guides WS-G-1.1 “Safety assessment for near surface disposal of radioactive waste”. According to these documents, the site characteristics shall be taken into account in the safety assessment and in the repository design. In determining the site characteristics that are important to the assessment of the site design and safety, the following shall be considered as a minimum: geology, hydrogeology, geochemistry, tectonics and seismicity, surface processes, meteorology, climate and impact of human activities.
As the process for siting of the NPP short lived radioactive waste repository is continuing, the Initial Safety Analysis Report was submitted as support for the application for partial siting authorization. The report does observe the requirements of IAEA documents.

H3.1.2. Safety impact of the facility on individuals, society and environment

The Initial Safety Analysis Report shall assess the likely safety impact of the repository on individuals, society and environment at any moment in time, till the radioactive waste will decay to a radioactivity that shall not put any significant radiological risk (both for normal and altered scenarios, including human intrusion).

Siting process for a new near surface repository

The implementation of the Romanian national strategy for radioactive waste management aims to create an operating repository for low- and intermediate-level radioactive waste by 2014. The facility will only take operational and decommissioning short-lived radioactive wastes, with long-lived radionuclides in limited quantities. The estimation of waste inventory was based on the following scenarios: waste generated by Cernavoda NPP that will be equipped with 4 CANDU type units, each of them operating a period of 30 or 40 years. In this context ANDRAD is preparing all the necessary documentation in order to have the Saligny site approved.

The siting process for a near-surface repository for low- and intermediate-level radioactive waste was initiated in Romania by the SNN in 1992. The Dobrogea region was selected in a regional mapping stage and the site selection process then identified 37 potentially suitable sites. Geological investigations were performed in three of them (1993-1994) and, later, site characterisation was carried out in two candidate sites, Cernavoda and Saligny (1995-1996). Final preference was given to Saligny site in 1997, which is close to CNE Cernavoda. In 1995-1997, a pre-feasibility study and a preliminary safety assessment were elaborated according to the Romanian specific regulations and a site license application was submitted to in 1998. This resulted in a number of requirements and comments from CNCAN. The site selection process slowed down after 1998 due to mostly non-technical reasons and was restarted after ANDRAD, was appointed to complete the repository development process.

Technical missions were performed between 1994 and 1999 and in 2005 within the framework of IAEA's Technical Co-operation Programmes and EC PHARE project.

In 2005, ANDRAD has taken over the responsibility to setup the repository and started to conclude the relevant data and information and coordinated the process that ensured the elaboration of a technical and safety documentation that should have been support for a siting approval from CNCAN. On November 2006, ANDRAD decided that a revision of the technical and safety documentation would be necessary before to get to the CNCAN.

A peer review from a WATRP expert mission approved by IAEA that took place on January 2007 made comments and recommendations that helped ANDRAD to decide issues for revision in the existing documentation.

In 2007, ANDRAD submitted to CNCAN improved documentation in order to get the partial siting license to site a near surface disposal facility for radioactive waste within Repository for Low and Intermediate Level Radioactive Waste, sited in Saligny, Constanta county. The partial siting license is a precursor to a siting license and it is intended to allow ANDRAD to perform site investigation and characterization, to enable land acquisition, and any other agreements and approvals requested by law. The site application was supported by the technical documentation "Safety Report of Siting a Near Surface Repository at Saligny site". CNCAN requested in 2007 the IAEA assistance with technical review of the Safety Report with special attention to the regulatory issues, site characterization work and safety assessment work.
CNCAN granted in February 2008 the partial siting license.

In this context, the following EC-funded projects have already been programmed to assist ANDRAD in the development of the repository:

- RO 2008/018 – 147.05.01 Unallocated envelope "Support to ANDRAD to get the siting license for Saligny LILW near surface repository".
- RO 2006 / 018-411.03.03 "Design and safety assessment for licensing the construction of Saligny L/ILW National repository";

- RO 2007/19343.06.05 Transition Facility “Support to ANDRAD to develop a new radioactive waste treatment and conditioning facility”;

All above mentioned projects should start in 2008.

H3.1.3. Public consultancy

When selecting a site, the future licensee has to consult the public. The Environment Agreement is issued by the Environmental Protection Authority, after analyze of the Environmental Impact Study. Public consultancy of this study is required, and the decision for issuing the Environment Agreement takes into account the opinion of the members of the public. The Environment Agreement is a prerequisite for issuing by CNCAN of the Construction Authorization.
The above mentioned consultancy process is done based on the transposition of the Directive 85/337/EEC on Environmental Impact Assessment, amended by the Directive 97/11/EC. The transposition is realized through the Emergency Governmental Ordinance no. 195/2005 on Environmental Protection, modified and approved by the Law no. 265/2006 and the Orders of the Minister of Waters and Environment Protection no. 860/2002, no. 863/2002 and no. 864/2002.

H3.1.4. Consultancy of Contracting Parties in the vicinity of the radioactive waste management facilities

Romania has ratified the ESPOO Convention. Consequently, any country (not only a Contracting Part), that could be affected by a radioactive waste management facility sited on Romanian territory will be announced, and will receive, upon request, the general data relating to the facility to enable it to evaluate the likely safety impact of that facility upon its territory.

H3.2. Avoidance of unacceptable effects on Contracting Parties in the vicinity of the radioactive waste management facilities

The Initial Safety Analysis, as well as the latter Preliminary Safety Analysis Report and Final Safety Analysis Report, for any new nuclear or radiological facility (not only for radioactive waste management facilities) shall prove that the national requirements, which are in line with the internationally endorsed criteria and standards, are met for individuals, society and environment, at the same level for national territory and for neighbor countries.

This requirement is obviously fulfilled for radioactive waste handling and storage facilities. Also, for surface repositories for short lived radioactive waste, it is relatively easy to demonstrate the fulfillment of the requirement.

H4. Design and construction of facilities *(Article 14)*

The design and construction of a radioactive waste management facility at CNE Cernavoda is part of the design and construction of the NPP. As all of the requirements of Article 14 of the Joint Convention are required by the Romanian legislation for all nuclear installations, the authorization of construction of a radioactive waste management facility at CNE Cernavoda is granted by CNCAN only if, inter alia:

i. the design and construction of the radioactive waste handling and storage system provide for suitable measures to limit possible radiological impacts on individuals, society and environment;

ii. at the design stage, conceptual plans and, if necessary, technical provisions for the decommissioning of radioactive waste management facility other than a disposal facility are taken into account;

iii. at the design stage, technical provisions for the closure of a disposal facility are prepared;

iv. the technologies incorporated in the design and construction of spent fuel management facility are supported by experience, testing or analysis.

It has to be mentioned that the radioactive waste management systems of CNE Cernavoda Units 1 and 2 were designed to meet adequate safety standards used in Canada and in other five countries.

According to the Order no.400/2005 of CNCAN president for approval of regulations on the general requirements for near surface repositories the following phases need authorization issued by CNCAN: siting, construction, operation, closure, active institutional control. For this each steps, the regulation contains provisions for content of safety case.

Regarding the waste originated from uranium mining and milling, it has to be mentioned that the Order no.192/2002 of CNCAN president for approval of Radiological Safety Regulations for Radioactive Waste Management from Uranium Mining and Milling has a chapter with requirements related to design and construction, covering the requirements of the Joint Convention.

In conclusion, as it was previously explained, the construction authorization for any radioactive waste management facility will be granted by CNCAN based on the Preliminary Safety Analysis Report, that shall demonstrate the fulfillment of the requirements of the Joint Convention presented in Article 14.

H5. Assessment of safety of facilities *(Article 15)*

H5.1. Initial safety assessment

According to the Romanian laws and regulations, for siting a nuclear facility, including a radioactive waste management facility, a siting authorization shall be issued by CNCAN. This authorization is issued based on an Initial Safety Analysis, as it was presented in the paragraph related to article 13.
Before construction of any nuclear facility, including a radioactive waste management facility, an environmental agreement issued by the Environmental Protection Authority and a construction authorization issued by CNCAN are required. The environmental agreement is issued based on an Environmental Impact Study while the CNCAN authorization is issued on the basis of a Preliminary Safety Analysis Report.

According to the best practices, the safety assessment of the Saligny near surface repository site was based on the safety assessment methodology from the ISAM project. The endpoint was the assessment of certain safety indicators. Individual annual effective dose for exposed peoples (both workers and general public) was the main safety indicator. The radionuclide concentrations in the disposal system compartments have been evaluated, as complementary safety indicators of repository.

The main conclusions resulted from the Saligny repository safety assessment are:

- In order to reduce the total amount of C-14 in the Saligny repository, only the fuel contact spent ionic resins were considered for disposal.
- The annual effective dose for the Reference Operational Scenario of repository was conservatively calculated and estimated to 2.88 mSv/year; the value is one magnitude order lower than the accepted limit for the professional exposure (20 mSv/year, the limit is according to CNCAN regulations regarding the surface disposal of the radioactive waste). The optimization of the design technical solutions, a better characterization of the waste as well as the elaboration of the operational procedures will make possible the minimization of the dose received by the operator.
- The assessments regarding the effective doses potentially received by an operator following an accident during the operational period of the repository (Alternative Operational Scenarios) led to values lower than 0,1 mSv, that are three magnitude order lower than the dose limit of 50mSv adopted for the accident conditions during the operational period (according to the ICRP 60).
- The maximum value of the total dose received by a representative member of the critical group assessed under the assumptions of the Reference Post-closure Scenario is 3.4 E-06 Sv/year. It is almost two magnitude orders smaller than the dose constraint (0.3mSv/year) specified by the CNCAN regulation on the general requirements for near surface disposal of the radioactive waste. This dose could be reached 3900 years after the repository closure and is mainly due to the radionuclide Carbon-14 (98%). The most important exposure pathway contributing to this dose is contaminated water ingestion.
- The doses resulted in the assessment of Alternative Post-closure Scenarios led to values much lower than 10mSv for which the ICPR 81 document states that efforts for the limitation of their consequences are not justified.
- Evaluation of complementary safety indicators as radio-nuclides concentrations in the repository compartments, geosphere and biosphere illustrates that the confining/retardation function both for the engineering and natural barriers is fulfilled, even at this first iteration when the information about the repository and inventory are at the conceptual level.

H5.2. Updated and detailed safety assessment

According to the Romanian laws and regulations, for issuing by CNCAN of a commissioning authorization for a NPP, including a radioactive waste management facility, a Final Safety Analysis Report is required, while for issuing by CNCAN of a

trial operation authorization or an operation authorization, amended Final Safety Analysis Reports are required.
Operation requires also the issuing by the Environmental Protection Authority of an operating authorization. This last authorization is issued after starting of the operation, based on Environmental Report that includes measurements of environmental parameters.
The operating authorizations are issued by CNCAN and by the Environmental Protection Authority for a limited period of time and have to be renewed periodically. That requires the update of supporting safety and environmental assessments.
Systematic impact assessment according to internationally recognized criteria and standards are required for completion of the Environmental Impact Study and of the Environmental Report.

The Initial Safety Analysis Report, Preliminary Safety Analysis Report, Final Safety Analysis Reports and their supporting documents are containing systematic assessment of the nuclear safety and of the environmental impact, in accordance with the internationally accepted criteria and standards.
For CNE Cernavoda radioactive waste management systems, the Initial Safety Analysis Report, the Preliminary Safety Analysis Report and the Final Safety Analysis Report are realized for the whole facility.

As it was presented in the paragraphs related to articles 13 and 14, the content of Initial Safety Analysis Report and of Preliminary Safety Analysis Report for future radioactive waste management facilities shall reflect the content of IAEA requirements and guides. The same is true for the Final Safety Analysis Report.

Requirements related to the content of the radioactive waste management facilities from uranium mining and milling are included in the “Radiological Safety Regulations for Radioactive Waste Management from Uranium Mining and Milling”.

For the case of existing radioactive facilities STDR Magurele, STDR Pitesti and LEPI Pitesti, periodical review of the safety assessment of the facilities are required. A revised Safety Analysis Report was required by CNCAN for STDR Magurele, in order to establish refurbishment measures.

For DNDR Baita Bihor, it has to be mentioned that the siting and construction authorization, as well as the later operation authorization were issued based on a documentation that was not at the level required by the new IAEA regulations. CNCAN required IFIN-HH to perform a new Initial Safety Analysis that was submitted in 2002. A Preliminary Safety Analysis Report followed in 2006, to establish the construction improvements and higher activity concentration limits. At a later stage a Final Safety Analysis Report will be submitted to CNCAN.

H6. Operation of facilities *(Article 16)*

H6.1. Licensing

The radioactive waste management systems operated by CNE Cernavoda are nuclear power plant systems. The CNE Cernavoda operation was licensed by

CNCAN following the legal procedure and based on appropriate assessment of safety. All safety analyses to support the five-formal licensing stages (site authorization, construction authorization, commissioning authorization, trial operating authorization, and operating authorization) were performed for Unit 1 and Unit 2.

The trial operating authorization was issued based on the amended Final Safety Analysis Report, which includes the commissioning test and control program results. The report is structured according to the provisions of the NRC Regulatory Guide 1.70.

The Operating License was finally issued based on the amended Final Safety Analysis Report (Phase II), which contains amendments derived from the results and conclusions of the trial operating period.
Periodically (at every 2÷3 years) the operation authorization is renewed, and appropriate assessments are requested in support of the application for issuing of the new authorization.
For any radioactive waste management facility the authorization to operate the facility is based on the Final Safety Analysis Report and is conditional on the completion of the commissioning program demonstrating that the facility, as constructed, is consistent with design and safety requirements.

H6.2. Operational limits and conditions

For operation of NPP, CNE Cernavoda issued under CNCAN approval, the reference document “Operating Policies and Principles”. This document describes how the utility operates, maintains and modifies the safety-related systems in order to maintain the nuclear safety margins and consequential risk to the public acceptably low. This document defines the specific operating limits for safety related systems, which must be maintained all the time to ensure that the plant always operates within its analyzed safe operating envelope. Other key boundaries for operation of radioactive waste management systems are included in their Operating Manuals.

For FCN Pitesti, STDR Pitesti, LEPI facility, STDR Magurele and DNDR Baita Bihor, technical (operational) limits and conditions are established, based on assessments, tests and operational experience. For DNDR Baita Bihor the limits and conditions include the waste acceptance criteria.
The technical limits and conditions are revised as necessary.

H6.3. Operation, maintenance, monitoring, inspection and testing

As parts of CNE Cernavoda, the radioactive waste management systems’ operation, maintenance, monitoring, inspection and testing activities are performed according to Station regulations: Operating Policies and Principles, Maintenance Philosophy, Quality Assurance Manual.
All these documents include, directly or by reference to appropriate procedures, rules that must be followed in performing activities related to operation, maintenance, inspection and testing.

As these documents are sustaining the operating license, the compliance with their requirements is mandatory for the NPP and any deviation must be reported to CNCAN.
As an example is presented the CNE Cernavoda radioactive waste systems monitoring programs, which are part of NPP monitoring program

The Solid Radioactive Waste Interim Storage Facility monitoring program includes:
- Ground water sampling for beta-gamma and tritium activities
- Atmospheric radiation surveys including air samples and gamma dose rate at the site boundary
- Contamination surveys of the entire site and structures
- Structures watertight surveys

Status of constructions during operation is monitored as follows:
- by current observations, visualizing the general status of the three concrete structures;
- by special precision measurements on fixed points with the intent of survey the external platform and buildings status.

Monitoring of radioactive organic liquids waste storage spaces is performed by means of gamma monitoring systems and monitoring of air contamination in accordance with radiation protection procedures.
Monitoring of spent resins storage vaults, as well as detection of excessive radiation levels in the room located in the neighborhood of the vaults is performed by means of gamma monitoring systems and monitoring of air contamination.

Similar requirements exist for FCN Pitesti, LEPI and STDR Pitesti, STDR Magurele, DNDR Baita Bihor.

H6.4. Engineering and technical support

The station organization chart for CNE Cernavoda documents the general areas of responsibility. The structure of the organization considers the needs for engineering and technical supports and for this reason it includes a strong Technical Unit covering System Performance Monitoring, Design Engineering and Component Engineering.
Also, it should be mentioned that a strong link is maintained with Romanian research institutes and with designer of the plant, Atomic Energy Canada Limited, Romania being member of CANDU Owners Group.
FCN Pitesti, SCN Pitesti and IFIN-HH consider also needs for engineering and technical supports. Their organizational chart include also staff for operation, maintenance, monitoring, inspection and testing of radioactive waste management facilities.

H6.5. Procedures for characterization and segregation of radioactive waste

As it was presented in a previous paragraph of the section B “Policies and Practices” the radioactive waste is categorized and segregated at all radioactive waste management facilities.

It shall be mentioned that at STDR Magurele and STDR Pitesti all radioactive waste conditioned packages are measured to comply with waste acceptance criteria at Baita Bihor.
At CNE Cernavoda, the characterization of radioactive waste is in progress.

H6.6. Incidents reporting to CNCAN

Incidents significant to safety are reported in a timely manner by CNE Cernavoda to CNCAN, according to established procedures. These reports and procedures are requested by CNCAN according to authorization conditions.

Abnormal Condition Reports are prepared to report those events that could have significant adverse impact on the safety of the environment, the public or the personnel, such as: serious process failures, violations of the Operating Policies and Principles, release of radioactive materials in excess of targets, doses of radiation which exceed the regulatory limits, events which interfere with the IAEA safeguards system.
For each reportable event a notification is made to CNCAN immediately after the discovery of the reportable event or within one working day depending on the gravity of the event and a report is prepared to document the event. For the events that are significant or complex, more detailed reports are prepared as Abnormal Condition Reports and submitted to CNCAN within the required time period.

Similar reporting systems are established in the authorization conditions and are precised in internal procedures of the licensee, in the case of FCN Pitesti, SCN Pitesti and of IFIN-HH.

H6.7. Collection and analyze of relevant operating experience

For CNE Cernavoda the station goal for operating experience is to effectively and efficiently use lessons learned from other plants and station operating experience to improve plant safety and reliability.
Station events and human performance problems often result from weaknesses or breakdowns in station processes, practices, procedures, training and system or component design that were not previously recognized or corrected. This is the reason why CNE Cernavoda considers, as the main topic of the Operating Experience Program, the Event Analysis System, comprising identification, evaluation and analysis of operational events (both internal and external) in order to establish and implement corrective actions to avoid re-occurrence.

The external information regarding operating experience proved to be a very important tool in improving station performance. Therefore, the second main topic of the operating experience program is the Information Exchange Program, with bi-directional use:

- collecting of external information and distribution to the appropriate station personnel;
- submitting the internal operating experience information to external organizations.

The basis for Operating Experience Program was set in place since the early stage of the commissioning phase (1993), with the objective to ensure:

- the reporting, reviewing, assessing of the station abnormal conditions and establishing of the necessary corrective actions;
- information exchange within CANDU Owner Group (COG), regarding abnormal conditions, technical problems, research and development projects, etc.

For the information exchange program, a COG (CANDU Owner Group) contact officer, appointed by the station management, with the following general responsibilities covers the relation between CNE Cernavoda and COG:

- serving as a liaison between COG and the station;
- reviewing the incoming messages and distributing them to the appropriate persons;
- ensuring the transmittal of the required information/reports to COG;
- ensuring optimum participation by the station personnel.

Programs to collect and analyse relevant operating experience are in place also at FCN Pitesti, SCN Pitesti and IFIN-HH.

H6.8. Decommissioning plans for radioactive waste management facilities

According to the provisions of Law no.111/1996 any nuclear installation needs to prepare decommissioning plans. This is valid also for the radioactive management facilities, other than repository. The regulations for decommissioning of nuclear facilities and installations require that for any radioactive waste treatment and conditioning facility, as well as for any radioactive waste storage facilities, decommissioning plans shall be prepared and updated.

H6.9. Plans for closure of disposal facilities

According to the Order no.400/2005 of CNCAN President for approval of regulations on the general requirements for near surface repositories, the closure of a near surface repository needs authorization for CNCAN. The Preliminary Safety Analysis report of DNDR Baita Bihor contains a special chapter which refers to the closure of repository. There is no provided yet a plan for closure of DNDR Baita Bihor.

The Order no.192/2002 of CNCAN President for approval of Radiological Safety Regulations for Radioactive Waste Management from Uranium Mining and Milling has provisions regarding the closure of the waste management facilities for uranium mining and milling.

H7. Institutional measures after closure *(Article 17)*

According to the Order no.400/2005 of CNCAN President for approval of regulations on the general requirements for near surface repositories, the active institutional control needs authorization from CNCAN. The regulation contains provisions on the institutional control after closure of repository. In the safety assessment report of DNDR Baita Bihor there is a chapter which details the monitoring after closure of repository.

It has to be mentioned that for the uranium mining and milling repositories, such requirements are implemented by Order no.192/2002 of CNCAN President for approval of Radiological Safety Regulations for Radioactive Waste Management from Uranium Mining and Milling.

SECTION I. TRANSBOUNDARY MOVEMENT

Transboundary movement *(Article 27)*

I1. Steps to ensure that transboundary movements are undertaken in a manner consistent with the Joint Convention and binding international instruments:

I1.1 Authorization of transboundary movement

According to Law no. 111/1996, import, export, and transit of radioactive materials, including spent fuel and radioactive waste, shall be authorized by CNCAN. It shall be noted that according to the above mentioned law, the import of radioactive waste (including of spent fuel, as Romania considers spent fuel to be radioactive waste) is prohibited. The only exception is when the import follows directly from the processing outside Romanian territory, of a previously authorized export of radioactive waste (including spent fuel), on the basis of the provisions of international agreements or of contracts concluded with commercial partners, under the terms of Law no. 111/1996.

According to the Romanian regulations for transport of radioactive materials the international shipment of radioactive materials can be performed only if the carrier gets a transport authorization issued by CNCAN. Shipment of B(U), B(M), C packages as well as any shipment of fissile materials which is not excepted by regulations needs a supplementary shipment authorization issued for the carrier or consignor for that particular shipment. The international shipments of any other packages or materials need to be notified to CNCAN before entering on the Romanian territory.

Supplementary, for the shipment of radioactive waste, the Regulation for International Shipments of Radioactive Wastes involving Romanian Territory, is also applicable. This regulation represents the transposing the Council Directive 92/3/EURATOM on shipment of radioactive waste between Member States and into and out of the Community.

For shipment of radioactive materials the Council Regulation 1493/1993 on the international shipment of radioactive materials between Member States is implemented into Romanian legislation.

I1.2. Subject of transit to relevant international obligations

As stated above in general for the transboundary movement, the transit on Romanian territory of radioactive waste and spent fuel is subjected to Romanian transport of radioactive waste regulations. It has to be noted that in Romania has been ratified and implemented the provisions of international agreements and conventions regarding the transport of dangerous goods (ADR, RID, ICAO, IMDG).
As it was explained above, all international shipments of spent fuel/radioactive waste involving Romanian territory need to be authorized by CNCAN.

In the authorization process, conditions are stated for presenting all the authorizations of the countries involved in the shipment and for harmonization of emergency plans and of escort arrangements of the countries involved in transport of spent fuel.

I1.3. Consent of transboundary movement by the State of destination

According to the provisions of the Regulations for International Shipments of Radioactive Wastes involving Romanian Territory Romania shall authorize an international shipment of radioactive waste only if consent of transboundary movement by the state of destination does exist.

I1.4. Authorization of transboundary movement by the State of origin

According to the provisions of the Regulations for International Shipments of Radioactive Wastes Involving Romanian Territory, CNCAN shall not authorize radioactive waste shipments to a country which, in the opinion of CNCAN, does not have the technical, legal or administrative resources to manage radioactive waste safely.
As Romania considers spent fuel to be radioactive waste, the requirement is applicable also for spent fuel.

I1.5. Re-entry into the territory of the country of origin in case the transboundary movement is not or cannot be completed in accordance with safety requirements

According to the provisions of the Regulations for International Shipments of Radioactive Wastes Involving Romanian Territory, when an international shipment of radioactive materials (or spent fuel) cannot be performed, or the shipment does not fulfill the requirements imposed for the authorization (approval) of the shipment, the radioactive material (spent fuel) shall be returned to the initial holder.

I2. Shipment of spent fuel or radioactive waste to a destination south to latitude 60º south for storage or disposal

According to the provisions of the Regulations for International Shipments of Radioactive Wastes Involving Romanian Territory, CNCAN shall not authorize radioactive waste shipments to a destination south to latitude 60º south.
As Romania considers spent fuel to be radioactive waste, the requirement is applicable also for spent fuel.

I3. Rights of contracting parties

As presented before, Romania has a legislative framework in accordance with international agreements and recommendations.

i. The Romanian transport regulations do not affect the exercise by ships and aircrafts of foreign countries, of maritime, river and air navigation rights and freedoms, as provided by international law.

ii. As presented above, import of radioactive waste shall be allowed, when the import follows directly from the processing outside Romanian territory, of a previously authorised export of radioactive waste, on the basis of the provisions of international agreements or of contracts concluded with commercial partners, under the terms of Law no. 111/1996.

iii. The Law no. 111/1996 establishes that the export of spent fuel for reprocessing is allowed.

iv. If export of spent fuel for reprocessing will be performed, the radioactive waste and other products resulting from reprocessing will be allowed to be returned, according to the provisions of the Law no. 111/1996 presented above, if there will be not arrangements for keeping the waste in the country where the fuel is reprocessed .

SECTION J. DISUSED SEALED SOURCES

Disused sealed sources *(Article 28)*

J1. Safe possession, remanufacturing or disposal of disused sealed sources

According to Romanian regulations, the radiation practices, including those involving sealed sources, shall be authorized. Exempted practices involve very low activity sources in consumer products, e. g. ^{241}Am smoke detectors of 1 μCi. According to Fundamental Regulations on Radiological Safety even these exempted sources are required to be disposed as radioactive waste.

The authorization of a practice does include the list of radiological installations, and the list of sealed sources contained in these installations. The transfer of radiological installations and radioactive sources from one holder of authorization to other holder requires transfer authorization
The transfer of sources for treatment, conditioning and long term storage or disposal is performed without transfer authorization. In this case, the sources are transferred to STDR Magurele and to STDR Pitesti. The two STDR have procedures for receiving the sources and for keeping records.
Generally, CNCAN requires that the sources that are no longer used, be transferred to STDR Magurele, or to another user, if they are still able to be used.

The storage of the disused sources is inspected by CNCAN, and if the conditions are not acceptable, CNCAN can take actions to enforce observance of regulations.

According to the Order no.356/2005 of CNCAN President for approval of regulation for high activity sources and orphan sources, CNCAN has to:

- develop an action plan for detection of orphan sources
- establish the responsibilities in the recovery of orphan sources and to develop and implement an emergency plan for recovery of these sources
- provide technical assistance to the members of the public who are accidentally involved in the detection of an orphan source.

J2. Reentry into the territory of Contracting Party of disused sealed sources

As presented before, according to Law no. 111/1996, Romania does not allow the import of radioactive waste, i.e. reentry on Romanian territory of disused sealed sources is not allowed, except in the case that the source can be reused.

SECTION K 1. FULFILMENT OF PLANNED ACTIVITIES TO IMPROVE SAFETY PROVIDED IN THE SECOND ROMANIAN NATIONAL REPORT

In the 2nd National Report submitted by Romania (Section K) and in the last corresponding review meeting, certain issues were identified as requiring further work for improvement of radioactive waste and spent fuel management and the submittal of more information in subsequent report.

In recent years, the institutions and organizations with responsibilities in the field of radioactive waste management and spent fuel management have paid special attention in the directions pointed to at that time. Valuable support of IAEA was done through technical cooperation programmes and the financial contribution of the European Commission, by the way of grants towards the financing of the nuclear safety for Romania. These have led to improvements in certain practices and the issuing of several laws.

1. Regarding the laws governing the management of spent nuclear fuel and radioactive waste:
    - The modification and completion of Government Ordinance No. 11/2003 was adopted by the Parliament on 15 January 2007. ANDRAD's and waste producers responsibilities have been updated and different methods of payment have been defined.
    - Based on this act, the Government adopted on September 5th 2007 Government Decision no. 1080 concerning setting up and management of financial resources for the management of radioactive waste and decommissioning of nuclear and radiological installations;
    - In 2006 ANDRAD has been started the consultations with stakeholders for updating the National Strategy for the management of spent nuclear fuel and radioactive waste. The consultation process has continued in 2007 and the first revision should be available in 2009;
2. As is described in this report, important steps were made in the area of the management of spent nuclear fuel and radioactive waste.
    - The capacity of DICA was increased by commissioning of two new concrete modules MACSTORE type for accommodating around 24000 fuel bundles.
    - In 2006 IFIN-HH finalized the Preliminary Safety Assessment Report for DNDR Baita Bihor. The report was approved by CNCAN;
    - CNCAN issued in February 2008 for ANDRAD the partial license, for the siting of a new repository for low and intermediate level radioactive waste. The repository should be operational by 2014 and will accommodate radioactive waste resulted from operation and decommissioning of CNE Cernavoda;
    - 435 corroded drums containing historical waste were reconditioned and disposed of at Baita repository. It is estimated that by the end of 2008 the repackaging activity of whole amount of drums will be completed;
3. In relation to decommissioning, the 9th edition of the decommissioning plan of the VVR-S research reactor was submitted to CNCAN in 2008. The decommissioning plan was endorsed by ANDRAD and is currently under CNCAN regulatory review.

SECTION K 2. PLANNED ACTIVITIES TO IMPROVE SAFETY

The following issues are identified as important for Romania for the next period:

1. Improvement of regulatory framework for predisposal and disposal of radioactive waste as well as for decommissioning of nuclear and radiological facilities
2. Revision of the strategy for the spent fuel management and for radioactive waste management, including their disposal.
3. Characterization of radioactive waste produced by operation of CNE Cernavoda Unit 1 and Unit 2.
4. Identification of techniques as well as technologies for treatment and conditioning of radioactive waste which is intended to be disposed in the Saligny near surface repository.
5. The preparation of conceptual decommissioning plan for CNE Cernavoda Unit 1 and 2.
6. The refurbishment of the Radioactive Waste Treatment Station (STDR) Magurele.
7. Improvement of safety of Baita-Bihor repository.
8. Transfer of DNDR Baita Bihor in ANDRAD's administration.
9. Improvement of safety of VVR-S spent fuel storage facility.
10. Repatriation of C-36 VVR-S spent nuclear fuel into the origin country.
11. Repatriation of EK-10 VVR-S spent nuclear fuel into the origin country.
12. Implementation of requirements stipulated in article 37- EURATOM Treaty for decommissioning of VVR-S research reactor.
13. Decommissioning of VVR-S research reactor from IFIN-HH.
14. Finalizing the site characterization and demonstration of safety of the LILW/SL Saligny near surface repository, in order to get the siting license from CNCAN.
15. Approval in the Parliament of the Saligny site for construction of the LILW/SL Saligny near surface repository.
16. Closure of the first part of Cetatuia II tailing pond of the Uranium Milling Plant of the Feldioara Subsidiary of the National Uranium Company.

17. Rehabilitation of the sites with sterile rock and low radioactive rock dumps resulted from geological research and mining activities for uranium ores production within the National Uranium Company.

SECTION L. ANNEXES

Table L-1: List of ***Spent Fuel Management Facilities***

Location	Spent fuel Management Facility	Main purpose
Nuclear Power Plant		
CNE Cernavoda	The Spent Fuel Handling System – U1	Wet handling and storage of the CANDU spent and defected fuel bundles
	The Spent Fuel Handling System – U2	
	The Interim Spent Fuel Dry Storage Facility (DICA)	Dry storage of the CANDU spent fuel bundles
Nuclear Research Centers		
SCN Pitesti	The Spent Fuel Storage Pool (TRIGA Reactor)	Wet storage of the TRIGA spent fuel elements (HEU and LEU)
	The Dry Storage Pits (LEPI)	Dry storage of the irradiated experimental fuel elements and fragments (TRIGA and CANDU)
IFIN-HH Magurele	The Spent Fuel Cooling Pool (VVR-S Reactor)	Wet storage of the VVR-S reactor spent fuel assemblies (EK-10 and C-36)
	The Spent Fuel Storage Ponds	

Table L-2: Inventory of ***spent*** nuclear ***fuel in storage at CNE Cernavoda*** at the end of 2007

Characteristics of storage facilities		Characteristics of stored spent fuel		
Storage Facility	Storage Capacity, (No. of fuel bundles)	Type of stored fuel	Storage inventory	
			Number of fuel bundles	Mass, (KgU)
CNE Cernavoda				
The Spent Fuel Bay – U1	50,000	CANDU bundle (37 elements)	33,508	636,652
The Spent Fuel Bay – U2	50,000		88	1,672
The Interim Spent Fuel Dry Storage (DICA)	324,000		22,800	433,200

<u>Table L-3</u>: Inventory of ***spent fuel in storage at Nuclear Research Centers*** at the end of 2007

Characteristics of storage facilities		Characteristics of stored spent fuel		
Storage Facility	**Storage Capacity**	**Type of stored fuel**	**Storage inventory**	
			Number of rods	**Mass, (KgU)**
SCN Pitesti				
TRIGA Reactor – The Spent Fuel Storage Pool	1,300 TRIGA fuel rods	TRIGA-HEU rod	611	27.05
		CANDU fuel bundle	111	55.62
		CANDU rods	1	0.3
LEPI – The Dry Storage Pits	25 CANDU fuel bundles	TRIGA-LEU rods/fragments	100	22.09
		TRIGA-HEU rods/fragments	3	0.308
		CANDU rods/fragments	11	5.17
IFIN-HH				
The Spent Fuel Cooling Pool	60 VVR-S assemblies	C-36 assemblies EK-10 assemblies	54 1	7.655 0.128
The Spent Fuel Storage Ponds	240 VVR-S assemblies	EK-10 assemblies	152	19.456
		S-36 assemblies	16	2.268

Table L-4: List of ***Radioactive Waste Management Facilities***

Location	Radioactive Waste Management Facility	Main purpose
Nuclear Power Plant		
CNE Cernavoda	The Solid Radioactive Waste System	Pretreatment and storage of NPP solid operational waste, except spent resins
	The Spent Resins Handling System	Storage of NPP spent resins
	The Gaseous Radioactive Waste System	Gaseous filtering and airborne releasing
	The Aqueous Liquid Radioactive Waste System	Aqueous liquid decontamination and environment discharging
	The Organic Liquid Radioactive Handling System	Organic liquid packaging and storage
Nuclear Fuel Fabrication		
FCN Pitesti	The Gaseous Radioactive Waste System	Gaseous filtering and airborne releasing
	The Liquid Waste Temporary Storage Tanks	Storage of liquid waste
	The Solid Waste Temporary Storage Platform	Storage of low contaminated solid waste
Nuclear Research Centers		
SCN Pitesti	Radioactive Waste Treatment Station (STDR Pitesti)	Treatment and conditioning of waste generated at SCN Pitesti and FCN Pitesti Recovery of Uranium from effluents
	Post Irradiation Examination Facility (LEPI)	Storage of HLW and LILW-LL
IFIN-HH Magurele	Radioactive Waste Treatment Station (STDR Magurele)	Treatment, conditioning and storage of institutional waste
		Storage and conditioning of historical waste
		Management of waste resulted from clean-up and future decommissioning activities
	National Repository for Low and Intermediate Level Waste (DNDR) – Baita Bihor	Disposal of the institutional waste.

Uranium Mining and Milling		
CNU – Feldioara Subsidiary	Cetatuia II Tailing Pond-Part I	Settling and storing of radioactive tailings resulted from milling process
	Cetatuia II Tailing Pond-Part II	
	Mittelzop Tailing Pond	Final settling of fines tailings
	The Old Trench Type Storage Facilities	Storage of solid radioactive materials
	The Low Activity Solid Radioactive Waste Disposal Facility	Storage of solid radioactive materials
CNU – Suceava Subsidiary	Mining sites	Storage and environment restoration/ remediation of sterile and radioactive rocks dumps resulted from research and uranium mining activities
CNU – Bihor Subsidiary	Mining sites	
CNU – Banat Subsidiary	Mining sites	
Radioactive Mineral Magurele	Old mining sites	Storage and environment restoration/ remediation of sterile and radioactive rocks dumps resulted from old uranium mining activities
Geolex SA	Old exploration sites	Storage and environment restoration/ remediation of sterile and radioactive rocks dumps resulted from old uranium and thorium geological exploration activities

Table L-5: Inventory of ***RW in storage at CNE Cernavoda*** at the end of December 2007

Characteristics of storage facilities			Characteristics of stored waste			
Storage Facility		Storage Capacity, m^3	Waste Class	Waste Form	Waste Material	Stored Volume, m^3
Name	Type					
CNE Cernavoda						
DIDR – Structure no.1	Warehouse	1,408.00	LILW	Solid	Operational waste	255.19
				Liquid	Organic waste	44.88
DIDR – Structure no.2	Concrete cylindrical cells	57.77	LILW	Solid	Spent cartridges	2.59
DIDR – Structure no.3	Concrete cubes	41.00	ILW	Solid	Large/highly contaminated pieces	0
Service Building	Vaults	600.00	ILW	Liquid +solid	Spent resins	79.35

Table L-6: Inventory of ***RW in storage at FCN Pitesti*** at the end of December 2007

Characteristics of storage facilities			Characteristics of stored waste			
Storage Facility		Storage Capacity, m^3	Waste Class	Waste Form	Waste Material	Stored Volume, m^3
Name	Type					
FCN Pitesti						
Liquid Waste Temporary Storage Tanks	Tanks	210	LLW	Liquid	Liquid radioactive wastes for transferring to STDR- Pitesti and liquid radioactive effluents for transferring to Purification Station - SCN Pitesti	74.5
Temporary Storage Platform for Low Contaminated Solid Waste	Ground platform	50	LLW	Solid	Non-combustibles wastes for transferring to CNU Feldioara repository and combustibles wastes for STDR-Pitesti)	20

Table L-7: Inventory of ***RW in storage at Nuclear Research Centers*** at the end of December 2007

Characteristics of storage facilities			Characteristics of stored waste			
Storage Facility		Storage Capacity m^3	Waste Class	Waste Form	Waste Material	Stored Volume/ Mass/ Pieces
Name	Type					
SCN Pitesti						
LEPI Pitesti – Precinct	Building	48	LILW-LL	Solid	Depleted uranium (from ^{60}Co therapy units of hospitals and industrial gammagraphy facilities)	4.00 tons
			HLW	Solid	^{60}Co spent sealed radioactive sources	3 pieces
LEPI Pitesti – Hot cells	Hot cells	7.5	HLW	Solid	^{60}Co spent sealed radioactive sources	6 pieces
			LILW-LL	Solid	Irradiation devices, irradiated samples, fragments of fuel cladding	0.6 m^3
IFIN-HH						
STDR Magurele – Radioactive Waste Storage Building	Concrete building with 5 rooms	660	LLW	Solid	IFIN waste	2356 kg
			LLW	solid		877 kg
			ILW	Liquid		0.09 m^3
			LILW-SL	Solid	SSRS	1044 pieces
			LILW-LL	Solid	SSRS	439 pieces
			LILW-LL	Solid	Smoke detectors	73,853 pieces

Characteristics of storage facilities			Characteristics of stored waste			
Storage Facility		Storage Capacity m^3	Waste Class	Waste Form	Waste Material	Stored Volume/ Mass/ Pieces
Name	Type					
			LLW-SL	Solid	Tc-99m generators	108 pieces
			LILW-SL	Solid	Historical waste	60 m^3
STDR Magurele – Spent Filters Storage Facility (DFU)	Concret platform with 4 closed wells	5	LILW	Solid	Aluminum irradiation devices	ND(*)
STDR Magurele – Depleted Uranium Storage Building	Building	30	LLW-LL	Solid	SSRS Shells	46 pieces
			LLW-SL	Solid		69 pieces
STDR Magurele – Storage Tanks	Ground platform with 2x300 m^3 tanks	600	LLW	Liquid	Operational Waste	210 m^3

(*) ND- Not Determined

Table L-8: Inventory of ***RW in storage at CNU*** at the end of December 2007

Characteristics of storage facilities			Characteristics of stored waste	
Storage Facility		Storage Capacity, tons (m^3)	Waste Material	Stored Volume, tons (m^3)
Name	Type			
CNU-Feldioara Subsidiary (milling)				
Cetatuia II – Part 1	Tailing pond	4,500,000 (2,120,000)	Milling tailings	4,500,000 (2,120,000)
Cetatuia II – Part 2	Tailing pond	880,000 (414,500)	Milling tailings	300,000 (155,400)
Mittelzop	Tailing pond for waste waters	300,000	Waste waters	300,000
The Old Trench Type Storage Facility	Trench	17,800	Low activity solid waste	17,827 (15,000)
The Low Activity Solid Radioactive Waste Disposal Facility	Surface repository	4,000 (6,560)	Low activity solid waste	3,200 (5,250)
CNU-Bihor Subsidiary (mining)				
Various ground platforms (4 sites)	Closed ground platform	N/A	Metallic and rubber waste	12 tons
Various dumps sites	Dumps	N/A	Sterile and radioactive rocks	4,257,962 m^3
CNU-Suceava Subsidiary (mining)				
Various dumps sites	Dumps	N/A	Sterile and radioactive rocks	684,553 m^3
CNU-Banat Subsidiary (mining)				
Various dumps sites	Dumps	N/A	Sterile and radioactive rocks	2,057,000 m^3
Radioactive Mineral Magurele (mining)				
Various dumps sites	Dumps	N/A	Sterile and radioactive rocks	ND

Table L-9: Inventory of ***RW disposed at DNDR – Baita Bihor*** at the end of December 2007

Characteristics of disposal facilities		Characteristics of disposed waste		
Disposal Facility	**Disposal Capacity, m^3 (No. of drums)**	**Waste Class**	**No. and Type of Disposal Packages**	**Disposed Volume, m^3**
IFIN-HH				
National Repository for Low and Intermediate Level Waste (DNDR)– Baita Bihor	5,000 (21,000/ 220L)	LILW-SL	406 / 320L	130
			7065 / 220L	1556
			435 / 420L	183