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

FIFTH NATIONAL REPORT

2014

República Argentina

República Argentina

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

FIFTH NATIONAL REPORT

On December 19, 1997, during the 41st Session of the General Conference of IAEA, the Argentine Republic executed the JOINT CONVENTION ON THE SAFETY OF SPENT FUEL MANAGEMENT AND ON THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT, agreed upon in Vienna during the Diplomatic Conference conducted on September 15, 1997. On July 6, 2000, the Argentine Congress enacted Law No. 25279 therefore ratifying the terms of the Joint Convention which entered into force on June 18, 2001.

The present National Report was prepared in accordance with Section 32 of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management to be submitted in compliance with Section 30 of the aforementioned Convention.

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

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ACRONYMS

AECL	**Atomic Energy of Canada Ltd.**
AGE	**Ezeiza Radioactive Waste Management Area**
ALARA	**As Low As Reasonably Achievable**
ANSI	**American National Standards Institute**
APS	**Probabilistic Safety Analysis**
ARN	**Nuclear Regulatory Authority**
ASECQ	**Spent Fuel Dry Storage System**
ASME	**American Society of Mechanical Engineering**
BSI	**British Standard Institute**
CAB	**Bariloche Atomic Centre**
CAC	**Constituyentes Atomic Centre**
CAE	**Ezeiza Atomic Centre**
CALPIR	**Advisory Committee for the Licensing of Personnel of Type I Installations**
CANDU	**Canadian Deuterium Uranium Reactor**
CAREM-25	**Argentine 25-MWe SMR**
CFR	**Code of Federal Regulations**
CMFSR	**San Rafael Mining and Milling Complex**
CNA I	**Atucha Nuclear Power Plant – Unit I**
CNA II	**Atucha Nuclear Power Plant – Unit II**
CNE	**Embalse Nuclear Power Plant**
CNEA	**Argentine Atomic Energy Commission**
CSA	**Canadian Standards Association**
DCMFEI	**Central Storage of Special Irradiated Fissionable Material (MTR SF Storage)**
DIN	**German Standards Institute**
DLM	**Master Logical Diagram**
DOE	**US Department of Energy**
ECCS	**Emergency Core Cooling System**
EPS	**Emergency Power System**
ESC	**Structures, Systems and Components**
EWS	**Emergency Water System**
ENREN	**Nuclear Regulatory Entity (Former Nuclear Regulatory Body)**
FACIRI	**Research Reactors Irradiated Fuel Storage Facility**
GRR	**Radioactive Waste Management**
HEU	**High Enriched Uranium**
HLW	**High Level Waste**
ICRP	**International Commission on Radiological Protection**
ILW	**Intermediate Level Waste**
ISO	**International Standard Organization**
LOOP	**Loss of Offsite Power**
LUE	**Enriched Uranium Laboratory**
LLW	**Low Level Waste**
LILW	**Low and Intermediate Level Waste**
LWR	**Light Water Reactor**
MCNP	**Monte Carlo Neutron Particle Code**
MDG	**Mobile Diesel Generator**
MTR	**Material Testing Reactor**
NASA	**Nuclear Power Plant National Operator (Nucleoléctrica Argentina)**
NEWMDB	**Net Enabled Waste Management Database, http://www-newmdb.iaea.org**
NPPs	**Nuclear Power Plants**
NORM	**Natural Occurring Radioactive Material**
NUSS	**IAEA Nuclear Safety Standards**
IAEA	**International Atomic Energy Agency**
OSART	**Operational Safety Review Team**
PHWR	**Pressurized Heavy Water Reactor**
PNGRR	**Radioactive Waste Management National Program**
PEGRR	**Radioactive Waste Management Strategic Plan**

PFS	**Sealed Source Production Plant**
PPMo99	**Molybdenum-99 Production Plant**
PPR	**Radioisotope Production Plant**
PPRS	**Radiological Protection and Safety Program**
PPUO2	**Uranium Production Plant**
PRAMU	**Uranium Mining Environmental Restoration Project**
PSR	**Periodic Safety Review**
PTAMB	**Intermediate and Low Level Solid and Liquid Radioactive Waste Treatment and Conditioning Plant**
PTARR	**Treatment and Conditioning Plant of Radioactive Waste**
RA-0	**Argentine Reactor 0**
RA-1	**Argentine Reactor 1**
RA-2	**Argentine Reactor 2**
RA-3	**Argentine Reactor 3**
RA-6	**Argentine Reactor 6**
RA-10	**Argentine Reactor 10**
RADWASS	**IAEA Radioactive Waste Safety Standards**
RPV	**Reactor Pressure Vessel**
RW	**Radioactive Waste**
RRII	**Research Reactors**
SAC	**Quality Assurance System**
SBO	**Station Blackout**
SG	**Steam Generators**
SHS	**Second Heat Sink**
SIEN	**Nuclear Emergency Response System**
SF	**Spent Fuel**
SIER	**Radiological Emergency System**
SIFEM	**Emergency Federal System**
SPDIN	**Nuclear Facility Decommissioning Subprogram**
TCV	**Volume Control Tank**
ULE	**Low Enriched Uranium**
UFA	**Spent Fuel Storage Building (CNA II)**
VLLW	**Very Low Level Waste**
WANO	**World Association of Nuclear Operators**

GLOSSARY

- *"closure"* means the completion of all operations at some time after the emplacement of spent fuel or radioactive waste in a disposal facility. This includes the final engineering or other work required to bring the facility to a condition that will be safe in the long term;

- *"decommissioning"* means all steps leading to the release of a nuclear facility, other than a disposal facility, from regulatory control. These steps include the processes of decontamination and dismantling;

- *"discharges"* means planned and controlled releases into the environment, as a legitimate practice, within limits authorized by the regulatory body, of liquid or gaseous radioactive materials that originate from regulated nuclear facilities during normal operation;

- *"disposal"* means the emplacement of spent fuel or radioactive waste in an appropriate facility without the intention of retrieval;

- *"disposable waste"* means those materials that cannot be dispersed in the environment due to its activity concentration and or total activity and therefore require treatment, conditioning and final disposal;

- *"exempt waste"* means those radioactive materials that can be removed from the regulatory control due to its activity concentration and or total activity, after a limited storage period for decaying;

- *"historical waste"* means those radioactive waste treated, conditioned or finally disposed applying criteria beyond the current regulatory frame and that require its re-assay;

- *"license"* means any authorization, permission or certification granted by a regulatory body to carry out any activity related to spent fuel or radioactive waste management;

- *"nuclear facility"* means a civilian facility and its associated land, buildings and equipment in which radioactive materials are produced, processed, used, handled, stored or disposed on such a scale that consideration of safety is required;

- *"operating lifetime"* means the period during which a spent fuel or a radioactive waste management facility is used for its intended purpose. In the case of a disposal facility, the period begins when spent fuel or radioactive waste is first emplaced in the facility and ends upon closure of the facility;

- *"radioactive waste"* means radioactive material in gaseous, liquid or solid form for which no further use is foreseen by the Contracting Party or by a natural or legal person whose decision is accepted by the Contracting Party, and which is controlled as radioactive waste by a regulatory body under the legislative and regulatory framework of the Contracting Party;

- *"radioactive waste management"* means all activities, including decommissioning activities, that relate to the handling, pre-treatment, treatment, conditioning, storage, or disposal of radioactive waste, excluding off-site transportation. It may also involve discharges;

- *"radioactive waste management facility"* means any facility or installation whose primary purpose is radioactive waste management, including a nuclear facility in the process of being decommissioned only if it is designated by the Contracting Party as a radioactive waste management facility;

- *"regulatory body"* means any body or bodies given the legal authority by the Contracting Party to regulate any aspect of the safety of spent fuel or radioactive waste management, including the granting of licenses;

- *"reprocessing"* means a process or operation, the purpose of which is to extract radioactive isotopes from spent fuel for further use;

- *"sealed source"* means radioactive material that is permanently sealed in a capsule or closely bonded and in a solid form, excluding reactor fuel elements;

- *"spent fuel"* means nuclear fuel that has been irradiated in and permanently removed from a reactor core;

- *"spent fuel management"* means all activities related to the handling or storage of spent fuel, excluding off-site transportation. It may also involve discharges;

- *"spent fuel management facility"* means any facility or installation, the primary purpose of which is spent fuel management;

- *"State of destination"* means a State to which a transboundary movement is planned or takes place;

- *"State of origin"* means a State from which a transboundary movement is planned to be initiated or is initiated;

- *"State of transit"* means any State, other than a State of origin or a State of destination, through whose territory a transboundary movement is planned or takes place;

- *"storage"* means the holding of spent fuel or of radioactive waste in a facility that provides for its containment, with the intention of retrieval;

- *"transboundary movement"* means any shipment of spent fuel or of radioactive waste from a State of origin to a State of destination.

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FIFTH NATIONAL REPORT

SECTION A INTRODUCTION

A.1 Summary of the Main Topics of the Report

The structure of the Fifth National Report complies with the *Guidelines Regarding the Form and Structure of National Reports* (INFCIRC/604/Rev.3).

Section A describes the scope of the nuclear activity developed in Argentina since 1950 as well as the legal and regulatory framework. It also makes reference to the *Strategic Plan for Radioactive Waste Management* (*Strategic Plan*), which refers to the safety of Spent Fuel Management and Radioactive Waste Management.

Section B sets out the policies for the safety of Spent Fuel Management and Radioactive Waste Management and includes a description of national practices in connection with said policies.

Section C lays down the scope of application for Argentina of the terms of the Joint Convention, regarding spent fuels, naturally occurring radioactive materials (NORM) and disused sealed sources. The content of this section does not reflect modifications with respect to the declarations in the prior National Reports.

Section D describes the facilities destined for spent fuel management and radioactive waste management, including their respective inventories. Discharges and pertinent doses are included in Section F.

The Legislative as well as the Regulatory framework are explained in **Section E**. Special emphasis is given to the implementation of safety measures and regulations. The structure and responsibilities of the Regulatory Body are also described.

Section F explains the obligations foreseen with reference to the responsibilities of the license holder, human and financial resources, quality assurance, operational radiation protection, emergency preparedness and decommissioning.

Section G deals with the safety of spent fuel management and the obligations defined by the Joint Convention regarding:

- General safety requirements
- Existing facilities
- Siting of projected facilities
- Design and construction of facilities

- Safety Assessment of facilities
- Operation of facilities
- Final disposal of spent fuel

This section includes a brief description of the facilities, their condition and the actions taken or foreseen to improve safety.

Section H specifies the degree of compliance with the responsibilities foreseen for radioactive waste management on the following matters:

- General safety requirements
- Existing facilities and past practices
- Siting of projected facilities
- Design and construction of facilities
- Safety Assessment of facilities
- Operation of facilities
- Institutional measures after closure

This section includes a brief description of the facilities, their condition and the actions taken to improve safety.

In this Section, a summarized description of the situation of Uranium mining waste has also been included.

It should be noted that the spent fuel management facilities and radioactive waste management facilities are located in the same site, either in the Ezeiza Radioactive Waste Management Area (AGE), in Atucha Nuclear Power Plant site (CNA I and CNA II) and in Embalse Nuclear Power Plant (CNE), therefore the contents of Section G also apply to Section H equivalent responsibilities, except for those cases where the latter are specific.

Section I covers the obligations and experiences inherent to transboundary movement provided in article 27 of the Joint Convention.

Section J makes reference to disused sealed sources provided in article 28 of the Joint Convention.

Section K describes the activities planned to improve safety and specifies the measures that are foreseen to be adopted in the future.

Section L includes the Annex containing the relevant Laws, and R&D activities related to SF & RW.

A.2 Overview

The present National Report describes the actions taken in Argentina on the safety of spent fuel (SF) management and on the safety of radioactive waste (RW) management, in order to provide evidence of the fulfilment of the obligations derived from the Joint Convention. To facilitate the reading and a better understanding, it has been decided to

include a summary of those parts of the prior National Reports that are considered necessary in order to comply with this objective.

Nuclear energy began its development to be used for different applications in Argentina during 1950, when the Argentine Atomic Energy Commission (CNEA) was created. Initially research and development activities were conducted in basic areas. In the following years, progress has been made with the development of nuclear technology, the operation of relevant facilities working on the production of radioisotopes for medical and industrial applications and the performance of tasks in connection with the nuclear fuel cycle, including mining and uranium processing activities, manufacturing of fuel elements for research and power reactors, production and generation of nuclear power, production of heavy water and the operation of two nuclear power plants. In the past, reprocessing programs were undertaken at demonstrative scale.

As a result of these activities and others performed in the nuclear field by other private and public entities, different types of radioactive waste have been generated, which are managed by applying the legal and regulatory provisions in force, in agreement with the obligations derived from the Joint Convention.

The legal framework applicable to radioactive waste management integrates with the provisions of the National Constitution and with the legislation adopted by the National Congress by Law No. 24804 which regulates the Nuclear Activity and Law No. 25018 which determines the Radioactive Waste Management Regime along with Law No. 25279 which approved the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, as well as different laws related to the nuclear activity in accordance with treaties, conventions, agreements and international conventions.

In addition, accordingly with the Federal Government adopted in Argentina, a number of provincial and municipal regulations are in force with a significant impact on radioactive waste management activities in the country.

The National Law No. 24804 assigns CNEA the state ownership of spent fuel and the responsibility for the management of radioactive waste.

It also sets forth that CNEA shall determine the way in which nuclear power plants and any other significant facilities (Type I Facilities) are decommissioned.

Furthermore, the same Act creates the *Nuclear Regulatory Authority* (ARN), successor to the Nuclear Regulatory Entity (ENREN), which is empowered to regulate and supervise the nuclear activity in all matters related to radiological and nuclear safety, security and safeguards. Likewise, it authorizes the ARN to supervise the use of nuclear materials, the licensing of persons and facilities, and the verification of national and international safeguards.

Likewise, Law No. 25018 appoints CNEA as the implementing authority to perform all the activities related to radioactive waste management and sets up the *National Radioactive Waste Management Program* (PNGRR), responsible for the compliance with the

Radioactive Waste Management Strategic Plan (PEGRR).

For a better understanding of the contents of this National Report, the definition of *radioactive waste* has been specified, understanding that it includes:

- **exempt radioactive materials (exemption/clearance)**: radioactive materials that on account of their concentration of radioactivity and/or total radioactivity may be released from regulatory control.

- **discharges**: liquid and gaseous effluents containing radioactive materials that originate from the normal operation of a facility and that due to their total activity may be discharged into the environment in a planned and controlled manner.

- **radioactive waste**: materials that on account of their concentration of activity and/or total activity, cannot be dispersed into the environment and therefore, require treatment, conditioning and final disposal.

A.3 National Program for Spent Fuel and Radioactive Waste Management

As has already been mentioned, in September 23rd 1998 CNEA was appointed through Law No. 25018 as the application authority for matters related to radioactive waste management and determined the obligation to develop a *Radioactive Waste Management Strategic Plan (PEGRR)*, subject to the approval of the National Congress.

This PEGRR outlines the commitments that the National Government must assume for the safety of Spent Fuel Management and Radioactive Waste Management, ensuring public health, the protection of the environment and the rights of future generations.

The last update of the PEGRR includes the Fourth Nuclear Power Plant construction and its commercial start-up, the life extension of Embalse Nuclear Power Plant and the start-up of CAREM Prototype Reactor. These activities were declared to be a matter of national interest in the provisions of Law No. 26566.

Likewise, the Plan includes the relevant amendments to Atucha NPP, Units I and II, current research and production and reactors in operation and those to be erected, the facilities of the ARGENTINE ATOMIC ENERGY COMMISSION and the Argentine corporations CONUAR S. A. and DIOXITEK S. A.; as well as the changes related to URANIUM MINING ENVIRONMENTAL RESTORATION PROJECT (PRAMU) and PILCANIYEU TECHNOLOGICAL CENTRE and so on.

PEGRR establishes the mechanisms to manage in a safe manner all waste originated from the development of practices and also those generated in decontamination activities and decommissioning of nuclear facilities and radioactive installations. Moreover, it proposes research and development plans associated with technologies elected for every management stage, suitable human resource training, availability of necessary funds in furtherance of the Plan and related social communication activities.

This document outlines technological solutions related to the state-of-the-art technology which enable radioactive waste and spent fuels generated in Argentina to be managed efficiently.

Although spent fuel is considered a potential energetic resource due to its fissile material content, the decision about including spent fuel management reprocessing has been postponed until 2030.

Every activity included in PEGRR that may imply a radiological risk is regulated by ARN. Standards and regulations issued by ARN are based on radiologic and nuclear safety criteria consistent with those internationally adopted.

On the other hand, PEGRR is encompassed within the environmental policy of our country that, in the case of waste management, takes into account the concurrent powers of the Nation, the Provinces and the Autonomous City of Buenos Aires. In this sense, Section 4 of Law No. 25018 sets forth that CNEA shall coordinate with the Provinces and the Autonomous City of Buenos Aires the enforcement of the Radioactive Waste Management System, in order to make it possible to manage radioactive waste produced in these places and set up cooperation and advisory systems for the competent organizations.

With reference to the sites where the future facilities for the final disposal of radioactive waste shall be located, Law No. 24804 sets forth that CNEA, in its role of Responsible Organization, shall propose the potential sites that may result from the studies performed. These sites will require the approval both of ARN from the radiological and nuclear safety point of view and of a Law issued by the Provincial Government where the proposed repository would be placed.

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SECTION B POLICIES AND PRACTICES

B.1 Spent Fuel Management Policy

In Argentina, the Government exercises state ownership of special radioactive fission material contained in spent fuel from any origin: nuclear power plants and experimental, research and/or production reactors. (Section 2, Law No. 24804).

In this sense, the decision whether to reuse or not fissile material contained in spent fuel has to be adopted before 2030. At such time, the installation of the underground laboratory must have been started, which allows a deep geological repository to be designed and constructed. Said repository must be operative by 2060 (Strategic Plan – Law No. 25018).

With regard to spent fuel generated in the operation of research reactors or radioisotope production reactors and for which no further use is envisaged, the strategy considers two alternatives:

- Shipping to the country where the nuclear material was originally enriched, if possible.
- Wet interim storage. Afterwards, treatment and conditioning for final disposal.

Here we may underline that due to the adhesion of Argentina to the RERTR Program (Reduced Enrichment for Research and Test Reactors) in December 2000, July 2006 and November 2007, all spent fuel from research and production reactors containing Highly Enriched Uranium (HEU) were exported to the Department of Energy of the USA (US DOE) in the frame of the *Spent Nuclear Fuels from Foreign Research Reactors Acceptance Program.*

B.2 Spent Fuel Management Practice

The practice adopted in Argentina with reference to spent fuel management has been wet storage during the time necessary to allow for sufficient decay of the fission products and later interim dry storage.

In the case of CNE nuclear power plant, the spent fuel is stored in pools at the facility for a period of at least six (6) years and is subsequently transferred to dry storage (in concrete silos ASECQ, described in Section G).

At CNA I, spent fuel is subject to wet storage at the power plant itself. Nowadays, its capacity is enough to store spent fuel in CNA I until 2015 at least.

A building annex to CNA I with vertical dry silos for interim storage of SF will be constructed with the aim of allowing the transfer from the pools building of those more decayed SF (see G.4.1).

At CNA II, the SF to be produced during its future commercial operation will also be subject to wet storage in pools within the same NPP (see G.2.2).

Spent fuel originated by the operation of research and radioisotope production reactors is stored in a pool at the respective reactor site, until the fission products decay sufficiently and are later transferred to a temporary spent fuel storage facility (Central Deposit for Special Irradiated Fissionable Material - DCMFEI), which is at the end of its lifetime and thus will be replaced by a new wet storage facility (FACIRI).

The new facility for the temporary storage of SF originated in RRII (Irradiated Fuel Storage Facility of Research Reactors – FACIRI) will replace DCMFEI deposit and includes safety improvements.

Currently, all spent fuel from research and production reactors containing Highly Enriched Uranium (HEU) provided by the USA have been returned to the Country of origin.

For the remaining low-enriched SF (20%), as mentioned above, there is a first extended wet storage, where it will stay until its reprocessing or final disposal in a deep geological repository is defined.

Beyond the decision to be adopted, the Strategic Plan foresees the development of research and development activities related to the final disposal of spent fuel, or the fission products contained therein.

B.3 Radioactive Waste Management Policy

The main guidelines of the policy to be applied to radioactive waste management are:

- The radioactive waste originated from all nuclear applications performed in the country, including waste arising from the decommissioning of related facilities, will be managed safely.

- The allocation of responsibility for the development of radioactive waste management corresponds to the National State through CNEA, having the generator the obligation of providing the necessary resources for such management.

- The management of radioactive waste will be performed safely, ensuring the protection and the rights of present and future generations and the environment.

- The PEGRR will be authorized, periodically reviewed and audited by the National Congress.

- The establishment of a proper procedure to obtain and to manage the necessary financial resources in order to comply with the obligations arising from the performance of the assigned responsibilities with reference to this matter, considering that many of them imply costs deferred in time.

- A system for registry and preservation of information will be implemented, to ensure complete tracking of inventories of radioactive waste generated and to be generated from all nuclear activities in the country.

- A public communication and information program will be implemented.

In agreement with this policy, the following additional factors have been taken into account:

- The main responsibility for radioactive waste management lies in the National State through the *Argentine Atomic Energy Commission (CNEA*).
- The regulation and supervision of radioactive waste management are duties inherent to the National State performed by the *Nuclear Regulatory Authority (ARN).*
- The implementation of the policy on this matter will follow the guidelines of the *National Radioactive Waste Management Program*, with the responsibilities specified in Law No. 25018, handling the radioactive waste management in the Republic of Argentina with an integrated perspective.

In order to achieve its objectives, this *National Radioactive Waste Management Program* shall ensure the following:

- Identification and assessment of accumulated and projected waste inventories
- Adoption of the appropriate technological solutions for the safe management of such waste, with scientific-technological support
- Definition of responsibilities and specification of obligations, and interrelations of the involved parties, from the generation of waste to the final stage of management
- Definition of the required facilities for final disposal
- Communication of its activities to the public and provision of the required information
- Assessment of the costs associated to all these activities, determination of the financial sources and the financial and management methods

The establishment of the PEGRR implies the definition of the treatment methodology and the final disposal technological systems for the different types of waste. The review every three years of the *Strategic Plan* is conducted as set forth in the provisions of the Law and provides the opportunity to introduce the modifications originated by management optimisation in its technological aspects derived from scientific breakthroughs, or from the development of innovative technologies and eventual changes in the strategic definitions relative to spent fuel treatment.

The communication and information program intended for the public will provide the required information so that the population may value the scope of the proposed plans as well as their benefits, providing the adequate environment for public participation in subjects of their concern.

B.4 Radioactive Waste Management Practice - Criteria

The following criteria are applied to radioactive waste management:

- The radioactive materials that on account of their activity concentration and/or total activity may be considered exempt will be released from regulatory control.
- The optimized discharges of liquid and gaseous radioactive materials may be released into the environment in compliance with the authorized discharge limitations determined by the corresponding operation license.
- Those radioactive materials that on account of their activity concentration and/or total activity cannot be released into the environment will be treated and conditioned for their final disposal.

Regarding the first case, the Nuclear Regulatory Authority sets the exemption criteria that radioactive materials may be exempt in case the resulting effective dose for individuals most exposed does not exceed 10 µSv/year and the effective collective dose does not exceed 1 man-Sv/year.

The regulatory guidelines GR6-Rev.0 set general exemption levels for 300 radionuclides in values or concentration levels corresponding to those stated in GSR Part 3, Annex I, Chart I-I: Radiation Protection and the Safety of Radiation Sources: International Basic Safety Standards (Interim Edition), for moderate quantities of material.

Moreover, by means of a Resolution, the ARN Board adopted a number of general values for clearance which correspond to the values indicated in IAEA Safety Guide No. RS-G-1.7. The Regulatory Guidelines GR8-Rev-0 were published in March 2011 in order to apply those values.

In the second case, the Standard AR 6.1.2, *Radioactive Effluents Limitation Standard for Type I Radioactive Facilities*, determines that:

- The release of radioactive material to the environment should be as low as possible.
- The effective annual dose in the critical group due to radioactive effluent discharge of each facility should not exceed 0.3 mSv.

In addition, since June 2013, ARN has established that in case of the design of a nuclear power reactor, a nuclear research reactor or a Type I radioactive facility within a site containing several facilities, sufficient retention for the emission of radioactive effluents shall be foreseen, so that it does not exceed the annual dose in a person, equivalent to 0.5 mSv, considering the radioactive effluents of all facilities within the site.

The authorized discharge limits are established by ARN for each facility, taking into consideration some degree of flexibility in accordance with the normal operation of the plant without neglecting the compliance of the ALARA criterion.

Operating Licenses granted by ARN to the relevant facilities establish authorized discharge limits to release gaseous and liquid effluents.

Facilities include storage and decay tanks for liquid effluents, where they are controlled and stocked. These liquids are discharged into the environment in agreement with authorized values established in the relevant operating licenses.

In the case of gaseous discharges, the discharge is conducted in accordance with activities measurements and the authorized values imposed in operating licenses.

The authorized discharge limits are defined for each facility and are included in the respective Operating Licenses.

Finally, the Standard AR 10.12.1 “Radioactive Waste Management” determines the general and particular criteria for waste generators and for those responsible for their management. This standard regulates the management of materials containing radioactive substances that on account of their nature and/or activity cannot be released into the environment.

B.4.1 Criteria Applied to Define and Classify Radioactive Waste by Categories

The new category proposed by IAEA has recently been adopted as a classification system which entails six classes of radioactive waste, mainly based on long term safety considerations and on the disposal of radioactive waste. While the generic relationship is entailed between different classes of waste and options, the acceptance of waste for a particular disposal facility requires to be proved by means of a safety analysis.

(1) Exempt waste (EW): Waste that meets the criteria for clearance, exemption or exclusion from regulatory control for radiation protection purposes.

(2) Very short lived waste (VSLW): Waste that can be stored for decay over a limited period of up to a few years and subsequently cleared from regulatory control according to arrangements approved by the regulatory body, for uncontrolled disposal, use or discharge. This class includes waste containing primarily very short half-lives radionuclides often used for research and medical purposes.

(3) Very low level waste (VLLW): Waste that does not necessarily meet the criteria of EW, but that does not need a high level of containment and isolation and, therefore, is suitable for disposal in near surface landfill type facilities with limited regulatory control. Such landfill type facilities may also contain other hazardous waste. Typical waste in this class includes soil and rubble with low levels of activity concentration.

(4) Low level waste (LLW): Waste that is above clearance levels, but with limited amounts of long lived radionuclides. Such waste requires robust isolation and containment for periods of up to a few hundred years and is suitable for disposal in engineered near surface facilities. This class covers a very broad range of waste. LLW may include short lived radionuclides at higher levels of activity concentration,

and also long lived radionuclides, but only at relatively low levels of activity concentration.

(5) Intermediate level waste (ILW): Waste that, because of its content, particularly of long lived radionuclides, requires a greater degree of containment and isolation than that provided by near surface disposal. However, ILW needs no provision, or only limited provision, for heat dissipation during its storage and disposal. ILW may contain long lived radionuclides, in particular, alpha emitting radionuclides that will not decay to a level of activity concentration acceptable for near surface disposal during the time for which institutional controls can be relied upon. Therefore, waste in this class requires disposal at greater depths, of the order of tens of meters to a few hundred meters.

(6) High level waste (HLW): Waste with levels of activity concentration high enough to generate significant quantities of heat by the radioactive decay process or waste with large amounts of long lived radionuclides. They should be included in insoluble matrixes such as glass or ceramic and packed in high-integrity and -durability containers. Disposal in deep, stable geological formations usually several hundred meters or more below the surface is generally the option used for disposal of HLW.

This classification is used only with the aim of providing information about radioactive waste inventories and to organize the information of this National Report. As regards the limits of content of each radioisotope, said limits will be established in accordance with safety assessment of the final disposal site once it has been selected.

B.4.2 Origin of Radioactive Waste

The origin of waste included in each one of the categories stated in Section B.4.1 is the following:

- EXEMPT WASTE: those originated in different activities. This waste shall not be considered radioactive waste once they have been released from regulatory control.
- VERY SHORT LIVED WASTE: Solid and liquid biological waste generated from research centres, medical applications, etc., containing radioisotopes with periods of disintegration less than 100 days such as Ir-192, Tc-99m, I-131, Fe-59 which may be released from regulatory control after being stored until they decay below the authorized limits.
- VERY LOW LEVEL WASTE: They are included in the category of waste generated in extracting operations and processing of uranium. The remains of the material after extracting the largest amount of uranium are technically named “mill tailings”

  Mill tailings, along with mineral not economically exploitable and ores, are known as “mining waste”. Also included in this category are contaminated soils and waste originated during the operation and decommissioning of nuclear facilities with activity levels slightly superior to those specified in the levels of exemption.

- LOW LEVEL WASTE: This waste may be classified as:

  a) Conditioned Waste: conditioned under procedures framed into a quality system, in specially designed metallic 200 L drums, safely stored in authorized facilities. These waste include:

     - Solid and liquid waste originated in NPPs in radioisotope production facilities, in isotope production and research reactors and facilities related to the fuel cycle.
     - Incompressible non-compactable waste from the operation of nuclear power plants and other nuclear facilities, conditioned directly in 200 L drums.
     - Wet solid waste (sludge) originated in the treatment of liquids from CNA I, conditioned on site with cement matrixes within 200L drums.
     - Short-lived decayed or disused sealed sources (τ<5 years), conditioned in industrial drums embedded in cement matrixes.
     - Liquid and solid biological waste generated in research centres, medical applications and so on, treated and conditioned by means of specific techniques adequate to the type of waste.
     - Waste originated from decommissioning of nuclear power plants.

  b) Non-conditioned waste: safely stored, to be characterized and tested in order to define the proper treatment and conditioning in accordance with the definition of acceptance criteria for its future disposal or long term storage.

     - Spent ion exchange resins and filters used in nuclear facilities.
     - Decayed sealed sources originated from medical and industrial applications.
     - Contaminated and/or activated structural elements originated in decommissioning of nuclear facilities.
     - Organic or watery liquids originated from radioisotope production and manufacture of nuclear fuels, stored in stainless steel containers.
     - Solid wet waste. Sludge originated from fuel manufacture and exhausted resins coming from radioisotope production reactors or research reactors.

- INTERMEDIATE LEVEL WASTE: This kind of waste consists of alpha emitters from the experimental development of mixed oxide fuel (MOX) and other materials containing long lived isotopes as those used in medicine (Radium-226 tubes, cells and needles, Pu-238 pacemakers, depleted-uranium shields, etc.) and in industry (neutron sources). Resin and filters that do not comply with the limits established for low level waste are also included in this type of waste.

- HIGH LEVEL WASTE: These are fission products contained in spent fuel from the operation of nuclear power plants and spent fuel elements from research and production reactors.

B.4.3 Practices Applied for Radioactive Waste Management

Radioactive waste management practices have been defined in the PEGRR. These practices are based on the consideration of different alternatives for final disposal and they take into account technical, operational and financial factors.

Parts of these practices include the minimization and segregation of waste at the generator's facilities. Based on the performed segregation, treatment and conditioning technologies are applied to each type of waste according to the foreseen final disposal alternative.

Low Level Waste

In the case of *compactable solid radioactive waste* generated from the operation and maintenance of Nuclear Power Plants as well as in other nuclear and radioactive facilities, the treatment consists in reducing the waste volume compacting it in 200 L drums. *Non-compactable solids* such as metal parts, debris, etc. are also stored in 200 L drums.

With reference to low level *liquid waste* generated in nuclear power plants, the management is different depending on the technologies used in each plant. At CNA I, liquid waste generated from operation and maintenance activities is collected in tanks, characterized and concentrated by evaporation. Concentrates, as well as sludge from the clean-up of tanks, are immobilized in cement matrixes and conditioned in 200 L drums.

In the case of CNE, liquid waste originated from operation and maintenance activities are treated in resin beds, discharging in a planned and controlled way the low activity current into the environment, following pre-established procedures and within the range of discharge values authorized by the Regulatory Authority.

Spent resin beds and mechanic filters, classified as low or intermediate level radioactive waste, depending on the limits established in the licences of future repositories, are stored at the facilities specially designed in each Power Plant awaiting treatment and conditioning in accordance with compatible procedures in compliance with the waste acceptance requirements determined by the Managing Organization of final disposal.

At AGE, there is an especially designed interim storage facility where non-conditioned waste may be stored prior to their processing, as well as conditioned waste packages awaiting transport and/or final disposal.

Repository for Low Level Radioactive Waste

Initially, the practice applied for the final disposal of *Low Level* solid radioactive waste has consisted in the disposal of conditioned waste packages in engineering enhanced surface semi-containment systems located in the Ezeiza Radioactive Waste Management Area (AGE), operated by the Argentine Atomic Energy Commission (CNEA) as Management Organization. Since 2001, every final disposal activity of radioactive waste at AGE has been discontinued in order to conduct the Radiological Safety re-evaluation and to define the conditions for its closure.

Packages that had been located within the solid waste semi-containment system and that had not been covered with the multilayered system, have been recovered, re-encapsulated and placed in transoceanic containers stored within the Long Term Storage Deposit awaiting their final disposal.

Conditioned packages with high doses of exposure are in special concrete containers which provide the adequate shield so that they can be safely handled.

In the case of *very short lived liquid waste,* the practice at the AGE consisted in the absorption of radionuclides by silt-calcareous soil beds with a high content of high-retaining capacity clays, thus certain radionuclides with short half-life decayed to negligible levels during their permanence in the bed volume.

The disposition of *structural waste* which on account of its size cannot be conditioned in drums was made directly at the AGE's *Structural Material Final Disposal System*, conceived to handle low level specific activity waste (generally metal pieces coming from contaminated areas), which was periodically immobilized with a concrete casting in order to avoid dispersion.

The Strategic Plan aims to build new repositories for very low and low level waste. Works related to the first stage to search for and select sites and areas to locate both repositories within the same site are being performed, which is planned to be selected by 2020.

In the case of *Low Level* waste requiring a bigger level of isolation, the construction of final disposal systems near surface is foreseen, similar to those in operation in L'Aube, France and El Cabril, in Spain. This type of repository is based on the use of multiple and redundant barriers, completing the model with the application of approximately 300 years of institutional post-closure control. Waste will be immobilized in cement matrixes and packed in 200L drums and/or in special concrete containers.

High and Intermediate Level Waste

With respect to *High Level Waste* generated in the final stage of the nuclear fuel cycle, spent fuel is temporarily stored until a decision on its reprocessing or final disposal is adopted.

The PEGRR foresees to perform studies for the siting, construction and operation of a Deep Geological Repository. The deadline for the decision on the possible reprocessing or final disposal of the SF is subject to the completion of the studies for the siting of the Deep Geological Repository, which have to be concluded at the latest by 2030.

Duly treated and conditioned *Intermediate Level Radioactive Waste* shall also be disposed of in the deep geological repository.

Deep Geological Repository

As already has been informed, the need to have a deep geological repository in Argentina is foreseen in the very long term; therefore, the activities that are being performed are all included in the R+D Plan of PNGRR.

If the reprocessing (closed cycle) option is adopted for waste generated from the last stage of the cycle, high level waste separated at that stage would be conditioned in especially designed glass matrixes and containers, and finally disposed of in the deep geological repository.

If on the contrary, the closed cycle option is not acceptable, SF shall be conditioned and directly disposed of in the geological repository.

Until the projected Waste Repositories are available, waste and spent fuel awaiting final disposal are stored in facilities especially designed for this objective.

SECTION C SCOPE OF APPLICATION

As in previous reports, this Fifth National Report deals with safety measures applied to the management of spent fuel and radioactive waste originated from all uses of nuclear energy, both inside and outside the fuel cycle, including wastes originated from nuclear power generation, manufacturing of nuclear fuel, mining and uranium processing, production of radioisotopes for medical purposes, industrial uses, research and development activities, including controlled and planned radioactive discharges derived from the normal operation of the facilities where the above mentioned practices are performed.

The present National Report also deals with safety of disused sealed sources.

This National Report is not applicable to Naturally Occurring Radioactive Material (NORM) originated outside the fuel cycle since Law No. 25018, “Radioactive Waste Management Regime”, in its Section 2, defines its scope of application exclusively to those derived from the nuclear activity conducted in the Argentine national territory.

As has been stated in prior National Reports, Argentina has no reprocessing plants in operation and such plants are not included in plans for the near future.

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SECTION D LISTS AND INVENTORIES

D.1 Spent Fuel Management Facilities

The current spent fuel management facilities are the following:

SITE	FACILITY
CNA I	I & II Pool Building
CNA II	Pool Building (UFA)
CNE	Storage pool
CNE	Storage silos (ASECQ)
Ezeiza Radioactive Waste Management Area (AGE)	Central Storage Facility for research reactors SF (DCMFEI – FACIRI[1])

([1]) Licensing in process

A brief description of these facilities is shown in *Section G.2 Existing Facilities*.

D.2 Spent Fuel Inventory

D.2.1 CNA I

INVENTORY until Nov 28th, 2013 (*)			
SYSTEM	QUANTITY	U total	Pu (**)
		kg	kg
Pools I - II	10,884	1,652,777.12	6,103.77

D.2.2 CNE

INVENTORY until Sep 10th, 2013 (*)			
SYSTEM	QUANTITY	U total	Pu (**)
		kg	kg
Pool	32,845	614,380.26	2,212.18
Silos	105,120	1,960,934.48	7,206.56
TOTAL	137,965	2,575,314.75	9,418.74

D.2.3 AGE

INVENTORY until August 13th, 2013 (*)		
TYPE	QUANTITY	Kg
MTR	176	204.40
PINS (***)	232	14.19
Total	408	218.59

(*) PIV Date (PIV: Physical Inventory Verification, IAEA)
(**) Estimates obtained by means of a calculation code, on the basis of SF burn-up, residence time, and position in the core.
(***) Pins: Research reactors pin type fuel

D.3 Radioactive Waste Management Facilities

The existing radioactive waste management facilities at the date are the following:

SITE	FACILITY
Atucha Nuclear Power Plant Unit I	Liquid Radioactive Waste Treatment & Conditioning System
	Liquid Radioactive Waste Treatment System by Concentration
	Immobilization System by Cementation of Radioactive Waste
	Treatment & Conditioning System for Solid Radioactive Waste
	Storage Facilities for Solid Radioactive Waste
	Treatment & Storage System for Mechanical Filters from the Reactor's Primary Circuit
	Storage System for Exhausted Ion Exchange Resin
Atucha Nuclear Power Plant Unit II	Treatment & Conditioning System for Liquid Radioactive Waste
	Treatment & Conditioning System for Solid Radioactive Waste
	Treatment System by Concentration of Liquid Radioactive Waste
	Immobilization System by Cementation and Storage of Radioactive Waste, Exhausted Ionic Exchange Resin, and Mechanical Filters from the Reactor's Primary Circuit
	Discharge System for Gaseous Radioactive Waste
Embalse Nuclear Power Plant	Treatment & Conditioning System for Solid Radioactive Waste
	Solid Radioactive Waste Storage Facilities
	Exhausted Resin Storage Tanks
	Liquid Radioactive Waste Treatment System
	Gaseous Radioactive Waste Treatment Facility
	Facilities for Storage of Low, Intermediate and High Level Radioactive Waste for the Life Extension Project
Ezeiza Atomic Center	Plant for Decay, Pre-treatment and Discharge of Active Liquids from the Radioisotope Production Plant - PPR
Ezeiza Radioactive Waste Management Area (AGE)	Low Level Solid Radioactive Waste Treatment Facilities (**)
	Radioactive Sources and Waste Interim Storage Facility
	Handling Yard and Stowage of Items
	Long Term Storage Deposit
	Final Disposal System for Structural Solid Radioactive Waste and Sealed Sources (*)
	Semi Containment System for Solid Radioactive Waste (*)
	Semi Containment System for Very Low Level and Very Short Lived Liquid Radioactive Waste (*)
Pilcaniyeu Technological Complex	CTP Low Level Radioactive Waste Deposit
Uranium Dioxide Production Plant	Uranium Dioxide Production Plant Raw Material Deposit

(*) These facilities have concluded their operations.
(**) This facility is in a state of partial dismantling in order to be modified for expansion of operations.

A brief description of each facility is shown in *Section H.2 Existing Facilities and previous practices.*

D.3.1 List of Facilities with Waste from Mining and Processing of Uranium Minerals

Mining waste and uranium minerals processing waste appear in the following facilities:

SITE	FACILITY
MALARGÜE (Mendoza Province)	Malargüe Former Industrial Mining Complex 1954 - 1986
HUEMUL (Mendoza Province)	Huemul Site Stopped operating in 1974
CÓRDOBA (Córdoba Province)	Córdoba Mining Complex Began operating in 1982
LOS GIGANTES (Córdoba Province)	Former Industrial Mining Complex Los Gigantes 1982 - 1989
PICHIÑÁN (Chubut Province)	Former Industrial Mining Complex Pichiñán 1977 - 1981
TONCO (Salta Province)	Former Industrial Mining Complex Tonco 1964 - 1981
LA ESTELA (San Luis Province)	Former Industrial Mining Complex La Estela 1982 - 1990
LOS COLORADOS (La Rioja Province)	Former Industrial Mining Complex Los Colorados 1993 - 1997
SAN RAFAEL (Mendoza Province)	San Rafael Mining and Milling Complex 1979-now

A brief description of the management status of these facilities is shown in *Section H.5. Waste from Mining and Processing of Uranium Minerals.*

D.4 Radioactive Waste Inventory

The following is the radioactive waste inventory until December 31st, 2013. The presentation of data has been prepared with information in accordance with the shape of the NEWMDB of the International Atomic Energy Agency.

D.4.1 CNA I

ATUCHA I NUCLEAR POWER PLANT											
Type of Waste	Place of Facility	Proc.	Est.	Volume (m^3)	RO %	FF/FE %	RP %	NA %	DF %	DC/RE %	ND %
LLW	Storage	No	Yes	157.68	100	0	0	0	0	0	0
LLW	Storage	Yes	Yes	490.00	100	0	0	0	0	0	0

D.4.2 CNE

EMBALSE NUCLEAR POWER PLANT											
Type of Waste	Place of Facility	Proc.	Est.	Volume (m^3)	RO %	FF/FE %	RP %	NA %	DF %	DC/RE %	ND %
LLW	Storage	No	Yes	476.455	100	0	0	0	0	0	0
LLW	Storage	Yes	Yes	649.000	100	0	0	0	0	0	0

Est.=distribution is an estimate, Proc.=Is the waste processed (Yes/No)? RO=Reactor Operations, FF/FE=Fuel Fabrication/Fuel Enrichment, RP=Reprocessing, NA=Nuclear Applications, DF=Defence, DC/RE=Decommissioning/Remediation, ND=Not Determined.

D.4.3 Pilcaniyeu Technological Complex

PILCANIYEU TECHNOLOGICAL COMPLEX	
Stored Waste (#)	**Vol (m^3)**
Process Waste	**3.6**
Miscellaneous Waste	**34.6**

D.4.4 Uranium Dioxide Production Plant

UO_2 Production Plant	
Stored Waste (#)	**Vol (m^3)**
Operational Waste	**81.6**

(#) Material contaminated with Natural Uranium

D.4.5 Ezeiza Radioactive Waste Management Area (AGE)

EZEIZA RADIOACTIVE WASTE MANAGEMENT AREA											
Type of Waste	**Place of Facility**	**Proc.**	**Est.**	**Volume (m^3)**	**RO %**	**FF/FE %**	**RP %**	**NA %**	**DF %**	**DC/RE %**	**ND %**
LLW	**Storage**	**No**	**Yes**	**236.4**	**8**	**42**	**0**	**50**	**0**	**0**	**0**
LLW	**Storage**	**Yes**	**Yes**	**717.8**	**56**	**21**	**0**	**23**	**0**	**0**	**0**
LLW	**Disposal**	**Yes**	**Yes**	**2,397.3**	**66**	**1**	**0**	**33**	**0**	**0**	**0**
ILW	**Storage**	**No**	**Yes**	**4.3**	**0**	**28**	**0**	**72**	**0**	**0**	**0**
ILW	**Storage**	**Yes**	**Yes**	**23.0**	**0**	**43**	**0**	**57**	**0**	**0**	**0**
ILW	**Disposal**	**Yes**	**Yes**	**169.6**	**2**	**46**	**13**	**39**	**0**	**0**	**0**

Est.=distribution is an estimate, Proc.=Is the waste processed (Yes/No)? RO=Reactor Operations, FF/FE=Fuel Fabrication/Fuel Enrichment, RP=Reprocessing, NA=Nuclear Applications, DF=Defense, DC/RE=Decommissioning/Remediation, ND=Not Determined

SECTION E LEGISLATIVE AND REGULATORY SYSTEM

E.1 Implementation of Measures

Argentina has a legal framework that regulates all nuclear activity, including radioactive waste management and spent fuel management. The administrative and regulatory structure that has been implemented with reference to this issue is comprised in the following manner:

- An Independent Regulatory Body
- A National Organization which is responsible for radioactive waste management, for the determination of the manner in which nuclear power plants and any other relevant facility will be decommissioned and holds the ownership of the special fissionable materials contained in irradiated fuel elements
- An appropriate set of radiological and nuclear safety “regulatory standards”
- A system to grant licenses
- A control system to verify the compliance with the regulatory standards and radiological and nuclear safety requirements
- A sanction system for cases of non-compliance of licenses, standards or other requirements
- A clear assignation of responsibilities

E.2 Legislative and Regulatory Framework

E.2.1 Legal Framework

In order for the report to be self-consistent, all relevant legal background in areas of safety of spent fuel and radioactive waste management until the moment this report is closed will be presented**.**

E.2.1.1 Background

CNEA (Argentine Atomic Energy Commission) was created in 1950 by Decree No. 10936/50. One of CNEA’s specific responsibilities was the control of all public and private nuclear activities to be performed in the national territory.

Later, various legal regulations defined CNEA’s competence also as the Regulatory Body for nuclear and radiological safety matters, especially regarding the protection of individuals and of the environment against exposure to the harmful effects of ionising radiation, safety of nuclear facilities, and control of the destination of nuclear material. In this regard, the specific regulations were Decree Act No. 22498/56, ratified by Law No. 14467 and Decree No. 842/58.

Law No. 14467 determined CNEA’s competence to issue the necessary regulations for the permanent control of the activities related to radioactive substances and to provide the necessary means to control the existence, marketing and use of materials related to peaceful applications of atomic energy.

Furthermore, Decree No. 842/58 has approved the regulation for the *Use of Radioisotopes and Ionising Radiation Regulation* and made it effective to govern the use and application of radioactive materials and the radiations they emitted or which were originated by nuclear reactions and transmutations. The use of *X Rays* generators was excluded from the competence of the CNEA, and is of exclusive concern of the Ministry of Health.

The sustained growth of the nuclear activity in the country made it necessary to strengthen the independence of the Regulatory Body with respect to the other activities carried out by CNEA. In 1994, by Decree No. 1540/94, the National Executive Power created the National Nuclear Regulatory Body (ENREN) to perform the regulation and surveillance of the nuclear activity, transferring the complete staff, equipment and facilities from CNEA's Regulatory Affairs Management to ENREN. As from 1997, ENREN adopted the present denomination of Nuclear Regulatory Authority (ARN).

E.2.1.2 Current situation

The present legal framework comprises the National Constitution, the treaties and conventions, laws and decrees as stated below and by the regulatory standards described in E.2.2.1.

- **National Constitution**, specifically Art. 41 which sets out that:

  ***Art. 41**.- All inhabitants are entitled to the right to a healthy and balanced environment fit for human development and that productive activities may meet present needs without endangering those of future generations; and they have the duty to preserve it. As a first priority, environmental damage shall bring about the obligation to remediate as determined by law.*

  The authorities shall provide for the protection of this right, the rational use of natural resources, the preservation of the natural and cultural heritage and the biological diversity and shall also provide for environmental information and education.

  The Nation shall issue the standards that include the minimum protection budgets and those complementary regulations required for the provinces, without altering their local jurisdictions.

  The admission into the national territory of actually or potentially dangerous waste and of radioactive waste is forbidden.

- **International Treaties and Conventions:** The Argentine Republic has adhered as contracting party, to a number of bilateral and multilateral international instruments, which have higher status than laws under the National Constitution and imply different commitments and obligations in the nuclear field for the State. These are strict commitments and obligations regarding the control of: **(a)** the non-proliferation of nuclear weapons; **(b)** nuclear safety; **(c)** spent fuel and

radioactive waste safe management; **(d)** security of nuclear materials; and **(e)** cooperation in case of nuclear accidents and radiological emergencies.

- **Law No. 24804**, enacted in 1997. This Act determines that the National State will establish the nuclear policy and perform research and development activities through CNEA, and regulatory and surveillance actions through the ARN, successor to the ENREN. The law also provides that CNEA is the national organization which, among other duties, advises the National Executive Power on the definition of the nuclear policy, is responsible for radioactive waste management, determines the manner in which nuclear power plants and any other relevant facility shall be decommissioned and holds the ownership of the special radioactive fissionable materials contained in irradiated fuel elements.

- **Annex I to Decree No. 1390/98** that regulates Law No. 24804, enacted in November 27th, 1998. According to this Decree, every individual person or legal entity that, as a result of a licensed or authorised activity, produces radioactive waste or irradiated fuel assemblies shall provide resources to the ARGENTINE ATOMIC ENERGY COMMISSION so that the latest can perform its duty of waste management. The entity or person generating waste shall be responsible for the storage of such material, within the scope of the facility it owns, having to comply with the dispositions which, to that effect, are established by the Nuclear Regulatory Authority. In the case of a NPP, the entity generating waste shall take the necessary measures in order to assure the safe operation of the plant and to have storage capacity sufficient to keep all the fuel assemblies included in that facility.

  In turn, the ARGENTINE ATOMIC ENERGY COMMISSION shall define the moment and the procedure by which the waste producer shall perform the transfer of the radioactive waste and of the irradiated fuel assemblies produced by itself to that organization.

- **Law No. 25018**, enacted in September 23th, 1998. The Argentine State, by means of the Argentine Atomic Energy Commission, assumes responsibility for all radioactive waste management. In turn, waste producers are responsible for the conditioning and safe storage of the waste generated in the facilities operated by them, until that waste is transferred to CNEA. The latter is in charge of elaborating a Radioactive Waste Management Strategic Plan as part of the Radioactive Waste Management National Program.

- **Law No. 26566**, enacted in 2009, declares of national interest the activities for the construction of a fourth nuclear power plant, as well as all the necessary acts to enable the life extension of Embalse (CNE) and Atucha I (CNA I) NPPs, and the activities involved in the construction, commissioning and operation of Atucha II Nuclear Power Plant (CNA II). Law No. 26566 also declares of national interest the design, implementation and commissioning of the CAREM [*Central Argentina de Elementos Modulares*] prototype reactor to be built in Argentina, committing CNEA for that purpose.

- Article No. 61 of **Law No. 26784**, enacted in 2012, revokes Article No. 34 of Law No. 24804, which stated that the nuclear energy generation activity developed by NASA was subject to privatization.

E.2.2 Regulatory Framework

E.2.2.1 National Requirements and Provisions on Radiological Safety

The Nuclear Regulatory Authority (ARN), successor to ENREN, was created by Law No. 24804 and is the organization responsible for the regulation and control of nuclear activities in order to:

- Protect the individuals against the harmful effects of ionising radiations and maintain a reasonable degree of radiological and nuclear safety in the nuclear activities performed in the Argentine Republic.

- Ensure that nuclear activities are not performed with purposes not authorized by this Act and regulations resulting therefrom, as well as by international agreements and the non-proliferation policies adopted by the Argentine Republic.

- Prevent intentional actions which may either have severe radiological consequences or lead to the unauthorized withdrawal of nuclear material or other materials or equipment subject to control.

In this sense, Law No. 24804, Art. 7 determines that the ARN is in charge of the regulation and control of the nuclear activity in all aspects regarding radiological and nuclear safety, security, control of the use of nuclear material, licensing and control of nuclear facilities and international safeguards, as well as the advisory role to the National Executive Power in the corresponding matters. In addition, Law No. 24804 in its Art. 10 sets forth that the regulation and control of the nuclear activity in said aspects is subject to national jurisdiction, and Art. 14 provides that the ARN shall act as an independent agency under the jurisdiction of the Presidency of the Nation.

Besides Law No. 24804, Art. 16 grants the ARN the following powers, among others: the power to issue regulatory standards in matters of its competence, to grant licenses, permits or authorizations to facilities and persons, to conduct regulatory inspections and assessments, and to impose sanctions in the corresponding cases (for further details see Section E.3 of this report).

The regulatory system of ARN[(1)] to the end of this National Report is composed of 63 regulations and 8 regulatory guidelines.

ARN regulations include licensing of nuclear facilities, radioactive facilities and their personnel, conjointly with different of radiological protection, nuclear safety and transport

[(1)] These are known as Normas AR (Standards AR).

of radioactive materials requirements. In order to have access to these regulations, visit the following website: http://www.arn-gob-ar

The basic regulatory approach of the regulatory standards is focused on performance, that is, they define the compliance of safety objectives, complementing with prescriptive requirements. In this sense, the manner to achieve said objectives is mainly based on good engineering judgement, on the qualifications of designers, constructors and operators, and on the appropriate decisions taken by the Responsible Organization. IAEA Standards are used as reference and permanent consultation during the process of elaboration, revision or change of AR standards associated to radioactive waste management.

Standard AR 10.1.1, Basic Radiological Safety Standard (Revision 3, 2001), determines the requirements and provisions on the matter which are consistent with the recommendations of the International Commission on Radiological Protection (specifically with issue No. 60).

Although the regulatory system has not undergone major changes with respect to previous reports, the Regulatory Organization has continued updating current regulations, especially modifying the following standard:

Table 1 – Standards Updates during 2011-2013

CODE	DENOMINATION
Standard AR 10.16.1 Rev. 2	Transport of Radioactive Material

In addition, the following regulatory standards and guides have been incorporated:

Table 2 - New Standards and guides introduced during 2011-2013

CODE	DENOMINATION
Guideline AR-8 Rev. 0	Clearance Generic Levels
Regulation AR 0.11.4 Rev. 0	Licensing for staff working in facilities Type II and Type III of the Nuclear Fuel Cycle

E.2.2.2 Licensing System

Hereinafter the fundamental concepts of the system are summarized.

In Argentina the licensing system for radiological safety is defined in the Basic Standard AR 10.1.1. Radioactive waste management facilities, spent fuel facilities of nuclear power plants and spent fuel management facilities of research reactors are categorized by this standard as Type I or Relevant. Therefore, in the licensing stage of these facilities, as well as in the licensing of their staff, the standards *AR 0.0.1 Licensing of Type I Facilities* and *AR 0.11.1 Licensing of Staff of Type I facilities* are applicable.

The regulatory standards (AR Standards) determine that the construction, operation and decommissioning of Type I facilities cannot be started without the corresponding licenses requested by the Responsible Organization and granted by the Regulatory Body. The licenses are granted after the ARN has performed an independent evaluation of the safety conditions foreseen and presented in the corresponding “Safety Report”.

The validity of said licenses is subject to the compliance with the conditions set forth therein and with the standards and requirements issued by the Regulatory Body. Failure to comply with one or more of these standards, conditions or requirements may cause the ARN to suspend or cancel the corresponding license, in accordance with the sanction system in force.

The staff of a nuclear or radioactive facility has to be properly trained and qualified in accordance with their duties at the facility. The ARN requires that all staff assigned to significant safety-related tasks is licensed and has specific authorizations to perform the assigned duties. Standards AR 0.11.1 and AR 0.11.2 determine the criteria and procedures to grant individual licenses and specific authorizations to the staff performing tasks that require licenses in nuclear and radioactive facilities. Said standards also set out the terms and conditions according to which the ARN, prior review and report from its Advisory Boards, will grant these licenses and authorizations.

Based on regulatory criteria, international experience and the recommendations made by the IAEA, a gradual modification process for the validity of the Operation Licenses for Type I facilities has begun. They are being changed from an indefinite or permanent period of time to an expiration term. In order to condition their renewal, a limited term is determined, among other requirements, to a global re-assessment of safety at regular intervals (Periodic Safety Reviews - PSR). This is a complementary tool to the continuous safety revision performed routinely by the persons responsible for the facilities and by the Regulatory Nuclear Authority. The validity period is made explicit in the Operation License itself.

E.2.2.3 Prohibition to Operate without a License

Law No. 24804, Section 9 provides that in order to develop a nuclear activity any natural or legal person shall, among other requirements, comply with ARN regulations in its scope of competence and request a license, permit or authorization that will enable them to perform the activities and comply with the obligations in safeguards or non-proliferation matters that Argentina has subscribed to or will subscribe to in the future.

E.2.2.4 Control System

Since the beginning of nuclear activities in the country and in order to verify that nuclear and radioactive facilities comply with the standards, licenses and requirements in force, the Regulatory Authority has determined a control system. At present, the control system includes regulatory evaluations, inspections and audits. If necessary, the ARN requires the implementation of corrective measures, and in case they are not complied with may lead, as a last step, to impose the sanctions provided in the regulatory system.

E.2.2.4.1 Documentation and Reports

During the licensing process, the Responsible Organization has to submit to the ARN the documentation related to radiological and nuclear safety it has created. The main components of said documentation in the case of an Operation License for a nuclear power plant, which includes the management of the radioactive waste and the spent fuel generated by said facility, are the following:

- Safety Report
- Operation Policies and Principles Manual
- Quality Manual
- Operational Organization Chart and Tasks and Duties Manual
- Operation Manual
- Emergency Plan
- Radiological Safety, Waste Management and Environmental Monitoring Manual
- Maintenance Manual
- Probabilistic Safety Assessment
- Management of Operational Experience Program
- Staff Training Manual
- Education and Training Requirements for Staff Performing Specific Duties
- Preliminary Plan for the Decommissioning of the Facility
- Any other documentation related to radiological and nuclear safety, safeguards and security

The above documentation has to be kept permanently updated, and the modification proposals must be forwarded to the Regulatory Authority.

The license and the above mentioned documentation constitute the Mandatory Documentation. On the other hand, any other standard or requirement issued by the Nuclear Regulatory Authority in connection with radiological and nuclear safety, safeguards and security is also mandatory.

In addition, the License granted by the ARN determines the periodical reports that the Organization that is responsible for the facility has to submit to the Nuclear Regulatory Authority. In the case of an Operation License for a nuclear power plant, the communications related to Radiological and Nuclear Safety includes the following, among other topics:

- Occurrence of an abnormal event.
- List of non-relevant events occurred, in accordance with the provisions of the Operational Experience Management Program.
- Activity values for each relevant radionuclide discharged to the environment and results of environmental monitoring sample tests.
- Inventory of processed and stored solid radioactive waste.
- Values of the doses received by the staff exposed due to their work.

- Report on the annual Emergency Plan application drill: development, results and experiences learnt.
- All evidence or information which, in the criteria of the Responsible Organization, shows weakness or degradation in the quality of components, equipment and systems which are important for safety or different risks in magnitude or nature from those foreseen in the Final Safety Report or in the Probabilistic Safety Assessment.

In the other nuclear and radioactive facilities, requirements related to the Mandatory Documentation and Reports are graded in accordance with the hazard involved.

E.2.2.4.2 Regulatory Inspections and Audits

Law No. 24804 authorizes the ARN to perform regulatory inspections and evaluations, carried out by their staff from the beginning of the regulatory activities in the country, in the following manner:

- *Routine Inspections*: They are performed essentially by inspectors. Their objective is to verify that the Responsible Organization complies with the restrictions and conditions determined in the operating license.

- *Special Inspections*: They are performed by experts in different matters (dosimetry, implementation and control, etc.) in coordination with the inspectors. They have different objectives as, for example, the supervision of preventive maintenance tasks during scheduled shutdowns.
- *Technical Evaluations*: They involve the analysis of data collected during inspections or from other sources. For example, evaluations of the radiological safety of specific practices at nuclear or radioactive facilities to detect their potential weaknesses and identify possible measures to reduce staff or public doses or to improve the safety level.

- *Regulatory Audits*: They are performed in accordance with written procedures and are scheduled to review organizational, operational and procedural aspects related with nuclear and radiological safety.

E.2.2.5 Specific Regulatory Actions

The regulatory actions that may be taken by the ARN regarding a particular facility may originate from*:*

- The results of regulatory inspections and evaluations performed at the facility.

- The knowledge of abnormal events that have occurred at the facility or at a similar facility.

- The results of independent technical evaluations.

In such cases, the ARN sends a regulatory document to the Responsible Organization in the form of a requirement, recommendation or request for additional information, as the case may be; in this document the ARN urges the Responsible Organization to take the required corrective measures within a determined term. These documents have the following scopes:

- *Requirement*: It is a regulatory order that the Responsible Organization must comply with in the requested manner.

- *Recommendation*: It is an order which differs from a requirement in that the Responsible Organization has certain flexibility to comply by means of alternative solutions (for example, engineering alternatives) which ensure, at least, the same result required by the recommendation. These alternative solutions must be proposed to the ARN for their evaluation.

- *Request for additional information:* It is a regulatory order whereby more details of the documentation provided are required, for example, the explanation of an assertion, and the demonstration of the result of calculations or additional documentation.

E.2.2.6 Sanction System

Non-compliance with the Regulatory Standards and requirements set out in the respective licenses or permits authorizes ARN to impose the appropriate Sanction System. Article 16 of Law No. 24804 authorizes ARN to impose sanctions which shall be graded according to the seriousness of the fault as follows: warning, fines (which shall be proportional to the seriousness of the fault and the potential damage), suspension of the license, permit or authorization or its cancellation.

For these purposes, ARN is authorized to lay down the relevant procedures that may apply in case of violation of the standards to be issued in the exercise of its competence, ensuring the constitutional guarantees of due process and the defence rights.

The sanction system represents the last link of the safety chain. ARN considers that if the regulatory system is really effective and the Responsible Organizations fully exercise their responsibilities, the application of sanctions and fines should occur only in exceptional cases.

In this sense, an informal ARN function is to make Responsible Organizations and Primary Responsibles aware of their responsibility regarding safety, in order to increase the communication of safety culture at all levels of the organization structure.

E.2.2.7 Clear Assignment of Responsibilities

Law No. 24804, in its Art. 31, sets out that the responsibility for the radiological and nuclear safety of a facility rests without excuse on the holder of the license, permit or authorization. Its compliance with the provisions of the above mentioned Law or with the

regulatory standards or requirements that may derive from it do not exempt the holder from said responsibility or from making all that is reasonable or compatible with its possibilities in favour of radiological and nuclear safety, safeguards and security.

The holder of a license, permit or authorization may delegate, in whole or in part, the execution of tasks, but continues having the full responsibility determined by this Act.

Concerning the responsibilities of the radioactive waste generator and the transfer of said waste to the managing organization, Law No. 25018 in its Art. 6 sets out that the National State, through the authority in charge of the application of this Act (CNEA), shall assume the responsibility for radioactive waste management. The generators of this waste must provide the necessary resources to perform it in due time and manner.

The generator will be responsible for the conditioning and safe storage of waste generated by the facility he operates, in accordance with the conditions set out by the Regulatory Body, until they are transferred to CNEA, with the obligation to give immediate notice to the ARN on any event which could result in an incident, accident or operation failure.

Article 7 of Law No. 25018 authorizes CNEA to determine the acceptance criteria and the transfer conditions for radioactive waste that may be necessary to assume the corresponding responsibility. This article also determines the approval requirement by the ARN for these transfer conditions.

Article 8 sets out that the transfer of radioactive waste and irradiated fuel elements to CNEA shall be made at the time and in accordance with the procedures laid down by CNEA, with ARN's previous approval. In no event, shall the operator of the generating installation be exempted from the responsibility for contingent civil and/or environmental damages until the transfer of the radioactive waste is completed.

Therefore and in agreement with Decree No. 1390/98, which regulates the provisions of Law No. 24804, said transference defines the limit of responsibility of the operator of the generating facility, with reference to radioactive waste and irradiated fuel elements.

E.3 Regulatory Body

E.3.1 Duties and Competence of the Regulatory Body

In Argentina, nuclear development started in 1950. All nuclear activities performed in the country until the year 1994 were controlled by the Argentine Atomic Energy Commission (CNEA) through its regulatory branch: the Regulatory Branch Management. The applied regulatory system was defined by Law No. 14467 and its Regulatory Decree No. 842/58.

In 1994, the National Government, considering that the regulation and supervision of nuclear activities should be reserved to the National State, assigned the exclusive performance of these duties to an independent agency, in order to differentiate the role of the controller from that of the controlled parties.

Thus, Decree No. 1540/94 creates the National Nuclear Regulatory Body (ENREN – Ente Nacional Regulador Nuclear) to perform regulatory and control duties of the nuclear activity, transferring the complete staff, equipment and facilities from CNEA's Regulatory Branch.

In 1997 the National Congress enacted the National Law of Nuclear Activity (Law No. 24804), creating the NUCLEAR REGULATORY AUTHORITY (ARN) with the aim of regulating and controlling the nuclear activity, receiving the transfer of all ENREN's resources.

The Nuclear Regulatory Authority acts as an independent agency under the jurisdiction of the Argentine Presidency and is subject to a public control system. As provided by Section 7 of the Act, it is responsible for the regulation and control of the nuclear activity on matters of radiological and nuclear safety and security, as well as the control of the use of nuclear materials, licensing and supervision of nuclear facilities and international safeguards.

The above stated Law sets out that the regulation and control of nuclear activities are "subject to national jurisdiction". The ARN also acts as an advisory body to the National Executive Power in matters of its competence.

Law No. 24804 assigns a wide set of faculties and responsibilities to the ARN. Among the most important are the following:

- Issuing the regulatory standards with reference to nuclear and radiological safety, security and control of the use of nuclear materials, licensing and supervision of nuclear facilities, international safeguards and transport of nuclear materials regarding nuclear and radiological safety and security.

- Granting, suspending and cancelling licenses for the construction, commissioning, operation and decommissioning of nuclear power plants.

- Granting, suspending and canceling licenses, permits or authorizations for mining and uranium concentration matters, safety of research reactors, relevant accelerators, and relevant radioactive facilities, including facilities for radioactive waste management and nuclear applications in medical and industrial activities.

- Undertaking inspections and regulatory evaluations at the facilities subject to ARN regulation, with deemed necessary frequency.

- Imposing sanctions, which shall be graded according to the seriousness of the fault and which may imply confiscating nuclear or radioactive materials; the preventive closure of the facilities subject to regulation if nuclear activities are performed without the appropriate license, permit or authorization or upon the detection of serious non-compliance of the nuclear and radiological safety and security of materials and nuclear facilities.

- Creating, in accordance with international parameters, nuclear and radiological safety standards for the staff working at nuclear and radioactive facilities and

granting the specific licenses, permits and authorizations to perform the task subject to license, permit or authorization.

- Evaluating the environmental impact of any licensed activity, such as monitoring activities, review and follow-up of any impact, evolution or possibility of environmental harm that may result from the licensed nuclear activity.

It should also be noted that Annex I to Decree No. 1390/98, that regulates the above mentioned Act, provides that for a better compliance of its duties, the Nuclear Regulatory Authority shall approve contingency plans in the case of nuclear accidents, programs to deal with emergencies and, when necessary, offer the corresponding training to workers and neighbours.

These plans must foresee an active participation of the community. The Security Forces and the representatives of civil institutions of the area where these procedures take place shall report to the officer to be appointed by the Nuclear Regulatory Authority for said purpose. National, provincial and municipal authorities that may have any involvement in the creation of these plans must comply with the guidelines and criteria defined by the Nuclear Regulatory Authority organization, which for these purposes shall exercise the powers determined by the Convention on Nuclear Safety.

Law No. 24804 and Annex I of regulatory Decree No. 1390/98 grant the ARN the necessary legal competence to determine, develop and apply a regulation and supervision system for all nuclear activities performed in the country. In order to ensure an appropriate level of control, said legal competence is complemented by an adequate technical competence.

For this reason, as from the beginning of the regulatory activities in the country, it has been considered imperative to have qualified staff, so that with their level of knowledge and experience endow the Regulatory Body its own independent criteria in all aspects of nuclear and radiological safety, safety in the transport of radioactive materials and in radioactive waste management, as well as safeguards and physical protection.

For the same reason and as mentioned above, when the Regulatory Body was created, all human resources and materials were transferred to it from CNEA regulatory branch.

It is also worth highlighting that the ARN is authorized to contract experts who may advise on aspects specifically related to the performance of its functions. Therefore, the global strategy of the Argentine regulatory system is summarised the following basic aspects:

- Training of staff involved in radiological, nuclear, transport and waste safety; safeguards and security, either belonging to the ARN or at facilities performing practices subject to its control, also offering collaboration to IAEA’s training programs.

- Periodical creation and revision of the corresponding standards.

- Undertaking of regulatory inspections and audits to verify the fulfilment of the granted licenses and authorizations.

- Independent execution of studies and tests related to the licensing of regulated installations.

- Development of scientific and technical aspects related to radiological, nuclear, transport and waste safety.

E.3.2 ARN Organizational Structure and Human Resources

The Nuclear Regulatory Authority is managed by a Board of Directors constituted by a Chairman, a 1st Vice-Chairman and a 2nd Vice-Chairman reporting to the General Secretariat of the Presidency of the Nation. The Chairman also performs ARN's executive duties. ARN's organic structure in force is shown in Figure 1.

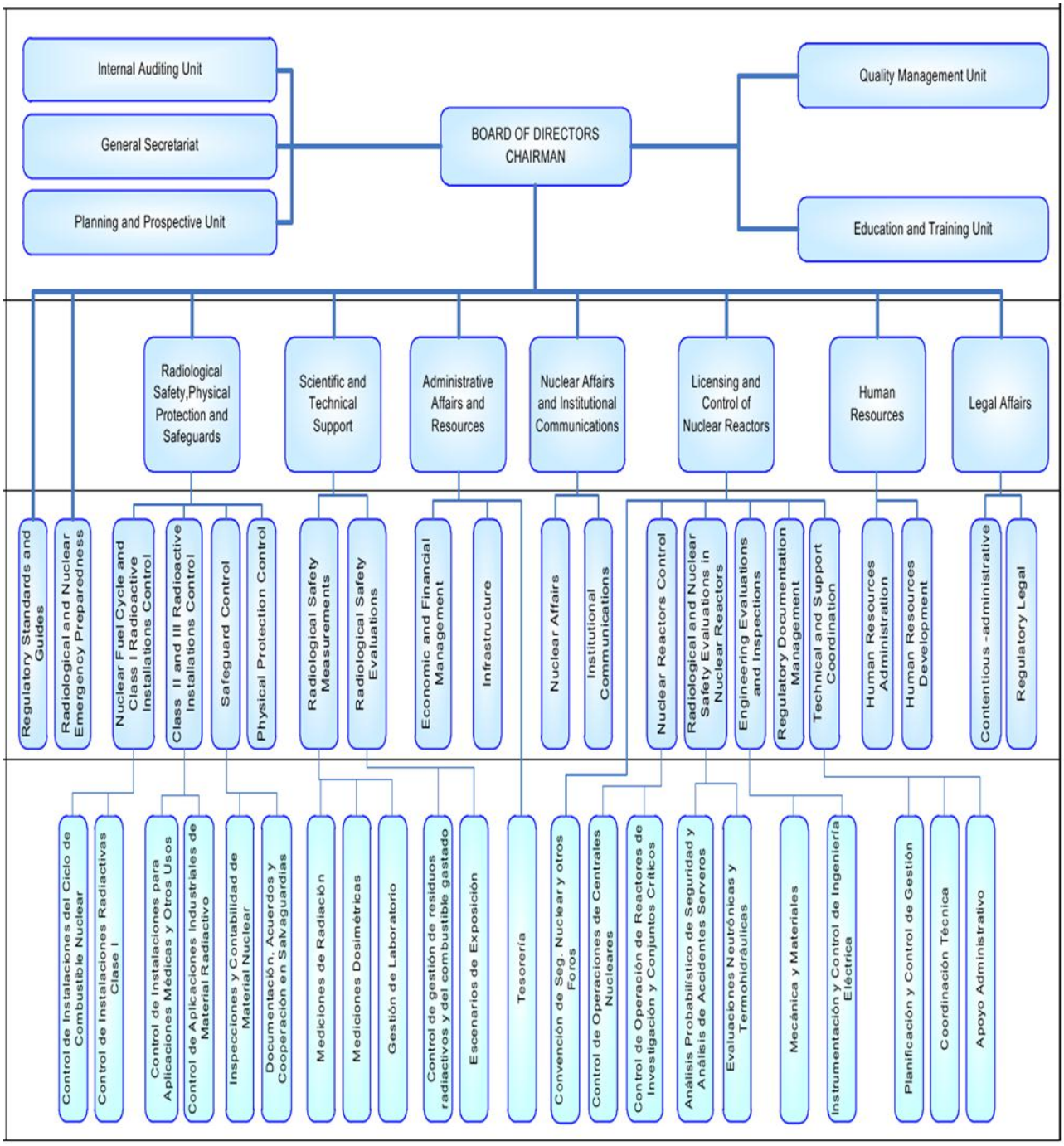
The main tasks performed by the *Radiological, Security and Safeguard Department* are the regulatory inspections and the evaluations concerning the Radiological Safety of Radioactive Facilities (medical, research and industrial facilities), Transport, Safeguard control and Nuclear Safety control.

The *Scientific and Technical Support Management* provides specialized technical support for regulatory inspections and assessments, and is responsible for developments in matters related to radiological, nuclear and radioactive waste management safety by means of the Radioactive Waste and Spent Fuel Management Control Department. This Management is also responsible for the oversight and assessment from the regulatory point of view of the environmental radiological impact of regulated facilities.

The *Nuclear Affairs and Institutional Communication Department* participates in the definition and implementation of the country's policies on regulatory issues at the corresponding national and international forum. It ensures the correct institutional relationship at national and international level, leading to a better compliance of ARN's regulatory functions. It promotes and communicates ARN's image and its regulatory institutional policy to the different publics and interested parties. Taking into account the ARN's role, it manages the solution of conflicts in the national nuclear area and institutional crisis that involve media or political aspects. In order to improve the regulatory actions it promotes internal and external communication.

The *Licensing and Control of Nuclear Power Plants Department* is in charge of guaranteeing the control of radiological and nuclear safety of nuclear power plants, research reactors and critical assemblies during operation, after closure and during decommissioning. It is also in charge of guaranteeing the licensing process of new nuclear power plants, research reactors and critical assemblies as well as the workers at these facilities who hold positions requiring a license issued by the ARN. It also verifies licenses, regulations, requirements, agreements and international conventions in force, and undertakes the corresponding regulatory actions.

Figure 1 – Organizational Chart ARN 2013



The *Administrative Affairs and Resources Department* offers administrative and accounting support to ARN's regulatory tasks.

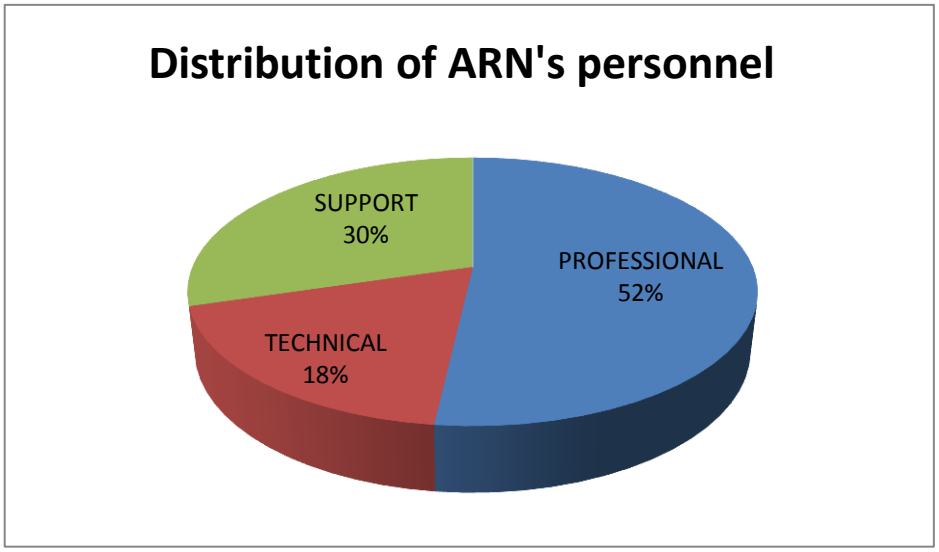
Regarding ARN's staff, until December 31st, 2013, the organization had 405 workers of which 52% are professional, 18% are technicians, and 30% perform support tasks.

Working processes conducted in the ARN can be divided into substantial processes and support processes, which is just a descriptive division because the specific processes could not be performed unless the other processes' support. In this sense, of the 7 Managements of the ARN, 4 are devoted to specific tasks and 3 perform support activities.

Of the 405 workers, 65% are devoted to specific processes tasks and 35% perform support tasks.

The following Figure 2 shows the distribution of staff according to their tasks: professional, technical, and support.

Figure 2



The distribution of the workforce in the different locations is divided into the following: 73% is working in ARN's Headquarters, 19% in Ezeiza Atomic Center, 7% in CNA I, CNA II and CNE, and 1% in other sites. The geographical distribution of all ARN employees is presented in Table 3:

Table 3 – Geographical Distribution of ARN employees

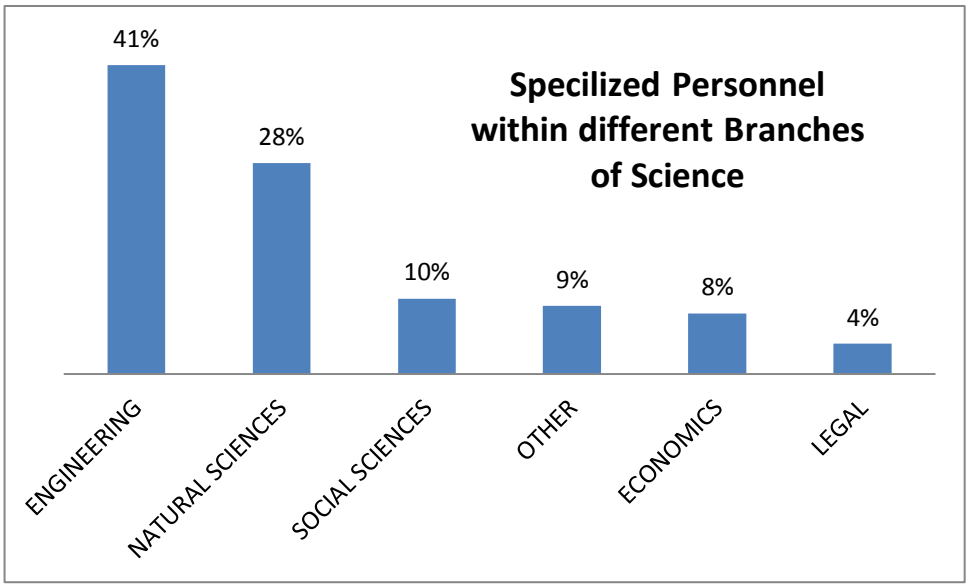
HEADQUARTERS	73%
EZEIZA ATOMIC CENTER	19%
CNA I, CNA II & CNE NUCLEAR POWER PLANTS	7%
OTHER	1%

E.3.3 Resources Assigned to the Regulatory Control of Facilities under Surveillance

The distribution of ARN's workforce assigned to safety inspection and evaluation tasks, directly related to the safety of regulated facilities is described in the *Annual Work Plans*. This *Plan* discriminates efforts according to the different type of activities performed, directly or indirectly related to the safety of the facilities: inspections and evaluations of nuclear safety, radiological safety, radioactive waste management safety and transport of radioactive material safety, safeguards and security, scientific support, radiation measurements, environmental studies, electronics, administration, legal affairs, information technology, planning, training and institutional relations.

Figure 3 shows the specialized personnel within the different branches of science, where 41% belongs to Engineering, 28% to Exact and Natural Sciences (Physics, Chemistry, Biochemistry, Medicine, etc.), 10% to Social Sciences, 8% to Economics, 4% to the Legal Area, and the final 9% to other specific studies.

FIGURE 3



Measurement of Drinking Water in Ezeiza

In the previous Convention Report, the National Government required that different UN organizations and specialized international scientific institutions, coordinated by the IAEA, conduct a peer review in the surroundings of the Ezeiza Atomic Center (CAE), with the following results:

"With reference to its objectives, the international expert's report has allowed to conclude as follows, with a high degree of certainty:

- ✓ *There is no anthropogenic (of human origin) contamination with radioactive elements in surface soil, in the subsoil, nor in the surface or underground waters used for the supply of water for human consumption in the area constituted by the districts of Ezeiza, Esteban Echeverría and La Matanza of the Province of Buenos Aires (Argentina). In particular, no presence of enriched or depleted uranium has been detected.*
- ✓ *There is natural uranium in the Puelche acquiferous, as a result of natural geochemical processes.*
- ✓ *The radioactivity levels measured in the underground waters comply with the international standards of radiological protection and, therefore, do not represent any danger for human health.*
- ✓ *The water for consumption supplied to the population of the above mentioned neighbourhoods does not contain radioactive elements at levels that may be harmful for the health.*

- ✓ *Upon the results of the performed measurements of the water samples, no damaging sanitary effects are foreseen due to the exposure to ionizing radiation. Sanitary statistics back this conclusion.*
- ✓ *As there is no anthropogenic contamination with radioactive elements, no contamination whatsoever may be attributed from this type of activities that have been performed or that are being performed at the CAE site.*
- ✓ *The Argentine Nuclear Regulatory Authority adequately regulates the activities of the Ezeiza Atomic Centre.*

Apart from the radiological risk, uranium may also mean a chemical risk. The scientific basis to evaluate this danger is still in preparation and until now there is only a preliminary orientation level by the WHO. Although the international expert report was limited to the radiological aspects, it has been observed that in some water samples the concentration of natural uranium exceeds the preliminary orientation values determined by the WHO of natural uranium on the basis of its chemical toxicity. Some underground samples taken from the Puelche acquiferous have a uranium content that exceeds the preliminary orientation by the WHO, but comply with the reference level determined by the pertinent Argentine standards."

The aforementioned report dispels any possible doubt regarding the inconsistent complaint. Nonetheless, a new expert report was afterwards required, which was conducted by a Spanish scientific organization throughout 2011. Once again the results indicated that the detected uranium arises from earth crust and is not attributable to the activities performed in the Ezeiza Atomic Center.

Both reports were required under the frame of the proceedings entitled *"Actuaciones Inst. Por Av, Pta. infr. Arts. 200 y 2007 CP"* (Expte. Nº 5452) pending before the Federal Criminal and Correctional Court of First Instance N° 1, Court Office Nº 1, Lomas de Zamora, Buenos Aires, Argentina. On March 4th 2013, the Judge resolved to file the case because of the absence of crime, and such decision remains being a final judgement.

E.3.3.1 Qualification of the ARN Staff

Postgraduate Courses in Radiological Protection and/or in Nuclear Safety are part of the basic initial training for the technical staff joining ARN's workforce. This initial training is then complemented with the job training as well as with the participation, both at national and international level, in specific courses, congresses, seminars and research projects.

E.3.3.2 Maintenance of the Regulatory Body's Competence

ARN signed an Agreement-Program with the Undersecretary of Public Administration, in which a Matrix of commitments for Management Results is determined so as to approach the development of a comprehensive quality management system, the staff performance evaluation and a demand plan for personnel recruitment.

E.3.3.3 Training Activities

Education and training have been two of the main aims of the ARN, due to its certainty that building specialized knowledge is one of the axes of radiological safety for workers and society in general. In the same direction, the ARN trains its staff in order to accurately comply with its technical functions.

ARN periodically participates in training courses, congresses and experts' meetings on radiological and nuclear safety, safeguards, and protection and security training for professionals in the national and international levels.

Argentina's experience in education and training in radiological and nuclear safety is based on its postgraduate courses in Radiological Protection and Safety of Radiation Sources, and in Nuclear Safety, which, during the last 35 years provided education to 1000 professionals in Latin America and the Caribbean, 45% of which are Argentine.

Figure 4

IAEA's decision of building competencies in radiological and nuclear safety by means of training and knowledge management has driven the Agency to establish a commitment with ARN to support this activity in the long term.

In this line, the Argentine Government and the IAEA signed in September 30th, 2008 an agreement by which Argentina becomes the Regional Training Center in Latin America and the Caribbean in terms of Nuclear, Radiological, Transport and Waste Safety. This agreement was deployed by the ARN Education and Training Unit, created in 2010 and dependent on the ARN Board of Directors.

In July 2012, as a milestone achieved looking for education excellence, the Postgraduate Course in Radiological Protection reached the academic hierarchy of the Specialization Course of the University of Buenos Aires, and the Postgraduate Course in Nuclear Safety is expected to receive the same status during 2014.

The new academic hierarchy of these postgraduate courses imply the following advantages:

- Diplomas issued by the University of Buenos Aires (until now, they were issued by the Engineering School)
- National and regional validity (in countries with whom agreement exist)
- University frame advantages (online education platforms, education networks, etc.)
- Professors with academic acknowledgement. All of them are appointed by the University of Buenos Aires
- Possibility of being recognised as Specialists even if students have studied in previous editions of the postgraduate courses

The ARN also offers Radiological Protection training courses for the technical staff of the organization, of CNEA and of other public and private institutions related to the nuclear activity. In addition, the ARN provides training courses in specific areas associated with regulation, such as Safe transportation of radioactive material; Safeguards for national inspectors of the IAEA, the ABACC and operators; Monitoring of aerosols for International Surveillance System operators; Security of nuclear facilities and materials; Physical security of sources; Illicit traffic prevention and Medical response in case of accident caused by radiation.

E.3.3.4 Quality Management System

ARN has established, documented and implemented a Quality Management System in agreement with the requirements determined in the IRAM-ISO 9001:2000 Standard. The facts and requirements of said system are described in the “ARN Quality Manual”. In this document, the Board declares, among others, the Quality Policy, the commitment with the Quality Management System, the Management by Processes and Constant Improvement.

The Quality Management System is implemented on the basis of the approach by processes. Therefore, seven (7) regulatory or main processes and four (4) support processes have been identified.

The analysis and follow up of these processes are performed through internal quality audits executed by persons who are independent from the process to be audited and who also have the adequate qualifications. During 2011 and 2013, fifty one (51) internal audits have been carried out, and 22 external audits have been received, from the Certification Body, to the processes that certify its quality management system.

At present, the ARN has certified the following courses under the ISO 9001 Standards:

- Curricula development, planning and execution of Radiological Protection, Nuclear Safety, Safeguards and Security courses and training activities
- Licencing of Items, special radioactive materials and radioactive materials expedition; Creation and update of standards and regulatory guides associated with radioactive material transportation; Radioactive material transportation auditing; radioactive material transportation guidance, training and communication
- Licencing of staff working in Type I facilities and in nuclear fuel cycle Type II and III facilities
- Management of ARN inbound and outbound documents
- Regulatory Guidelines
- Intervention in radiological and nuclear emergencies
- ARN's "Physical Dosimetry" Calibration Laboratory was certified, process: "Radiation field detectors calibrations for dose rate between 0.5 and 16 mSv/h"
- ARN´s "Environment Control" Testing Laboratory was certified, process: "Determination of uranium in water by fluorometry" and "Determination of tritium in water by liquid scintillation"
- ARN's "Biology Dosimetry" Laboratory was certified, process: "Cytogenetic technique with human blood"

During 2013, the following processes have been added to ISO 9001:

- Operation and maintenance of station for detection of radionuclides RN01, made up of the particle systems ARP01 and noble gases ARX01, from the International Monitoring System (IMS) within the frame of the existing agreements (CTBTO, Comprehensive Nuclear-Test-Ban Treaty Organization). Management of radionuclides laboratory ARL01 according to CTBTO quality system.
- Monitoring of internal documentation of the Scientific and Technical Support Process.
- Regulatory control and auditing of the security of nuclear facilities and sealed radioactive sources security, in accordance with the regulatory standards AR 10.13.1 and 10.13.2.

The following are under the process of certification:

- Safeguards control (scope to be defined).
- Auditing in Type I facilities, and nuclear fuel cycle Type II and III facilities.
- Customer Service and documentation management in Type II and III facilities.

Documentation Management

Until mid-December 2013, one hundred and seventy two (172) documents have been approved and twenty two (22) documents are under preparation process. The ARN has a Document and Registry Control system and a system for Information Security.

Documentation and quality management system tools have been extended, providing documents that can identify the processes and their interaction with support, strategic, and direction processes. These have been achieved by the creation of maps and process data

sheets, included in the ARN general map, by means of and internal web or Intranet. Up to now, twenty two (22) Process Data Sheets have been approved. Regarding the Registry control, fifteen (15) Registry Control forms are still valid and available on the Intranet, one (1) is under revision, and five (5) are under different preparation process.

All procedures related to the Quality Management Unit, the ARN Quality Control Manual and other associated documents have been updated. New forms have also been incorporated and others have been modified within the quality system, which are used by the Unit and by ARN different processes.

The Scientific and Technical Support Process is working in order to integrate the documents related to the management of Standard 17025 labs, and the documents of the ARN quality system management. The “Quality Control Manual for Certified Laboratories” has also been developed by such process.

“Quality Checks” have also been adopted in the Unit in order to help continuous improvement of processes.

Interest group Satisfaction

ARN focuses on the requirements of third parties involved, controlling safety is not compromised, while other actions related to law, public and staff safety and environment protection are taken.

During implementation meetings conducted by the Quality Unit with the different certified and certification-in-progress processes, several methods are set out according to the process needs, in order to measure interest group satisfaction and evaluate the suggestions provided, as well as other aspects helping to improve the management system.

E.3.3.5 Financial Resources

Law No. 24804 sets out in its Section 25 that the necessary financial resources for ARN proper functioning shall originate mainly from:

- Annual regulatory fees,
- Contributions from the National Treasury determined for the budget of each fiscal year, and
- Other funds, assets or resources that may be assigned according to applicable laws and regulations.

Section 26 of said Law determines the annual regulatory fee payable by the holders of an authorization or permit or by corporate bodies whose activities are subject to ARN’s surveillance, specifying the fees for nuclear power plants and authorizing the ARN to determine the fees applicable to other regulated activities.

In this sense, the ARN approved a “Licensing and Inspection Fee System” that sets out the respective fees for the issuance of licenses and permits in accordance with the facility or practice, as well as the annual fee for the operation of said facilities or practices.

The System determines an annual fee during the operation of each facility or practice by means of a simple formula which takes into account two factors: the “Regulatory Effort” stated as the number of inspection/evaluation hours that the ARN assigns to the regulatory control of the facility or practice and the cost of said effort, based on the monetary value of the hour of inspection/evaluation, which is determined on an annual basis.

On a yearly basis, the ARN prepares a budget project, which includes a list of the inflow provisions from regulatory fees and justifies request of funds to the National Treasury. This budget is published in the Official Bulletin in order to clearly indicate the manner in which the funds from persons and institutions which are bound to pay regulatory fees shall be used.

The budget assigned to the ARN for the 2013 fiscal year was ARS 212,397,762, as shown in Chart 4. Below, several charts show the budgetary distributions of the execution of the work plan for 2013, of expenses according to different criteria.

Figures 5 and 6 show the budget distribution of regulatory tasks by type of inspection and by type of task, and Figure 7 shows budget distribution by item.

Chart 4 –ARN Budget of the fiscal year 2013

ITEM	VALUE IN AR$
1. Staff	**115,781,000**
2. Inputs	**4,388,000**
3. Services	**65,958,382**
4. Equipment	**11,384,998**
5.1 Scholarships	**2,802,751**
5.9 Transfers abroad	**10,458,249**
9. Figurative expenses	**1,900,000**
TOTAL	**212,397,762**

Figure 5 - Budget distribution of regulatory tasks by type of inspection

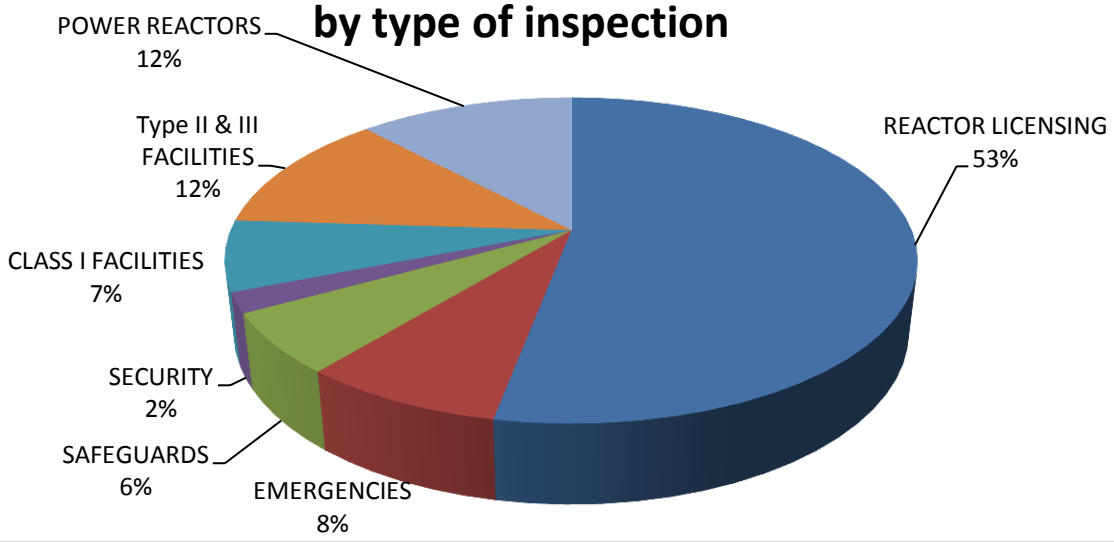


Figure 6 - Budget distribution by type of task

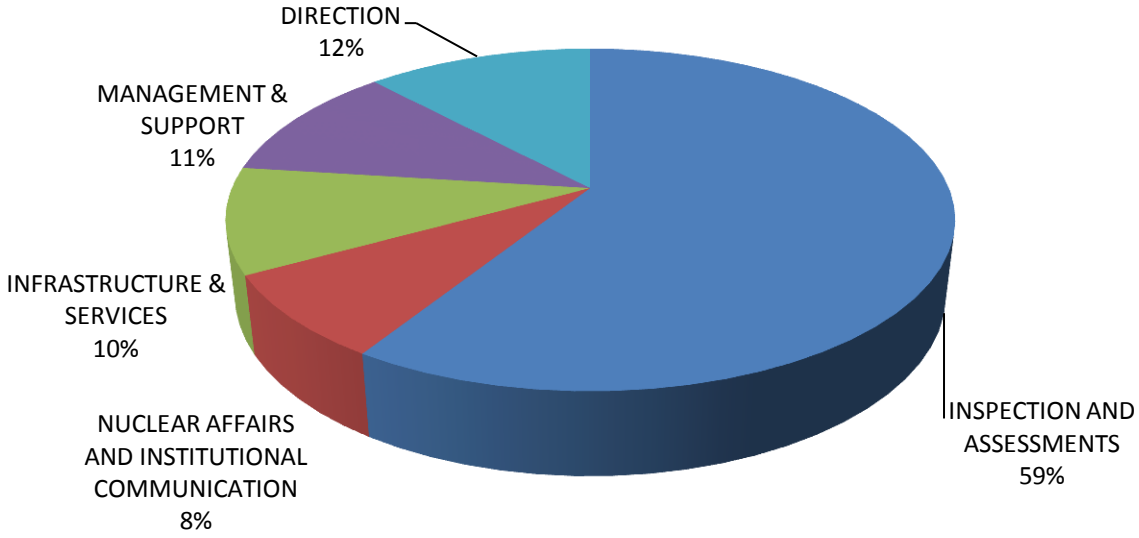
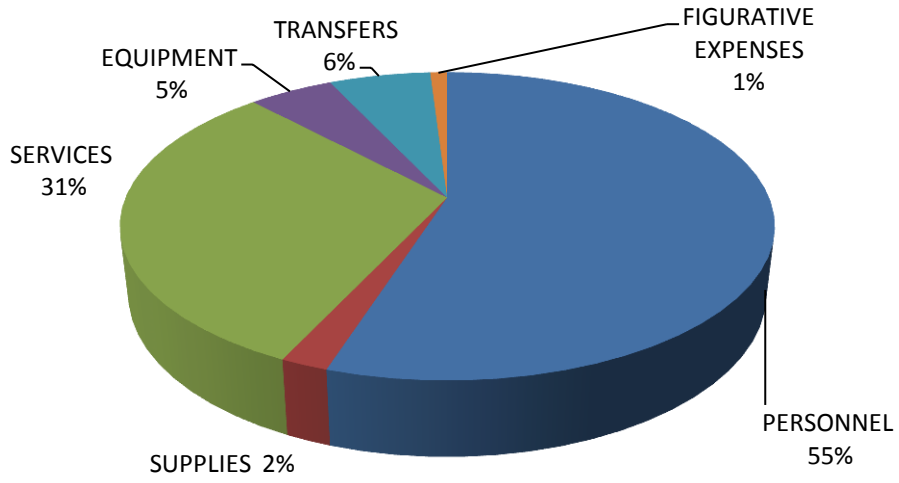


Figure 7 - Budget distribution by item



E.3.4 Relationship with Other Organizations

In the period 2011-2013, the ARN continued with cooperative activities with other organizations, with agreements in force. Within this framework, with the Latin American Forum of the Radiological and Nuclear Regulatory Organizations, with IAEA participation, a Spanish American radiation safety network has been created, which allows the exchange of information between regulatory organizations in the region in order to contribute with the objective of attaining a high regional radiation safety level.

The national and international agreements and treaties are presented in ARN Annual Reports.

In addition, ARN specialists usually participate, as nominated experts, in the following international committees and programs:

- Commission on Safety Standards, “CSS” (IAEA)
- Radiation Safety Standards Committee, “RASSC” (IAEA)
- Nuclear Safety Standards Committee, “NUSSC” (IAEA)
- Waste Safety Standards, Committee “WASSC” (IAEA)
- Transport Safety Standards Committee, “TRANSSC” (IAEA)
- Permanent Advisory Group on Safeguards Implementation, “SAGSI” (IAEA)
- United Nations Scientific Committee on the Effects of Atomic Radiations, “UNSCEAR” (UN)
- International Commission on Radiological Protection (ICRP)

E.3.5 Annual Reports

Every year the ARN submits to the National Executive Power and to the Argentine Congress a Report on the activities performed the previous year, in agreement with the dispositions in Art. 16 of the National Act of Nuclear Activity.

These Reports describe the main supervisory and regulatory activities performed by the ARN in nuclear and radiological matters, safeguards and security during the previous calendar year.

In order to give the widest possible coverage to the activities conducted and to the use of the assigned budget resources, the Report is also forwarded to public libraries, national universities, regulatory bodies, officers in health, energy and environmental areas and to the main users of radioactive material. Since 1998 the contents of the Annual Reports are published in the institutional web page, http://www.arn.gob.ar

SECTION F OTHER GENERAL SAFETY PROVISIONS

F.1 Responsibility of the License Holder

F.1.1 Background

Nuclear activity started in Argentina in the 1950's. At that time the facilities did not have the magnitude and complexity they have nowadays. The responsibility for nuclear and radiological safety fell on an individual, usually the head of the nuclear facility who, assisted by his staff or by contracting third party services, performed all safety-related activities. Once the facilities had the appropriate means and equipment, and the staff was trained, the Regulatory Body granted the person responsible for them the pertinent operation license.

Even though the above mentioned concepts are still essentially valid, a number of improvements have been introduced to the regulatory system throughout the years. Thus, depending on the magnitude of the nuclear facilities, the Regulatory Body demands that the people who occupy specific positions in the operation staff undergo a special training and hold an individual license. Furthermore, training requirements for the operating staff were increased.

On the other hand, in the case of larger and complex nuclear facilities, the Regulatory Body considered that, having the necessary number of trained operating staff was not sufficient by itself to ensure their operation with an appropriate safety level. Therefore, it was required to periodically review the design and operational aspects of relevant facilities and to introduce, whenever necessary, modifications in terms of safety as advised by state-of-the-art technology. In response to such considerations the Responsible Institution was formed.

F.1.2 Responsible Institution and Primary Responsible

The ARN requires that each nuclear facility shall be supported by an organization able to provide the appropriate support to the staff of the plant in tasks inherent to radiological safety, nuclear safety, security, safeguards and radioactive waste management safety, such as the review of operating procedures, maintenance of safety systems, technical modifications to the plant, etc.

This role falls on the Responsible Institution, which in the case of nuclear power plants is Nucleoeléctrica Argentina S.A. (NASA), responsible for the operation of Atucha Nuclear Power Plant – Unit I (CNA I) and Embalse Nuclear Power Plant (CNE), including the nuclear fuels storage systems and the management of waste generated in these facilities. CNEA is the Responsible Institution for the Ezeiza Waste Management Area (AGE) facilities as well as for a number of significant facilities, including several research reactors.

AR 0.0.1 and AR 10.1.1 regulatory standards set the responsibilities of the Responsible Institution, amongst which the most significant are:

- The Responsible Institution shall make every reasonable effort in accordance with its possibilities to ensure safety, complying at least with ARN's regulatory standards. Such responsibility also includes design, construction, commissioning, operation and decommissioning of the facility.
- Fulfilment of the regulatory standards and procedures is a necessary but not sufficient condition concerning the responsibilities of the Responsible Institution, which shall make every reasonable effort, within its possibilities, to ensure safety. The Responsible Institution shall also comply with the regulatory standards and requirements set by other competent authorities that are not related to nuclear activities as for example the conditions concerning the release of chemical effluents. (see Section H.1).
- The Responsible Institution may be in charge of the operation of more than one nuclear facility and delegate totally or partially the execution of tasks, however, it remains fully responsible for them.
- In every nuclear facility the Responsible Institution shall appoint a Primarily Liable comprised of one or more people from its staff, called the Primary Responsible, who shall be directly in charge of the radiological and nuclear safety of the facility, as well as the compliance with the licenses and regulatory requirements applicable thereto. In the case of nuclear power plants in operation, their directors are the Primary Responsible.
- The Responsible Institution shall provide the necessary assistance to the Primary Responsible, so that the Primary Responsible may exercise its responsibilities. The Responsible Institution must supervise the Primary Responsible to verify that it complies with its safety-related responsibilities.
- The Responsible Institution shall evaluate the nuclear facility safety and submit to the ARN the respective technical documentation to award the license required.
- No modification altering the design, operating characteristics or the mandatory documentation included in the operating license of a nuclear facility related to radiological or nuclear safety may be made without ARN´s prior authorization.
- The Responsible Institution and the Primary Responsible shall facilitate the inspections and audits required by the ARN.
- Any change in the organizational structure of the Responsible Institution that may affect its capacity to comply with its responsibilities shall require ARN's prior consent.

Apart from the responsibilities of the Responsible Institution and of the Primary Responsible, the ARN has set the responsibilities of the employees who work at the facility. In this regard, regulatory standard AR 10.1.1 sets that employees are responsible for their compliance with the procedures established to ensure their own protection as well as the protection of other employees and of the public. This condition is consistent with the recommendations of the International Atomic Energy Agency (IAEA).

F.1.3 Regulatory Control of Fulfilment of License Holder's Responsibilities

In order to verify that licensees comply with their responsibilities, the Regulatory Body, the Nuclear Regulatory Authority (ARN), performs different types of controls as follows:

- ARN is permanently updated about the operational organizational structure. In case there is any modification, the Responsible Institution shall send to ARN a document stating the new operational organizational structure, the missions, functions and requirements of the staff. It is clear that every proposed change must be duly justified. ARN evaluates the documents and its corresponding justifications and, in the case of not finding any observations, the document enters in force when the facility has the capacity to cover all the posts to be licensed.
- Regulatory Standard AR 0.11.1 determines the requirements to be fulfilled by nuclear facility staff to obtain an individual license or specific authorization.
- The procedure to grant individual licenses and specific authorizations allows ARN to control the competence of the people that have to be in charge of safety-related responsibilities in the facility. Said competence is re-assessed whenever the specific authorization is renewed.
- The individual license may be cancelled or revoked by ARN if during the performance of the duties, non-compliance with any of the conditions required for its granting is demonstrated. Likewise, the specific authorization may be modified, cancelled or revoked. In addition, ARN regularly verifies the compliance of the Primary Responsible with its obligations regarding the safety of the facility, especially its compliance with the applicable standards, conditions of the operating license and any other requirement related to radiological safety, all of which is carried out through evaluations, regulatory inspections and audits performed by ARN's resident inspectors and analysts, and whenever necessary, with the assistance of external experts.
- Standards AR 10.14.1 and AR 10.13.1 state requirements to be fulfilled by facilities regarding Safeguards and Security.
- ARN has established a regime of sanctions to be applied in cases of non-compliance with any regulatory requirement.

F.2 Human and Financial Resources

Introduction

The Argentine Atomic Energy Commission (CNEA), as set forth in prior National Reports, is the State responsible organization for Spent Fuel (SF) Management as well as for any radioactive waste generated in the national territory. For that purpose, the *National Program for Radioactive Waste Management* was created by Law No. 25018, which sets CNEA as the responsible authority for the development and periodic updating of a *Strategic Plan for Radioactive Waste Management* (PEGRR).

Both financial and human resources are essential for the assurance of safety conditions of nuclear facilities. Consequently, the Regulatory Body requires that all staff working at SF and radioactive waste management facilities shall be properly trained and qualified in accordance with the tasks performed, and that the staff assigned to safety-related tasks shall hold a license and the Specific Authorization permit.

In the case of SF and radioactive waste generated by nuclear power plants, the Responsible Institution that reports for the operation of Nuclear Power Plants (NASA), has the responsibility not only to have trained and qualified personnel in accordance with the current legal and regulatory framework, but also to provide the financial resources necessary for the development of operation activities, which include the storage of radioactive waste and the storage of SF until those responsibilities are transferred to CNEA.

Financing of the National Program for Radioactive Waste Management

CNEA has updated and implemented the triennial PEGRR, which is supported by the National Treasury contributions included in the regular budget and approved by the Executive Power.

CNEA Organizational Structure and Human Resources

The *National Program of Radioactive Waste Management* and the *PRAMU* (described later) now report directly to the Nuclear Safety and Environment Management.

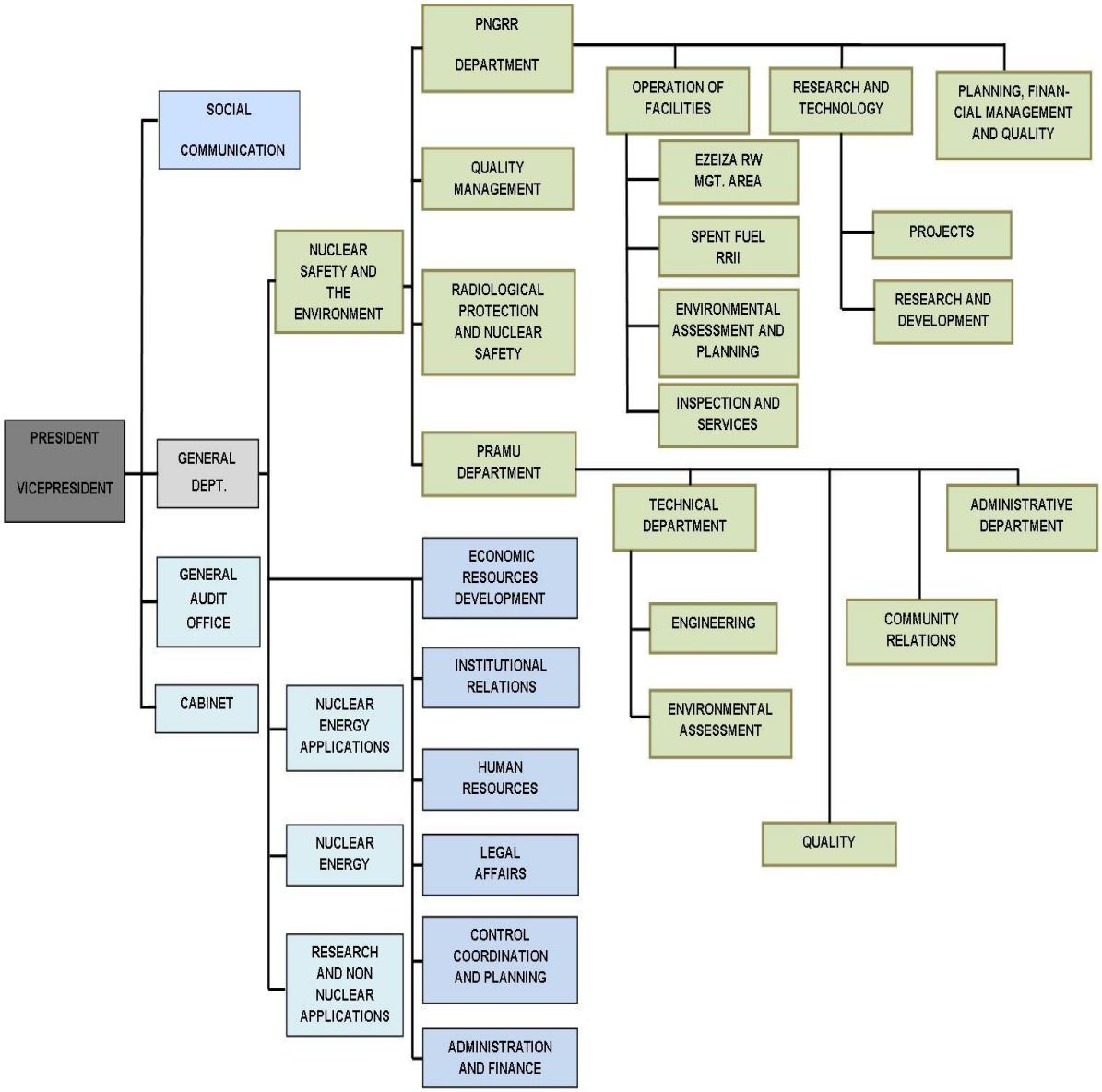
The Nuclear Safety and Environment Management undertake the following activities:

- It establishes methodologies of management and criteria for Safety, Environment and Quality.
- It conducts the follow-up of performance in Safety, Environment and Quality.
- It coordinates, advises and provides other Managements and Sites with technical assistance on these topics.

In order to achieve this, CNEA has established a Radiological Protection and Safety Department, a Quality Department and an Environmental Management Department.

As part of all this, in CNEA, a Quality Management, Safety and Environment Integrated System is being implemented by applying the most prevalent standards related to this topic. This system, based on a policy of continuous improvement, is the most efficient methodology for complying with CNEA policies, through planning objectives and the necessary processes to obtain results according with that policy; the implementation of processes established to meet the goals; monitoring of those processes concerning the policy; objectives and requirements established and the revision and decision-taking to improve its performance.

CNEA Organizational Structure



The main elements of this system are the identification of hazards, risk assessment and determination of controls, identification and control of environmental aspects, identification and compliance with legal requirements, establishment of programs and improvement objectives, determination of roles and responsibilities and assignation of resources, ensuring the competence of the personnel through its training, awareness and application of methodologies of communication and participation and response to emergencies, incident research, non-conformities, corrective and preventive actions and, internal auditing and systematic performance revision conducted by the Departments in furtherance of their duties.

The PNGRR Department is responsible for conducting activities of management of radioactive waste originated in their facilities, in facilities which are external to CNEA, such as nuclear power plants and other small facilities, as well as management of SF originated from research and radioisotope production reactors.

The following charts show the assigned financial resources and distribution of personnel in accordance with the objectives.

Financial Resources of CNEA devoted to RW and SF management (2013) (Included PRAMU)

ITEM	RESOURCES (AR$)
Research & Development	1,804,047
SF and RW Management	1,916,623
Foreseen Improvements	43,012,669
Personnel	24,536,927
TOTAL	**71,270,266**

Human Resources of CNEA devoted to Radioactive Waste Management and Spent Fuel Management (2013) – (Included PRAMU)

QUALIFICATION	Complete Dedication	Partial Dedication
Professionals	63	14
Technicians	72	9
Fellowship holders	13	2
TOTAL	148	25

Training of Human Resources

Most employees devoted to RW and SF Management have taken a postgraduate course on Radiation Protection and Nuclear Safety for professionals or the Radiation Protection Course for technicians organised and directed by the ARN.

In addition, the staff is encouraged to attend and participate in courses, seminars, and training at universities and other science and technical institutions. For some specific matters regarding nuclear issues, it has been possible to train them abroad through scientific and training visits, and attendance to specialization courses and seminars.

Also, RW and SF management personnel participates yearly in dictating training courses on Radioactive Waste Management in the Postgraduate course in Radiochemistry and Specialization in Nuclear Reactors organized by CNEA's Dan Beninson Institute jointly with the National University of San Martín and in the specialization course in Technological Applications of Nuclear Energy at CNEA's Balseiro Institute jointly with the University of Buenos Aires.

NASA members of staff, who perform specific duties at nuclear power plants, are re-trained in accordance with the requirements set by Regulatory Standard AR 0.11.3. In order to comply with those requirements, at the beginning of each calendar year, NASA sends ARN the retraining program to be developed in each period. The program includes the courses of study for each specific duty, time schedule, list of topics, lecturers appointed, and assessment of courses.

Training of Fellowship Holders

The PNGRR has a staff of fellowship holders devoted to the main lines of research and development carried out at CNEA´s three Atomic Centres and at CNEA's headquarters, all of them under the direction of specialized professionals in specific disciplines.

Some fellowship holders have completed postgraduate courses at CNEA´s Educational and Training Institutes; therefore, they have a supplementary training prior to their commitment to the assigned lines of research and development. Fellowships for professionals may include advanced courses or master or doctoral theses. In the case of technical fellowship holders, they are researcher's assistants. Scholarships have also been granted to advanced students of other disciplines.

F.3 Quality Management

F.3.1 Introduction

In the Argentine Republic the application of an adequate quality management program during the design, construction, commissioning, operation and decommissioning stages of a nuclear facility is a regulatory requirement. With this purpose AR 3.6.1 regulatory standard *Nuclear Power Plant Quality System* issued by the ARN determines the quality system requirements applicable to Nuclear Power Plants.

AR 3.7.1 regulatory standard *Schedule for the Documentation to be Submitted Prior to the Commissioning of a Nuclear Power Plant*, and other related to other type of facilities, determines the time when the Responsible Institution has to submit the program and the quality manual to the Regulatory Body.

Furthermore, the licenses for the operation of facilities set that during said stage they shall have quality management programs. Said quality management programs and manuals are mandatory for the facility.

The Regulatory Body controls the implementation of quality programs through the Responsible Institution.

In the case of spent fuel management and radioactive waste management facilities located within the site of nuclear power plants, they are subject to quality standards set for nuclear power plants in a General Quality Management Program.

F.3.2 Nucleoeléctrica Argentina Sociedad Anónima (NASA)

Since the Argentine corporation NASA was organized in 1994 (Decree No. 1540/94), it has developed its nuclear activity in connection with the operation of both CNA I (Atucha Nuclear Power Plant – Unit I) and CNE (Embalse Nuclear Power Plant). It is also responsible for the construction, commissioning and operation of Atucha Nuclear Power Plant – Unit II (CNA II).

Law No. 26566 determined that NASA would build, start up and operate a fourth nuclear power plant and would conduct any and all acts in furtherance of extending the lifetime of the Embalse Nuclear Power Plant and the finalization of Atucha II Nuclear Power Plant.

NA-SA, as the Responsible Institution, has a General Quality Assurance Program, which is the reference framework for specific quality assurance programs for each organizational unit. The program is described in the *General Quality Assurance Manual,* which was approved and made effective in November 1997. The Regulatory Body requirements and those established in IAEA 50-C-Q document and other applicable safety guides were taken into account to elaborate the General Quality Assurance Program.

Subsequently, the *General Quality Assurance Manual* has been reviewed on different opportunities. Review 1 incorporates a new Quality Policy approved by the Board of the Responsible Institution.

Currently, Revision 2 of the Quality Assurance Manual is in force and includes implemented changes in the organization towards late 2009 along with the impact on projects to be executed at Atucha NPP – Unit II and CNE Life Extension.

NASA's Quality Assurance Program Status

ORGANIZATION UNIT	DOCUMENT	REVISION	NUMBER OF PROGRAMMING PROCEDURES
NASA	Quality Assurance General Manual	Revision 2	20
CNA I	Quality Assurance Manual for Operation	Revision 4	234
CNE	Quality Assurance Manual for Operation	Revision 6	646
CNA II	Quality Assurance Manual for Construction	Revision 5	160
NPPs Services Management	Management System Manual	Revision 7	325
CNE Life Extension Project	Management System Manual	Revision 1	130

As mentioned above, the *General Quality Assurance Manual Rev.2* complies with the requirements of AR 3.6.1 regulatory standard *Nuclear Power Plant Quality System* and IAEA Practice Code 50-C-Q.

F.3.3 Argentine Atomic Energy Commission

CNEA Quality Management System

CNEA has established a quality policy, whose current version has been approved by CNEA's authorities by Resolution 74/03-04-2009 (B.A.P.13/09).

The new Quality Management structure of CNEA is constituted by the Quality Management Department, dependent from September 28th , 2010 of the Nuclear Safety Management and the Environment Division, which in turn depends on the General Manager.

Addition to the above Management Area was due to the need to generate appropriate conditions in CNEA for the harmonization and integration of systems of quality management with nuclear safety and environment, thus allowing identification, understanding and managing interrelated processes, contributing to the effectiveness and efficiency of the organization in achieving its objectives, as provided in the Quality Policy of CNEA.

The Quality Management Department´s responsibilities include coordinating the activities of quality management performed in CNEA and centralize information on this topic. Such coordination is done through a quality network, whose nodes are driven by those responsible for the areas of quality work in the respective levels of the structure.

In particular, in the Applications of Nuclear Technology and Nuclear Safety and Environment Divisions, and in the Nuclear Energy Division there are units devoted to Quality Management that coordinate the implementation of systems for quality management of the sectors that compose them, and conduct internal audits of quality management in each of them.

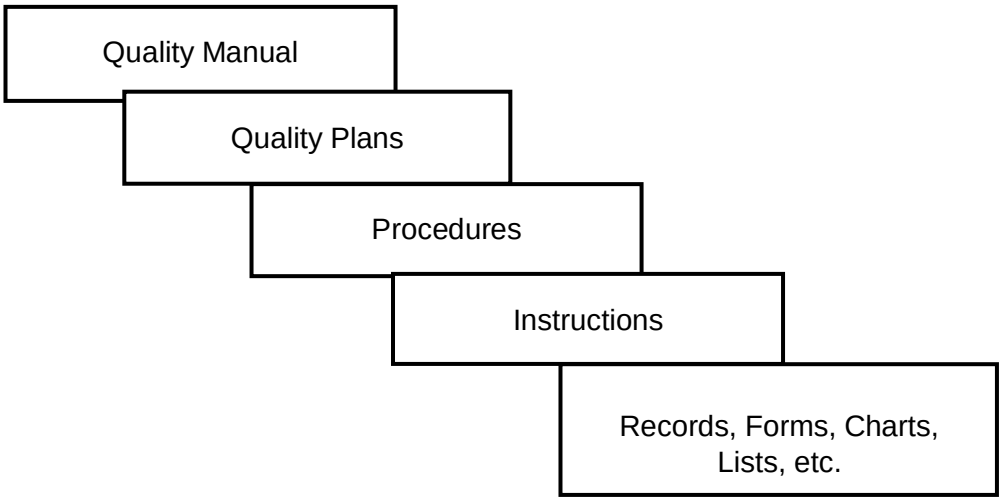
CNEA´s Quality System of is documented through a Quality Management Program headed by the quality policy and regulatory procedures of Quality Management.

CNEA´s Quality System documentation is completed by the one issued at different levels of the organization, such as general procedures, management system manuals, operative procedures standards and quality plans developed in accordance with CNEA's applicable standards, particularly ARN regulations and requirements.

The scope of the documents of the quality management system of each sector depends on several factors such as the size of the sector, types of activities carried out and their degree of complexity, and issues regarding regulatory requirements and safety.

Every area having a management system establishes their organizational structure with a board, which manages the area and a quality responsible, who implements the system. In some situations, the person responsible for quality is part of the board.

Each sector with a quality management system has a hierarchic structure similar to the following:



Quality Manual: It describes the pertinent activities of the sector, clarifying the scope of each one of them.

Quality Plans: They describe the special characteristics of the sector when manuals are used from another higher hierarchical sector, from which it depends; or when special projects are carried out within the quality management system.

Procedures: They describe the management system procedures. They can have different characteristics: standard, general, and operational and can be issued either by their own sector or by a higher hierarchical sector.

Instructions: They describe more specific activities than those stated in the procedures, either technical or managerial ones, issued by their own sector or by a higher hierarchical level.

Records: They are documents showing results obtained or supplying evidence of activities carried out.

The extension of the system documentation quality management of each sector depends on various factors such as the size of the sector, the type of activities performed and complexity, safety aspects and regulatory requirements.

All sectors with management systems, organizational are structured with a board that leads the area and a quality manager that keeps the system implemented. In some cases the quality manager is part of the direction.

The sectors that meet management system standards such as ISO 9001, ISO/IEC 17025, among others, have internal audits in accordance with a procedure provided by CNEA.

CNEA´s sectors that generate and manage radioactive waste or spent fuels are subject to audits and inspections of different kinds, characteristics and origins which include technical aspects and management systems:

- Inspections by the Nuclear Regulatory Authority (ARN).
- Audits by the National General Audit (AGN).
- Audits by the National Auditing Committee (SIGEN).

They are also subject to external audits by qualified or accredited laboratories; facilities are audited by clients and third parties.

Gradually, CNEA is trying to get qualification, peer evaluation, certification and accrediting of all its sectors. These activities are being carried out according to institutional priorities.

Internal qualifications are carried out by CNEA's Qualification Committee of Laboratories and Nuclear Facilities (CoCaLIN), whose background dates from the decade of the 1980's with the creation of the Qualification Committee for Fuel Cycle Management Processes. The Qualification Committee of Laboratories (CoCaLab) was created in 1995 and, later on, it broadened its scope by creating CoCaLIN. On October 12th, 2007, through Provision No. 144/07, the General Management Division updated CoCaLIN constituency to have it suited to the new organization.

To date, seven operation units have been accredited: Radioisotope Dosimetry and Radiation Dosimetry Lab, Nuclear Analytic Techniques Lab, Uranium Compounds Lab, Fuel Element Production Plant for Research Reactors, Materials Office and Control and Instrumentation Office.

Currently, other four research laboratories and Interlaboratory Management Committee are in the process of being accredited, supported by the Ministry of Science, Technology and Productive Innovation.

In Argentina, accreditations are carried out by the Argentine Accreditation Agency (OAA) which has been recognized by international institutions as the International Laboratory Accreditation Cooperation (ILAC), International Accreditation Forum (IAF) and Inter American Accreditation Cooperation (IAAC).

Certifications are granted by IRAM, a Certifying Agency accredited by the Argentine Accreditation Agency (OAA).

According to what was previously stated in the former Report, it is worth highlighting that the goals suggested by the Quality Management Department (GESCAL) related to lab certification, facilities and engineering services have been fulfilled in a satisfactory manner. Thus, by taking into account the experience obtained, planning on necessary activities will be undertaken so as to increase the number of certifications and authorizations/permits of other facilities and services.

Radioactive Waste Management National Program (PNGRR).

The PNGRR, organization implemented by CNEA in order to comply with its waste management responsibilities, has designed a *Quality System* for all radioactive waste management stages to ensure that the conditioned waste complies with the acceptance requirements both for its transport and for its interim storage.

The *Quality System* lies within the framework of CNEA´s Quality Management standard policy. The responsibility to prepare *Quality System* procedures and their compatibility with CNEA's Quality Management Program is carried out by the Documentation and Quality Management Section which reports to PNGRR's Head. To date, the *Quality System* includes 79 operational procedures and 3 work instructions which correspond to several activities developed in the Program.

This Section has 6 workers directly engaged in quality management and documentation without taking into account Project and Operation inspectors. Also, it should be noted that during 2012 and 2013 the Quality Management Division has conducted several audits to the Quality Management System implemented in the PNGRR.

Also, in order to have an efficient access to documentation, a Data Base was implemented, where, in addition to the procedures mentioned, specifications and layout of the facilities and the regulations and legislation issued by regulatory and other authorities provide the frame for radioactive waste management are recorded. At the moment, the Data Base has 2900 records.

According to regulations issued by the Regulatory Body, all sectors managing radioactive waste must submit safety reports including the description of their management systems in order to obtain the pertinent operation licences.

Uranium Mining Environmental Restoration Project (PRAMU)

For restoration activities of uranium mining sites, in 2000, CNEA developed the *Uranium Mining Environmental Restoration Project* -PRAMU- which defines the organization and activities to be performed in the management of environmental liabilities derived from uranium mining.

The Quality Management System, developed in PRAMU is being redesigned, having produced and revised 13 documents (procedures).

F.4 Operational Radiological Protection

Basic radiological protection criteria applicable in the country establish that:

- Practices using radiation shall be justified.
- Radiological protection has to be optimised.
- Established limits and dose constraint levels shall be met.

- Accidents shall be adequately envisaged, but if they occur, emergency procedures must be implemented so that their radiological consequences can be mitigated.

The criteria of the Regulatory Body concerning radiological safety in spent fuel and radioactive waste management facilities have been defined in the following standards:

AR 10.1.1 Basic Radiation Safety Standard
AR 10.12.1 Radioactive Waste Management
AR 3.1.1 Occupational Exposure in Nuclear Power Plants
AR 3.1.2 Limitation of Radioactive Effluents in Nuclear Power Plants
AR 4.1.1 Occupational Exposure in Nuclear Research Reactors
AR 4.1.2 Limitation of Radioactive Effluents in Nuclear Research Reactors
AR 6.1.1 Occupational Exposure in Type I Radioactive Facilities
AR 6.1.2 Limitation of Radioactive Effluents in Type I Radioactive Facilities

Dose Limits for the Public

The annual effective dose limit for members of the public is 1 mSv in one year and is applicable to the total effective dose to a representative person due to all facilities and practices. Equivalent annual dose limits are 15 mSv and 50 mSv for crystalline and skin, respectively.

Dose Constraints for the public

For the design purposes of every facility, the Regulatory Body has established a constraint of 0.3 mSv for the annual effective dose of the representative person, due to the release of liquid and gaseous radioactive effluents.

In addition, since June 2013, the ARN has established that in the case of the design of a nuclear power reactor, a research reactor or a Type I radioactive facility within a site with multiple facilities, enough retention against the release of radioactive effluents should be considered, so that the annual dose value in the representative person does not exceeds 0.5 mSv, taking into account the release of radioactive effluents of all facilities included in the site.

When the effective annual dose in the workers exposed to radiation does not exceed 5 mSv, the annual effective dose in the representative person does not exceed 0.1 mSv and the annual collective dose does not exceed 10 man-Sv, in particular for small radioactive facilities, a demonstration of optimization is not foreseen unless expressly required by the Regulatory Body.

Occupational Dose Limits

Dose limits for workers are as follows:

- The effective annual dose limit is 20 mSv. This value shall be considered

as the average in 5 consecutive years (100 mSv in 5 years), not exceeding 50 mSv in any single year.

- The equivalent dose limit is 150 mSv year for crystalline and 500 mSv year for skin.

The dose limit is applicable to the sum of the dose due to external exposure in the period under consideration plus the committed dose from intakes in the same period.

F.4.1 Conditions for Radioactive Material Release

F.4. 1.1 Discharges

In accordance with regulatory standards, the systems used for the retention of radioactive effluents shall be optimised.

The Regulatory Body establishes that, the discharges of radioactive effluents to the environment shall be as low as it is reasonably achievable and shall not exceed the value expressed in the following “discharge formula”.

$$\sum \left(\frac{Ai}{Ki} liquid + \frac{Ai}{Ki} gaseous\right) \leq 1$$

where:

A_i is the activity of *i* nuclide discharged to the environment in the period under consideration

K_i is a constant value of activity, stipulated for *i* nuclide, for a given facility

Every K_i value derives from the representative individual estimated doses due to gaseous and liquid discharges of radionuclide “i”, affected by a factor, using specific models.

In order to keep the continuous discharge conditions for the application of the respective model, daily and quarterly constraints are settled.

Gaseous and liquid discharges that occur during normal operation of the facilities are continuously monitored by the operator and submitted periodically to the ARN.

The Regulatory Body performs an audit program of discharges declared by the operator and an independent environmental monitoring plan in the surroundings of the facilities, which include measurements of activity in water, sediments, vegetables, fish and milk samples, and other samples of the surrounding biosphere.

The following Table shows the annual average activity discharged to the environment with gaseous and liquid effluents corresponding to the 2009-2013 period, discriminated by type of discharge and group of radionuclides for the 13 facilities authorized to perform controlled and planned discharges (nuclear power plants, research reactors and Type I radioactive facilities).

Information on the annual dose limit fraction is also included, and it represents such liquid and gaseous discharges in the representative person.

It's worth mentioning that the increase on the average discharge of tritium in the liquid effluents within the CNE, in the period described in this report with respect to the previous five-year period, is due to a loss of heavy water from the steam generators in 2012.

On the other side, there was also an update of the estimation method of the doses in the representative individual due to the gaseous discharges, now using the PC CREAM 08 software with the meteorological baseline associated to each site. This implied basically a variation in dilution factors, and can explain the different doses compared to the previous years.

Average Gaseous and Liquid Discharges 2009-2013

ANNUAL AVERAGE OF CONTROLLED AND PLANNED DISCHARGES – PERIOD 2009 - 2013												
FACILITY	LIQUID					GASEOUS						
	TOTAL ACTIVITY (Bq)				% de DC(*)	TOTAL ACTIVITY (Bq)						% de DC(*)
	H3	β/γ	α tot	Unat		Nob Gases	Aerosols	H3	Iodines	C14	Natural Uranium	
CNAI	1.2E+15	1.4E+11	4.9E+08	---------	0.08	1.3E+14	3.6E+06	7.1E+14	8.1E+07	5.1E+11	---------	0.7
CNE	3.5E+14	9.6E+09	---------	---------	1.2	4.8E+13	3.3E+08	4.0E+14	3.2E+06	4.3E+11	---------	0.2
PPUO2	---------	---------	---------	1.1E+09	0.02	---------	---------	---------	---------	---------	8.6E+06	0.02
RA-3	---------	8.3E+07	---------	---------	0.08	3.2E+13	9.4E+07	---------	1.8E+07	---------	---------	0.1
PPR	---------	4.5E+06	---------	---------	0.1	---------	---------	---------	1.7E+09	---------	---------	0.05
PPMo99	---------	---------	---------	---------	--------	8.7E+12	<LD	---------	1.1E+07	---------	---------	0.01
PFS	---------	---------	---------	---------	--------	---------	5.1E+05	---------	---------	---------	---------	<0.01
CYCLOTRON	---------	---------	---------	---------	--------	---------	1.7E+10	---------	---------	---------	---------	0.01
CONUAR	---------	---------	---------	1.5E+06	0.003	---------	---------	---------	---------	---------	1.9E+05	<0.01
LUE	---------	---------	---------	---------	--------	---------	---------	---------	---------	---------	ND*	--------
RA-1	---------	ND	---------	---------	--------	---------	---------	---------	---------	---------	---------	--------
FAC. ALFA	---------	---------	ND	---------	--------	---------	11.9E+00	---------	---------	---------	---------	<0.01
RA-6	---------	1.9E+07	---------	---------	<0.01	5.5E+10	<LD	---------	<LD	---------	---------	<0.01

--- = Not Applicable
ND = No Discharges registered
<LD = Less than Detection Limit
* = in the period of time considered, the facility was closed
% DC = Indicates the percentage of the allowed dose limit for the public (1 mSv)

F.4.1.2 Disposal of Solid Materials

On September 21st, 2009, the ARN´s Board's approved the Resolution of the "Generic Values of "Clearance" to release from the regulatory control the solid materials of very low level activity concentration. These levels were set in the Safety Guide No. RS-G-1.7 and derived from scenarios developed in the Safety Guide No. 44, both from the International Atomic Energy Agency.

Currently, Guide AR 8-Rev.0 is already published and corresponds to the application of generic levels of clearance. This guide may be used to facilitate the clearance application since it establishes the conditions for materials to be cleared, but they are not compulsory. Until now, conditional dispenses have been given to small users.

F.4.1.3 Exemption of Practices

In Standard AR 10.1.1, ARN makes reference to exemption of practices and criteria of applicable doses, as follows:

> *"Provided the approval of ARN, every practice is exempted in which it can be demonstrated that it is not conceptually possible to originate during a year an effective dose in more exposed individuals higher than 10 μSv or a collective effective dose higher than 1 man.Sv."*

In 2010, Standard AR 6-Rev.0 on "Generic Levels of Exemption" was approved. These levels were derived from 3 scenarios established in the document Radiation Protection 65 which appear in the following IAEA document: "Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, General Safety Requirements Part 3. These levels apply for those limited total activities or, when exemption occurs due to an activity concentration, to moderated masses of radioactive material in order of 1 ton. This implies that in case one does not overcome Generic Levels, exemption might occur automatically.

F.4.2 Occupational Exposure

The Radiological Protection criteria adopted by the Regulatory Body to control the dose received by workers is consistent with ICRP's recommendations.

AR 3.1.1, AR 4.1.1 and AR 6.1.1 regulatory standards —applied to nuclear power reactors, research reactors and radioactive facilities Type I— set different criteria to ensure that the occupational dose to workers stays as low as reasonably achievable and lower than the established dose constraints.

In practice and according to what regulatory standard 10.1.1 determines, it is considered that dose limit levels have not been exceeded when the following conditions are met:

$$\frac{H_p(d)}{L_{DT}} \leq 1$$

and

$$\frac{H_p(10)}{20mSv} + \sum_j \frac{I_j}{I_{L,j}} \leq 1$$

where:

$H_p(d)$ is the individual equivalent dose at a depth of 0.07 mm and 3 mm for skin and crystalline, respectively, integrated in a year.

L_{DT} is the limit of equivalent dose in skin or crystalline, as appropriate.

$H_p(10)$ is the individual equivalent dose at a depth of 10 mm from the skin surface, integrated in one year.

I_J is the intake value of nuclide *j* during a year.

$I_{L,J}$ is the annual intake limit for nuclide *j*, resulting from the division of 20 mSv by the dosimetric factor of effective dose commitment, per intake unit of the mentioned radionuclide.

In most facilities, the occupational doses are global values that include the doses received during operation and maintenance, for all the workers at the facilities subject to individual monitoring, therefore the doses received during radioactive waste and spent fuel storage activities are not distinguished.

Only in the case of doses to AGE staff, the reported doses correspond exclusively to radioactive waste management activities. In that facility, in the period 2009-2013, the average annual collective dose was of 0.013 man,Sv and the average annual individual dose was of 0.63 mSv.

F.4.3 Radiological and Nuclear Safety at CNEA

The Argentine Atomic Energy Commission (CNEA) responsible for the management of SF and RW generated in the national territory is the Responsible Institution for the operation of nuclear and radioactive facilities at several Atomic Centres.

In order to organise and coordinate organically the activities conducted at CNEA, related to radiological and nuclear safety, a Radiological and Nuclear Safety Department was created (GSR&N). This Department has goals, such as to strengthen policies to supervise and comply with the legislation and regulations in force and coordinate the implementation of measures, actions and practices in major facilities of CNEA in accordance with regulatory standards in force, in order to protect workers, population, the environment and the assets.

The main objective of the Radiological and Nuclear Safety Department is to strengthen the safety culture of CNEA in an integrated manner with qualified personnel to undertake this activity in an effective, efficient and transparent manner as a referent in this topic.

The Department coordinates the CNEA Safety Committee consisting of the Heads of Safety Units of Atomic Centers where nuclear facilities are located.

This Committee evaluates the state of documentation of facilities, formation and training of operating personnel, the state of facilities, failures or recorded detours, changes or modifications, innovations and improvements, and operating experience.

In order to achieve this objective, the Department has the following main activities:

Strengthen:

- Current capacity in CNEA in relation to safety topics.
- Control systems and support to facilities.

Optimize:

- Environmental radiological monitoring programs of CNEA sites and the communication of their results among the public.
- Optimize radiological monitoring programs of the personnel of radioactive facilities and neighboring areas.

Consolidate:

- A system of radiological public health medicine and optimization of the system of medicine at work.
- A net for supporting the licensing of facilities.
- A program of radiological protection for the patient at a national level.

The Department also participates in adapting the regulations (standards) and other relevant legislation. This department is a national contact point and is in charge of ensuring the compliance with obligations of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Law No. 25279).

F.5 Emergency Preparedness

F.5.1 Introduction

As presented in prior National Reports, the Nuclear Regulatory Authority requires that the responsible organization prepares a plan to answer in case of nuclear or radiological emergencies. This Emergency Plan includes the application of protective actions to prevent and/or mitigate eventual radiological consequences in accidental situations. The magnitude and scope of the plan are consistent with the type of facility. Every facility and every site have an internal emergency plan. There is also an emergency external plan that considers the possibility of accidental events that could have consequences in neighboring inhabitants.

Regulatory standards AR 10.1.1, AR 3.7.1 and AR 4.7.1, operating licenses and requirements presented to responsible organizations and primary responsible persons of facilities, regulate planning and preparation of the response in case of emergencies.

F.5.2 Structure of the Emergency Plan in the National Scope

Law No. 24804 and its provisions through the Decree No. 1390 of November, 1998 provide the ARN with the legal framework necessary to approve and intervene in contingency plans in case of nuclear accidents.

Municipal, provincial and national authorities that may be related to the preparation of these plans shall comply with guidelines and criteria defined by the ARN, which shall have those powers conferred in the Convention on Nuclear Safety, approved by Law No. 24776.

In December 2002, an interim version of the National Plan of Nuclear Emergencies was approved in the scope of the Federal Emergency System (SIFEM) and the National Office of Civil Protection which was updated in agreement with the Nuclear Activity Act. In 2003,

a Provincial Plan on Nuclear Emergencies was approved in Córdoba Province where the Embalse NPP is located. The Provincial Plan on Nuclear Emergency is to be approved in Buenos Aires Province where the Atucha NPP (CNA-Units I and II) and the Ezeiza and Constituyentes Atomic Centres are located.

In the case of nuclear power plants, municipalities that might directly be affected by a nuclear accident within a 10-km radius have a Municipal Plan for Nuclear Emergencies. This is the case of the town Lima and its neighboring areas surrounding NPP Atucha I, as with the towns : La Cruz, Embalse, Villa del Dique and Villa Rumipal near CNE.

When considering atomic centers, potential accidents in each facility are assessed and characterized in safety reports (design basis accidents). Most of these facilities have a low radioactive inventory, therefore, their probable radiological consequence would only affect them and, in the case of extreme conditions, also the atomic centres where they are located.

As it was previously mentioned, agreements with governmental authorities were reached in order to implement protective measures, and define responsibilities and positions of organizations in charge of applying them.

F.5.3 International Agreements

By the end of 1986, Brazil and Argentina signed the Argentine-Brazilian Cooperation Agreement. Annex II to Protocol 11 thereof includes the *Reciprocal Cooperation and Assistance in Case of Nuclear Accidents and Radiological Emergencies Program*.

In February 1990, Argentina adhered to the *Convention on Early Notification of a Nuclear Accident* and the *Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency.* The Regulatory Body is the contact and the Competent Authority of both instruments.

In addition, Argentina is a member and contact of the The Radiation Emergency Medical Preparedness and Assistance Network (REMPAN) of the World Health Organization.

On the other hand, if an accident involving potential loss of nuclear material in spent fuels should occur, Argentina has assumed the commitment of reporting to international agencies characteristics, causes and consequences of the accident in a special report.

F.5.4 Nuclear Power Plants Emergency Plans

In the case of spent fuel and radioactive waste management facilities located in nuclear power plants, the emergency plans of the plants contemplate the application of protective measures to prevent and/or mitigate the possible radiological consequences derived from nuclear accidents that might occur in those facilities. The emergency plans of nuclear power plants were described in the 1st National Report and have been fully developed in the reports of the Convention on Nuclear Safety.

F.5.5 Atomic Centres Emergency Plans

As discussed in previous reports, CNEA as the responsible entity for the operation of nuclear and radioactive facilities, established a general procedure for developing emergency plans (facilities emergency and evacuation plans CNEA-PN00O01). This document sets out general guidelines to which the Atomic Centres and Principal Branch Offices under CNEA's jurisdiction should adopt and comply with.

F.6 Decommissioning

F.6.1 Introduction

There are no operating facilities in the process of being decommissioned. The conditions in which these activities should be planned and performed are presented in the following paragraphs.

Nonetheless, CNEA has informed the ARN about its decision to decommission the RA-8 reactor in the short term. Now, the fuel assemblies of this reactor have been safely retired and stored.

F.6.2 Regulatory Aspects

The legal and regulatory framework of nuclear activities described in Section E of this National Report is applicable to decommissioning activities of nuclear facilities. Therefore, the criteria and radiological safety standards, waste management, quality and safety culture concepts to the operation of the nuclear facilities are applied.

One of the main requirements of the regulatory system is that it is not possible to start construction, commissioning, operation and decommissioning of a significant nuclear facility if it does not have the pertinent license requested by the Responsible Institution and issued by the Regulatory Authority.

Specifically, Law No. 24804, Nuclear Activity Act, sets forth in Article 16 (b) that the Nuclear Regulatory Authority is authorized to grant licenses for the decommissioning of nuclear facilities.

The above mentioned law and its regulating Decree determine, among other issues, CNEA's liability as responsible organization for the manner in which NPPs should be decommissioned.

AR-0.0.1 regulatory standard "Licensing of Type I facilities" sets out that a license issued by the ARN is required in order to proceed to the decommissioning of nuclear facilities.
Also, AR-3.17.1 regulatory standard "Nuclear power plant decommissioning" determines the basic requirements for the decommissioning of those facilities. The main conditions are as follows:

- ❖ The Responsible Institution, holder of the Decommissioning License, is responsible for planning and providing the resources required for the safe decommissioning of the nuclear power plant.

- ❖ The Decommissioning Program should consider the necessary institutional arrangements and foresee appropriate radiological protection in each stage. The Regulatory Authority's prior approval is required to implement the Program.

- ❖ The Decommissioning Program should include all necessary steps to ensure an appropriate radiological protection with minimum surveillance after decommissioning.

- ❖ The Responsible Institution will be able to delegate the decommissioning activities, either totally or partially, to third parties, but it will continue being responsible for them. During the decommissioning process, the Responsible Institution shall contemplate and submit to ARN's consideration, the following:

    - Project management
    - Site management
    - Roles and responsibilities of involved organizations
    - Radiological protection
    - Quality assurance
    - Waste segregation , conditioning, transport and final disposal
    - Monitoring after partial decommissioning stages have concluded
    - Security, safeguards and non-proliferation commitments

F.6.3 Background

The dismantling of RA-2 Critical Facility at CNEA's Constituyentes Atomic Center, performed during 1984-1989, is a former milestone in terms of decommissioning. The building that housed the reactor is now open for unrestricted use.

In compliance with the Nuclear Activity Act, Law No. 24804, the responsibility for the manner of how decommissioning activities are performed, falls on CNEA.

F.6.4 Planning for Decommissioning of Significant Nuclear Facilities

As stated in the previous reports, even though there is no specific date on which any relevant nuclear facility in Argentina shall definitely end its operation, the planning of their decommissioning is foreseen.

F.6.5 Financing

As stated in prior reports and as determined by Decree No. 1390/98, regulatory of Law No. 24804 regarding Nuclear Activity, the funds to meet decommissioning costs of each nuclear power plant would be set up with contributions of the company that would operate it if the nuclear power plant was to be privatised.

Law No. 26784 of 2012, in its Art. 61, revokes Art. 34 of Law No 24804; consequently, the operation of the nuclear power plants cannot be privatised, the responsibility for financing the decommissioning of Nuclear Power Plants, research reactors, and other significant nuclear facilities would be assumed by the National Government with its own funds.

SECTION G SAFETY IN SPENT FUEL MANAGEMENT

G.1 General Safety Requirements

It should be clarified that in general the contents of Section G are valid for Section H homologous requirements, except in cases in which the latter are specific.

The general safety requirements associated with spent fuel management have not been modified with respect to the requirements described in the previous National Reports. A summarized presentation of these requirements may be found in Section H – Safety in Radioactive Waste Management, as they do not reflect substantial differences.

Nevertheless, as part of the lessons learnt from the Fukushima accident, the ARN required in September 2011 the conduction of a Comprehensive Safety Assessment of the CNE, CNA I and II with the aim of detecting possible weaknesses and implementing the respective improvements.

Such Assessment included, among other requisites, the strategy of SF management, the design and behavior of the fuel element storage systems in case of extreme events, as well as the establishment of planned actions and its implementation schedule.

The Nuclear Plants have submitted to the ARN the required assessment and a proposal about the actions to be conducted and their respective schedule.

Having studied the documents sent by the NPPs, the ARN will require in the short term that the CNE and the CNA I and II apply the improvements to strengthen the safety of SF stored in the pools. The following are some of the most important measures the NPPs shall adopt:

- Availability of alternative sources of water, so that there is a safe water reserve in case of severe accidents.
- Implementation of the process of alternative water refilling in SF storage pools from an alternative reservoir.
- Availability of alternative resources for the secure provision of electricity by means of a mobile diesel generator to supply the essential power required in case of severe accidents, including SF pools.
- Implementation of the respective procedures.

Details of actions being conducted are included in section K.3.1.

G.2 Existing Facilities

As described in previous Reports, spent fuel (SF) management consists in wet or dry storage, depending on each case. Wet storage is performed in pools or tubes for the period required for the decay of the fission products in order to allow its subsequent temporary dry storage.

To date, the existing SF storage facilities are the following:

SITE	FACILITY
Atucha Nuclear Power Plant-Unit I (CNA I)	Pool Building I and II
Atucha Nuclear Power Plant-Unit II (CNA II)	Pool Building (UFA)[1]
Embalse Nuclear Power Plant (CNE)	Storage Pool
	Storage Silos (ASECQ)
Ezeiza Radioactive Waste Management Area	Central Storage for Spent Fuel from Research Reactors (DCMFEI-FACIRI[1])

(1) Facilities in process of start-up

G.2.1 CNA I Spent Fuel Storage Pools

Spent fuels described in this section come from CNA I, type PHWR, with an installed capacity of 362 MW (e) which started operation in 1974.

At present, every CNA I spent fuel is temporarily stored under water. The Power Plant has two fuel storage areas known as Pool Buildings:

- Pool Building I
  Constituted by two decay pools
  Storage capacity: 3240 positions

- Pool Building II
  Constituted by four decay pools
  Storage capacity: 8304 positions

Both buildings include a handling pool or working area.

The storage of spent fuel takes place in pools, which have a stainless steel lining of several millimeters thick, in a double tier arrangement. Fuel elements hang from stainless steel *racks*.

In order to collect and direct possible leaks through the welded seams and to be able to locate their origin, small concrete channels are left below the steel lining. Prior to lining, the walls are coated with an appropriate kind of waterproof paint.

In case leaks should exist, they are checked at the inspection station located at the lowest

level of the building. This leak detection system includes the floor and gate sealing frames.

Handling of spent fuels within the pools is performed using an overhead travelling crane with a telescopic mast fitted with the fuel handling tools. By maneuvering the crane and/or the telescopic mast it is possible to reach all points inside the pool.

With respect to the frequency at which the safety revisions are conducted, the ARN has adopted the *Periodic Safety Review* (PSR) methodology for Type I Facilities as well as the limitation of the period of validity for the Operation Licenses.

It is worth mentioning that a new facility is under construction for the dry storage of SF after a period of wet storage in CNA I (See Section G.4.1).

G.2.2 CNA II Spent Fuel Storage Pools

Fuel Storage Building

The fuel storage building is attached to the reactor auxiliary building and has access from it. It includes new and spent fuel, the necessary auxiliary systems and it is connected to the reactor building by means of a fuel transfer canal.

The fuel storage building is designed for external events, such as earthquakes, explosions pressure wave, tornados and explosive gases.

Spent Fuel Storage

Fuel elements are transported through the fuel transfer canal from the reactor building of CNA II to the pools.

Fuel elements are hung in a beam and stored in refrigerated demineralized water.

The number of positions in the four (4) pools is 6048 (1512 x 4). Storage maximum capacity of spent fuel during normal operation is 4536 in 3 pools (1512 x 3), and in Pool 2 of 733 SF, there is space left in case the whole reactor core needs to be removed. Such space shall be occupied in accordance with the strategy for removal and the composition of the fuel column.

The decay heat of the fuel elements stored in the pool is removed by means of a refrigeration system.

Within the pools, there is enough space to use a transport container and fill it so that afterwards it can be taken out of the site with the irradiated fuel elements.

The pools are reinforced concrete structures with a stainless steel liner, and the design is such that no damage can be done to the concrete structure when water at the pool is at 60ºC.

Cooling System and Spent Fuel Pool Cleaning

The “spent fuel pool” cooling system removes the decay heat generated by the irradiated fuel elements stored in the pools and dissipate it by means of the “guaranteed service of cooling water”.

The cleaning system of the pool does not have a relevant connection with the reactor safety. In case of malfunctioning, it can be disconnected and repaired before potentially unacceptable conditions are reached. Malfunctioning can be caused by components failure or because of exceeding differential pressure limits of mixed bed filters.

Components with high radioactive content, such as the mixed bed filter and the resin trap, are located in separate and shielded rooms; tubes and valves are located separately in valve rooms between the components room and the operation room. The fresh resin filling nozzle is located at the upper room of the resin tank.

G.2.3 CNE Spent Fuel Storage Pools

CANDU type spent fuels are originated in the CNE Nuclear Power Plant (CANDU 600) that started operating in 1984.

The storage of these spent fuels is performed in a concrete pool coated with epoxy resin. The original pool capacity represented 10 years of operation at 80% of the reactor power. When the worktable of the Dry Storage System (ASECQ) was installed, the storage capacity was reduced to 45144 positions, corresponding to 8 years of operation.

Failed fuel elements are encapsulated and stored under water in the failed fuel storage pool. Unloading and transfer of spent fuel is remotely controlled. Other fuel handling operations in the service building as well as in the storage pools are carried out manually under water, using long reach tools assisted by cranes and power hoists. Spent Fuel elements are stored under water in stainless steel trays.

G.2.4 Storage Silos for Spent Fuel (ASECQ), of the CNE.

The Dry Storage System (ASECQ) integrated to the CNE facilities, comprises a pool work table, SF handling tools, pool shield with its transport cart, cranes, transfer building (including the operation cell), the tractor vehicle for the transport to the silos field, the transport cart, spent fuel baskets, flasks, a lifting system for silos transference shielding, and the silos themselves.

Spent fuel elements are stored in these silos after 6 years of being refrigerated in the pool. The capacity of each silo is 540 spent fuel elements housed in 9 baskets, with 60 fuel elements per basket.

This system is in operation since 1993. There are plans to build the necessary silos to store the spent fuel generated during the whole lifetime of the power plant. At present, out of 248 silos are already built, the last 32 have been finished during 2013 and, towards the

end of that year, 200 silos were completely full already.

Upon request of ARN, the (ASECQ) system has been included in the *"Ageing Management Program for Power Plant Components and Systems Related to Nuclear Safety".* As a consequence thereof, a surveillance plan for baskets, interior lining and concrete structure of all the ASECQ silos system was incorporated. In addition to this surveillance action, a periodic measurement of aerosol and noble gases content inside the silos is conducted.

The surveillance plan continues normally since it has been in force up to date, no abnormality whatsoever has been observed in the analysis of the behavior of these components.

G.2.5 Centralized Storage of Spent Fuel from Research Reactors

Since 1972, CNEA has the "Central Storage of Special Irradiated Fissionable Material" DCMFEI, which is located at the Ezeiza Radioactive Waste Management Area (AGE) and is, up to now, the only facility operating in Argentina designed and built to store the SF from its research reactors. It comprises underground storage of 2.10 m long and 0.141 m diameter stainless steel tubes, with capacity to hold two spent fuel elements type MTR or one control element in each tube. The tubes are closed with lead filled steel plugs. At present, it stores spent fuel from the research and radioisotopes production reactor RA-3, located in Ezeiza Atomic Center, which operates with MTR low U-235-content fuel (20%).

Additionally, within the AGE, there is a storing area where 232 LEU fuel rods are stored, corresponding to the first core of RA-1 reactor.

The studies conducted in order to determine the current situation of these deposits concluded that it was necessary and convenient to secure the integrity of stored fuel along time and, consequently, in 2003, the decision was to start the project of a new facility (FACIRI), adapting existing pools in a building located at CAE and outside AGE.

G.2.6 Storage Facility for Research Reactors Spent Fuel (FACIRI)

The object of this new plant is to have a centralized storage facility for irradiated fuels, incorporating important safety improvements compared with DCMFEI.

This new storage system will allow a better control of the SF conservation condition and adequate monitoring of the water quality.

The FACIRI has been conceived as a facility for centralized wet storage of spent fuels definitively unloaded from the research reactors. The spent fuels showing failures will be encapsulated before being stored.

Wet storage will offer complementary cooling of the discharged spent fuels.

Description of the Facility

The FACIRI storage capacity is based on grids pilled one upon the other, forming 2 columns of grids located on the depth of a 16 m pool. In total, 608 spent fuel elements can

be stored distributed in 2 columns of 19 grids storing 32 spent fuel elements each.

The positions for normal fuel elements are 416, those for control rods are 96, and those for encapsulated spent fuel elements are also 96.

The pools have a double stainless steel lining containing the water where the fuels are stored. This double contention substantially increases the confining capacity of the pools.

The design includes a treatment system that allows keeping the quality of deionized water at adequate levels in order to preserve the integrity of SF during storage.

A monitoring station composed by a monitoring station and an underwater camera placed in one of the pools allows visual inspection of the stored spent fuels.

Safety Objectives in the Design of the Facility

The design of the FACIRI will ensure that the spent fuels are received, handled, stored, inspected and removed in a safe manner, maintaining sub criticality, confining the radioactive material, offering protection against radiation and dissipating the heat generated by decay, complying, additionally, with the requirements concerning conventional safety, safeguards and security.

Confinement

The confinement barriers are formed by aluminum cladding or encapsulation of SF, the pool water, the interior stainless steel lining, the exterior stainless steel lining and the concrete pool walls, to prevent the migration to ground waters in case the radionuclides should be dispersed in the pool water due to an eventual failure in stored SF's and to prevent the entrance of low quality water from the underground waters into the pool.

Recently, components and special systems installation activities have been completed, giving way for the start-up stage. Mandatory documentation has been presented and it is expected to be commissioned by the middle of 2014.

G.3 Siting of SF and Radioactive Waste Management Facilities

For the new reactor CAREM-25 site, a comprehensive assessment has been conducted. Even though this new facility is located within the same area of CNA I and II, independent analyses have been carried out for CAREM, including assessments of external events that could affect the plant safety, and the plant environment impact and potential effects on the population.

The evaluations were conducted in accordance with the IAEA Guidelines (NS-R-3 Site Evaluation for Nuclear Installations, NS-G-3.1/2//6, SSG-9/18/21, among others), ending in the respective design basis for the verification of the facility.

That site evaluation is part of the facility design documents, required by the ARN for licensing.

As mentioned in the previous National Reports, the safety requirements for the remaining sites to be used for spent fuel management have not been modified.

G.4 Design and Construction of New Facilities

G.4.1 Atucha Nuclear Power Plant - Unit I

NASA has developed a proposal to include in CNA I a dry storage facility for spent fuel elements.

According to the scenario projected by NASA, the Fuel Elements storage capacity in the decay pools would be full in 2015, being the facility end of life in 2017.

CNEA and CNA I's Special Projects Division developed the project conceptual engineering for the Burned Fuel Elements Dry Storage (ASECQ, Burned Fuel Elements is equivalent to Spent Fuel Elements).

This project foresees SF transfer with a major decay deposited in the Pool Building I to an annex which will be the Transitory Dry Storage Building. This building will include vertical subterranean silos (subterranean silos in an upright position) and will be an extension of the controlled area that will have the same features of the existing pool zone.

It is expected not only to reach end of life, but also to extend life operation of the plant for more than 5 years of full power, enough time to implement a new Dry Storage System compatible with both plants (CNA I and II).

According to the ASECQ project conceptual engineering, fuel will be located in a rectangular stainless steel storage unit (basket) with a capacity for nine SF; this unit will be hanging from a supporting grid in the upper part.

In order to handle the baskets with SF, there will be a device (shield for transportation and lifting) to store the baskets and provide an appropriate shield protection level to workers during transportation.

Every silo will be made up of stainless steel, with a storing capacity of 2 baskets with 9 SF elements inside each.

Some silos will include instrumentation for obtaining information about SF cladding temperature as well as the dose rate status.

About a hundred underground silos are planned to be installed in order to reduce the pool inventory and to offer the storage capacity required by the facility life extension.

The new building will have the same services offered by the Pools Building as it is an extension of the Controlled Zone.

At present, NASA is in charge of the building work, in particular Management Unit CNAII-IV CN, and its main stages are the following:

- Detail Engineering Project Implementation
- Civil Works Implementation
- Electromechanical Assembly Implementation
- Start-up

The civil works that began with the concrete retaining plate for floors, the beginning of excavation and installation of small piles for the building foundation is now being conducted.

As the facility mentioned in the above paragraphs will not be ready to start up in February 2015, as previously planned, and with the aim of protecting the operation of CNA I, the Nuclear Safety Department of CNA - II has created the following alternative:

1) Reorganization of the reactor's internal components placed in the decay pools hangers within the Pool Building I and II: During the 2013 planned outage, 93 positions to store irradiated fuels elements were recovered, which would allow four months extra of operation.

2) Spent fuel elements transfer from Unit I to Unit II: At the end of 2012, the project to transfer SF to CNA's storage pools began, and it is divided into three phases:

Phase I - Conceptual Engineering,
Phase II - Detail Engineering and Preliminary Safety Report, and
Phase III - Fabrication, Delivery of Components and Licensing.

The development of the two first phases was awarded to AREVA-Transnuclear. In mid-2013, the conceptual engineering was received, paving the way for the development of the documents included in Phase II.

At present, Phase II is in stage of revision and correction for its final approval. The end of this stage will be synchronized with the delivery of documents to build equipment and with the beginning of the licensing process.

Phase III will be developed in Argentina, and it includes the construction of four casks to transfer spent fuel elements with more than 25 years of decay; the fabrication of frames for lifting the casks using cranes from Unit I and Unit II (UFA) pools buildings; and finally the fabrication of a cask support to transfer them in horizontal position between both units. Those components, among other auxiliary devices that allow interaction between the casks and the facilities of the nuclear plant, will offer 620 free positions to store irradiated fuel from the reactor.

G.4.2 CAREM-25 Nuclear Power Plant

CAREM-25 is an innovative design reactor of small power (100 MWt) thought to offer new design solutions based on the worldwide expertise in the safe operation of light water reactors. CAREM-25 design is based on an integrated light water reactor, using enriched uranium as fuel. It is an indirect cycle reactor conceptually simple, which offers a high safety level.

The first CAREM reactor will be located in Lima, Zárate, Buenos Aires Province, next to CNA I y CNA II.

CAREM fuel elements have a hexagonal section with 127 rods: 108 are fuel rods; 18 are guide tubes for absorbing elements; and one is an instrumentation tube.

The reactor core has 61 fuel elements. There is an annual refueling and it comprehends the whole core.

Within the containment building, there is a spent fuel storage pool designed to store the SF originated during 10 years of full power operation, residual heat removal and a proper level of sub-criticality.

The SF storage pool will include a Cooling and Clean-up System whose functions are:

- Removing decay heat dissipated by irradiated fuel elements stored in the SF pool as a safety measure.
- In case it is required, it will allow decay heat removal of a whole core once the reactor has been extinguished for 60 hours.
- Keeping the radiological, physical and chemical parameters of the water of the fuel elements pool within an appropriate range.
- Compensate water loss by evaporation.

Furthermore, there is a plan to develop a replenish water system to compensate loss by evaporation at the maximum water temperature according to the operation design.

In case of emergency (loss of normal supply water line) it is planned to include a temporary support facility.

G.4.3 RA-10 Reactor

RA-10 reactor is a new multipurpose reactor for radioisotopes production, fuel irradiation, beams use, and neutron and thermal-hydraulic experiments. Its main purpose is to extend and consolidate radioisotopes production, provide materials and fuel irradiation, and offer new applications in the scientific and technological fields.

RA-10 reactor will be located at the Ezeiza Atomic Center (CAE). Its maximum thermal power will be 30 MW, and it will include a core consisting of MTR type fuel reflected by heavy water.

SF will be stored in pools inside the facility (enough to cover 10 years of operation) until they are transferred to a proper temporary storage facility. Pools cooling system will be designed so that decay heat can be safely removed from the core, from the experimental devices and from the irradiated fuel elements during normal and abnormal conditions.

G.5 Safety Assessment of Facilities

The requirements for the safety assessment of spent fuel and radioactive waste management facilities have not been changed since the presentation of the previous National Reports, except with reference to those expressed in section K.3.1 of the present National Report.

G.6 Operation of the Facilities

As mentioned above, the safety requirements applied to the operation of spent fuel and radioactive waste management facilities have not been modified with respect to the previous National Reports.

G.7 Final Disposal of Spent Fuel

At present, the safety requirements stated in the 1st National Report continue in force, as long as spent fuels are stored in facilities specially designed and operated for that purpose.

The last version of the PEGRR foresees a deep geological repository in Argentina by 2060.

SECTION H SAFETY IN RADIOACTIVE WASTE MANAGEMENT

H.1 General Safety Requirements

The following paragraphs summarize the scope of the general safety requirements for the management of radioactive waste generated in Argentina.

H.1.1 Criticality and Removal of Residual Heat Generated During Radioactive Waste Management

Radioactive waste stored or disposed of in the Argentine Republic does not require any particular measures associated with heat removal or criticality factors because it is classified as low or intermediate level on account of their radiological characteristics (half-life periods, types of radionuclides, energies and activity concentrations).

H.1.2 Minimization of Radioactive Waste Generation

Minimization of radioactive waste generation is an essential concept applied in Argentina in order to comply with the following conditions:

- Reduce radiation doses
- Reduce costs
- Minimize environmental impact

For that purpose, the minimization of generated waste is taken into account and in consequence the contents of activity and volume from the different streams. Also, as part of the minimization strategy of waste management, the recycling and reuse of contaminated or active materials is envisaged. One example is the reutilization of stored radioactive sources, provided their use is justified according to regulatory criteria applied in the country.

H.1.3 Interdependence Between Different Radioactive Waste Management Stages

Operational procedures associated with the treatment and conditioning stages take into account the interdependence between the different management stages (e.g. transport, temporary and long term storage and final disposal).

In the planning of the management stages of different types of radioactive waste are set acceptance criteria for each of them based on their interdependence and the medium and long term strategies.

H.1.4 Efficient Protection for Individuals, Society and Environment

The standard AR 10.12.1 – “Radioactive Waste Management” determines general requirements for the management activities to be performed with an appropriate level of radiological protection for individuals and for the preservation of the environment for current and future generations. The criteria to achieve this objective are:

Dose and Risk Limits: The main objective is to ensure that individual risks are below the appropriate applicable levels (Standard AR 10.1.1) and that the radiological impact remains as low as reasonable achievable (ALARA).

Optimization of Protection Systems: Radiological protection systems used for radioactive waste management must be optimized taking into account the reduction of the effective collective dose, the individual dose distribution, the cost of different options, uncertainties associated with long periods and dose restrictions as a boundary condition for optimization (Standard AR-10.12.1, Criterion 20).

Responsibilities: Radioactive waste generators (operators of nuclear facilities and users of radioactive material) are responsible for the management of the waste generated by them including an appropriate level of protection for workers and for the public (Standard AR-10.12.1, Criterion 24).

Liquid and Gaseous Waste: In order to comply with the discharge authorised values established by the regulations in force, liquid and gaseous radioactive waste must be treated by decay or retention, if necessary (Standards AR-3.1.2 and AR-6.1.2).

Solid Waste: The final disposal of solid radioactive waste has to be performed using, when appropriate, a multiple barrier system (Standard AR-10.12.1, Criterion 19). The closure of a final disposal facility for radioactive waste or any system related to such facility must have ARN's prior authorization (Standard AR-10.12.1, criterion 36). The responsibility of the facility operator extends until the final stages of closure, post-closure and institutional control during the period determined by the ARN (Standard AR-10.12.1, Criterion 37). When the Responsible Organization applies for the construction and operation licenses, it must provide evidence that the necessary steps have been taken for the system to compliy with the safety requirements in all its stages, including closure and subsequent stages (Standard AR-10.12.1, Criterion 30 and 31).

Safety Evaluation of the Disposal Systems: Safety evaluation of the final disposal systems must cover the design, construction, operation and closure stages, as well as the condition after closure and their future evolution. Safety evaluation may be presented in terms of doses for normal scenarios, in terms of risk for probabilistic events or by another safety indicator considered appropriate for the required confinement period at ARN's satisfaction (Standard AR-10.12.1, Criteria 30 to 33).

Information to be Supplied to the Nuclear Regulatory Authority: The responsible organizations of the facilities that generate the waste and the responsible organization of the waste management facility shall keep an updated inventory of the waste during the operation stage and forward regular reports on those inventories to the ARN. Files with inventories must be submitted to the ARN at the end of their activities. (Standard AR-10.12.1, Criteria 27 and 35).

H.1.5 Biological, Chemical and Other Risks Associated with Radioactive Waste Management

In agreement with the General Environmental Act No. 25675 of the Argentine Republic the provinces determine the specific requirements to be satisfied by all industries located in their territory.

Each management facility must comply with general and specific requirements determined by the competent application authority in environmental matters, with jurisdiction over the site of the facility.

For example, the Province of Córdoba has passed the Act No. 7343 on *Guiding Principles for Preservation*, *Defence and Improvement of the Environment* which has jurisdiction over the Embalse Nuclear Power Plant (CNE) located in this province.

H.1.6 Avoid actions with greater impact on future generations than permitted for the present generation

Article 1 of Law No. 25018 determines the rights to safety of future generations (see L.1.3.2)

The Standard ARN-10.12.1, in its Criterion 32, determines that the estimate doses to be received by future generations in connection with the final disposal facilities shall not exceed the dose restrictions determined at the beginning of the isolation period.

On the other hand, and by foreseeing that the present technologies used for radioactive waste management do not imply a potential risk for future generations, diverse studies and evaluations are carried out during the pre-operational, operational and post-operational stages of the facilities which shall continue during the institutional control stage.

H.1.7 Avoid Imposing Undue Burdens on Future Generations

The internationally accepted ethical principle whereby the beneficiaries of a practice should bear the total cost of the management and final disposal of generated waste has been contemplated in Law No. 25018. In its Section 13, this Law provides the legal foundations for the existence of a fund for the management and final disposal of radioactive waste based on the contribution of the generators, in case they are private entities, keeping this requirement in the State in case it is the owner. It also takes into account the deferred costs of spent fuel and radioactive waste management.

In this sense, Article 11 of the same Act considers the recovery of sites affected by industrial mining activities of Uranium minerals.

The creation of the PNGRR determined by Law No. 25018, and by means of the PEGRR, establishes the legal, technical and financial requirements, to avoid imposing undue burdens on future generations.

Furthermore, in order to secure the availability of sufficient resources, the current regulations set forth the creation of funds for financing the PNGRR and the decommissioning of each NPP. These funds shall come from the main radioactive waste generators, which are currently within the sphere of the State.

In accordance with the principle of unity of action and patrimony of the State, and while the nuclear power plants remain within the sphere of the State, the funding for PNGRR activities will depend on the National Budget granted to CNEA.

Regarding long-term projects, such as the installation of future repositories, as long as the funds anticipated by the current regulation are not integrated, the national State shall secure the availability of sufficient resources for CNEA to deal, when necessary, with the expenditure and investments to finance the management of waste originated from nuclear power plants.

H.2 Existing Facilities and Previous Practices

H.2.1 Introduction

Radioactive waste management facilities are located in the following sites:

- Atucha Nuclear Power Plant - Unit I
- Atucha Nuclear Power Plant - Unit II
- Embalse Nuclear Power Plant
- Ezeiza Radioactive Waste Management Area (Ezeiza Atomic Centre)
- Waste Decay and Treatment Facility corresponding to the Radioisotopes Production Plant (Ezeiza Atomic Centre)
- Pilcaniyeu Technological Complex
- Uranium Dioxide Production Plant
- Mining Waste Sites

Hereinafter follows a description of the present condition of such facilities.

H.2.2 Facilities of Atucha Nuclear Power Plant - Unit I

As stated in the previous reports, the execution frequency of the safety revisions for Type I facilities responds to the *Periodic Safety Review - PSR* methodology. Moreover, the ARN has determined the limitation of the validity period of the operation licenses as stated in Section E.2.2.2 of this National Report. The application of these measures is effective for CNA I since December 2003.

Within this framework and as part of the Probabilistic Safety Analysis for Atucha I Nuclear Power Plant (APS IT 911), performed by means of the construction of a Master Logical Diagram in July 2000, it has been concluded that the doses associated to the events related to the safety of the radioactive waste management systems, is two order of magnitude below the dose constraint value determined as reference value. In such report the Handling and Storage System for Spent Fuels were also included.

In the last five years, it was not necessary to recondition the liquid radioactive waste and sludge in the storage tanks system (called TT11 and TT12) of the Plant due to the low generation annual rate of this type of waste and the wide storage capacity of the systems aforementioned. Other tasks performed were treatment and conditioning of low level solid waste; treatment and storage of spent mechanical filters; and storage of spent ion exchange resin.

Low level solid waste compacting operations are conducted internally within the original press of the plant. The new waste press is in the start-up period. During the informed period, the new dismantling and storage system for spent mechanical filters was started, which implied improvement in terms of personal protection and environmental isolation.

The two 10 m^3 tanks called TC91/92 B01 with resin used for cleaning fuel elements pool water were transferred to the reservoir tank called Recinto 3-004, where there were already the cleaning resins from the primary circuit since 2012. In consequence, the 4 spent radioactive resin storage tanks are left empty so that they can be used for about 15 years of normal operation of the reactor.

The necessary equipment to assembly the Radioactive Waste Characterization Lab of CNA I was acquired. It will allow the radiologic information of the radioactive waste inventory to be finished in order to comply with the regulatory requirements.

H.2.3 Facilities of Atucha Nuclear Power Plant - Unit II

The following paragraphs include detailed information about Atucha Nuclear Power Plant - Unit II regarding RW Management.

Solid Waste Management Systems of CNA II

Solid waste management systems foresee internal solidification and storage of radioactive waste generated by the operation of the reactor and its maintenance before its final disposal outside the plant.

The aim of solid radioactive waste systems design is to offer a practical and safe way to collect, pack, temporarily store and prepare for final disposal the solid radioactive waste generated during the plant operation period.

The aim of that design is achieved by means of the following design basis:

- The systems are designed for the continuous processing of solid waste collected during an operational year. Afterwards, they have to be transferred to interim storage systems or sent to final disposal.
- The systems are designed to dry wet solid waste, such as mechanical filters and ion exchange resin, and to encapsulate them in cement. Any other low level solid waste is directly compacted in containers.

- The systems are designed to collect vaporization concentrate, spent ion exchange resin, contaminated filters and other waste generated during the operation of the plant, keeping the operator exposed to the lowest radiation level as possible.
- The systems provide the necessary protection within the area where compacted solid waste is stored, in order to keep radiation levels as low as possible.

The cementing solidification system is made up of the following equipment:

- Concentrate dosage: The radioactive concentrate recirculates continuously by means of a pump.
- Ion exchange resin treatment and dosage: The ion exchange resin is transferred from the storage tank, which are part of the water coolant purification system and the moderator, to the resin storage tank. After that, resin is transferred to the transport system where it is dried.
- Lime and cement dosage equipment: Lime and cement are delivered by truck and it is fed by means of a screw conveyor into a vertical silo. Storage silos have level measurement points and are located outside the controlled area.
- Continuous mixer: It is made up of a motor unit and a processing unit. The mixer is activated by a motor with an integrated fan. The processing unit works by means of a screw and is made up of several individual blades in a row, in order to fill the tanks.
- Video cameras and cleaning equipment: The continuous mixer and the drum refilling station are equipped with a TV camera. The process is controlled from the operation room and allows the staff to operate remotely and safely.
- Cleaning device with demineralised water: The mixer internal parts shall be cleaned to avoid dirt and possible obstructions. It is thought to develop a cleaning device with the distribution system for this purpose.
- Drums filling station: In this area, the 200-litres steel drums are filled with any of the following mixes: lime and cement mix with the concentrate, lime mix, cement and ion exchange resin or contaminated filters or used parts consolidated in lime/cement. Afterwards, the closed drums are transferred to a specific storage area.
- Storage facilities: The radioactive solid waste internal deposit is divided into two rooms specially equipped. In the first, lower-activity solid waste is stored within a steel structure to be piled up in drums. In the second, higher-activity solid waste is stored in drums, in vertical concrete tubes.

The plant is not affected in case there is a failure in the waste processing system, due to the fact that those (concentrate and ion exchange resin) can be stored in tanks for about 9 months, or in the resin storage tank for 4 years.

The main components of the radioactive waste processing system have electrical interlocks and, in consequence, the system can be driven to a safe condition in case of failure.

As the design does not allow drums to be in wrong position and thanks to the safety interlocks, radioactive waste spillage due to an accidental fall of drums from the transport system is avoided.

In several locations within the radioactive waste processing system, there are safety valves that protect the main parts of the plan against destruction in case of failure. Safety valves are particularly designed so that they open before reaching design pressure of the respective system.

Liquid Waste Management Systems of CNA II

The liquid waste management system includes a treatment system and a storage system.

These systems functions include the collection, storage and decontamination of liquid waste produced in the controlled area of the plant and other areas, as necessary, and, in case of complying with the regulatory limits and the ALARA principle, discharge them to the environment as effluents.

Accumulated liquid waste is divided according to their radioactivity level, their concentration of heavy water and their chemical composition. They are collected in liquid waste storage tanks. Tanks are divided in three groups according to their origin:

- Group I: Intermediate level liquid radioactive waste up to $3.7.10^{10}$ Bq/m^3.
- Group II: Low level liquid radioactive waste up to $3.7.10^{8}$ Bq/m^3.
- Group III: Intermediate level liquid radioactive waste with D_2O concentration up to $3.7.10^{10}$ Bq/m^3.

Group I liquid waste

- Water sump from Equipment Compartments
- Liquid waste from Controlled Area Laboratory
- Liquid waste from Decontamination Area
- Water from the Fuel Transfer Pool
- Sediment from Radioactive Waste Storage Liquid System
- Liquids originated in the liquid radioactive waste Processing Evaporator Equipment
- Distillate from the Radioactive Concentrate Processing System
- Regeneration and Wash Water from the Coolant and Moderator Purification System

Group II liquid waste

- Water sump from Operating Compartments
- Liquid waste from Laundry
- Liquid waste from Showers and Washrooms
- Distillate from Auxiliary Steam Condensate Manifold and Return System

Group III liquid waste

- Liquid waste with D_2O from the Equipment Drain System of the Auxiliary Building
- Liquid waste containing D_2O from the D_2O Enrichment System

- Liquid waste Collection and Treatment, Storage and Discharge Points to the environment

A possible failure in the liquid waste storage system, or in the liquid waste treatment, or in parts of these systems, has no negative effects in other systems.

Gaseous Waste Management Systems of CNA II

Radioactive gases are collected and processed by means of different systems according to their origin. These systems are:

- Heating, Ventilation and Air Conditioning Systems (HVAC) within the controlled area.
- Gaseous Waste Processing System (KPL System).

The general principles of the gaseous waste systems design are:

- The first objective is to process gaseous radioactive waste and control its release to the environment as effluents, complying with the regulatory limits and the ALARA principle.
- The second objective is to remove fission product gases from the reactor coolant and process them before they are released. Gaseous waste systems are designed to minimize possible personnel exposure to radiation.

The specific aims of the gaseous waste treatment system design are:

- Avoiding radioactive gaseous waste release from connected components and systems into the buildings atmosphere, originated within the reactor cooling system, deriving those gases to the KPL system.
- Retaining radioactive gases (Xe, Kr) for a sufficient decay time and release them through the ventilation stack in a controlled way.
- Controlling hydrogen concentration in the KPL system up to a 4% in volume in order to avoid the generation of an explosive mix deriving from the atmospheric oxygen getting into the system through leaks.
- Controlling oxygen concentration in KPL system to 1000 ppm (= 0.1% in volume) in order to avoid oxygen absorption in the reactor coolant and the resulting corrosion in the reactor cooling system.

According to these functions, the KPL system mainly consists of:

- Two Water Ring Compressors for establishing a negative pressure in the components connected to the KPL system.
- A delay line for noble gases decay.
- Two recombiners for recombination of H_2 and O_2 to water.

Delay line

Noble gases Kr and Xe are retained in delay beds by adsorption, until their radioactivity decays to an acceptable level for release through the ventilation stack.

The delay line is designed for a minimum delay time of 60 days for Xe and 60 hours for Kr (radioactive isotopes Xe^{133} and Kr^{85m}, respectively).

Recombiners

Recombiners are designed for full flushing gas flow (0.086 kg/s of N_2 with two compressors). Even if the reaction is started at room temperature, the catalyst reaches 100 ºC through the heating elements prepared to secure an efficient operation. This avoids moisture from precipitating onto catalytic material that could affect the recombination reaction.

KPL system offers a protection against accidental release of large quantities of radioactive gases to the environment based on:

- Redundant design of all important components.
- Instrumentation for detection of abnormal conditions and accidents and posterior alarm.
- Processing control and radioactive gases prevention, if the activity exceeds the pre-established limit.
- Continuous monitoring of all the parameters of the relevant processes that show the system availability.
- The system and its components of protection from malfunctioning, and an automatic functional unit to control startup, shutdown and normal operation, as well as by electric safety interlocks.
- Appropriate time for the operator's decision and action when there is a sign of abnormal conditions.

KPL system main components for the operation of the system and availability are always doubled:

- Waste gas compressors
- Recombiners
- Gas heaters
- D_2/O_2 control valves
- Reduction valves

H.2.4 Facilities of Embalse Nuclear Power Plant

In this period, new equipment was acquired for the alpha and beta emitters' radioisotopes lab, the last step for acknowledging waste radiological characterization.

H.2.5 Ezeiza Radioactive Waste Management Area (AGE)

The Ezeiza Management Area (Area de Gestión Ezeiza – AGE) is the facility exclusively destined for the treatment, conditioning and final disposal of low level solid and liquid radioactive waste. It is located in the province of Buenos Aires in an area of 8 hectares within the CAE. In 2006 CNEA, decided the permanent suspension of the operation of the final disposal systems as they had already concluded their operative stage.

In addition, low and medium level waste is safely conditioned and temporarily stored, awaiting the construction of an appropriate repository as foreseen in PEGRR. Within the same site, there is also a facility used to store disused sealed sources, as well as the remaining nuclear material of Mo-99 production among others.

Safety Re-evaluation of the Ezeiza Radioactive Waste Management Area (AGE)

In previous Joint Convention Reports, changes in factors related to hydrology, meteorology and demography that might affect Ezeiza Management Area's operativeness were produced. Most final disposal facilities began operating in the early 1970.

Taking these factors into consideration, CNEA, as the Responsible Organization, which had already decided to suspend the final disposal system operation for solids in 1999, decided during 2001 to do the same with the Final Disposal systems for liquids and structural waste, with the object to start with the safety re-evaluation of the AGE.

CNEA has presented a new Report about Safety Radiological Assessment of the Solid Waste Semicontention Systems that has been approved by the ARN in 2012. It also includes a schedule with activities in order to apply for the final closure license of the facility.

In addition, the radiological inventory and the conditions of other disposal systems information is being updated. AGE environmental evaluation and planning is being developed to improve the underground aquifers behaviour modelling. The aim is to increase quantity and quality of the data from spreading and longitudinal dispersion coefficient of PNGRR catalogue.

The situation of the AGE facilities until the end of 2013 is described in the following paragraphs.

AGE Facilities for treatment, conditioning and storage

- **Handling Yard and Stowage of Items**

  In the previous National Reports this reinforced concrete platform has been described, originally designed for the reception, control and management of temporary stored radioactive waste waiting to be characterised, treated and conditioned.

After some structural changes, it is being used as a transitory deposit of liquid and structural contaminated radioactive waste, which will be treated in PTARR when operative and in the Decontamination Facility.

❖ **Treatment and Conditioning Plant**

This plant was built in the 70s to treat and condition waste from small producers (institutional waste) and included facilities to separate and compact solid waste, a incinerator and a bitumen ash immobilization system. Recently, it only conducted the compaction process.

This facility is to be refurbished within the PTARR project informed in H.4.3.1. Meanwhile a new facility for compaction and cementation was performed to be used until the PTARR project is concluded.

❖ **Deposit for Temporary Storage of Radioactive Sources and Waste**

As a result of the routine operation if this deposit, the stored inventories of Radioactive Waste and Disused Sealed Sources have also been increased. The items stowage yards are divided into sectors, in order to improve the operational doses and optimise storage areas.

The achieved improvements regarding the control systems of the access to the AGE in general as well as the security of sources storage in particular may be underlined

❖ **Deposit for Long-term Storage (DAP)**

In order to store waste from old practices, a new building was built outside of AGE, 1800 m away from the northern access of the Ezeiza Atomic Center. It is 41.5 meters long; 20.4 m wide and 7.15 high. It was finished in 2010.

This deposit was designed to store overseas containers with historical waste drums inside. DAP storage capacity is 48 standard 20-feet containers, weighing between 20,300 and 23,000 kg including the drums. Each container is put over pillars to prevent water reaching them. In general, there are operators only when system inspection and maintenance is necessary. Ventilation is given by natural convection.

The DAP was licensed by the ARN as part of the AGE. For that purpose, all mandatory documents were submitted, including the safety assessment for human intrusion, fire and flood scenarios. The deposit has all the necessary safety systems to comply with these hypothetical scenarios and the ARN standards currently in force. The security system is monitored from the AGE.

In 2010, 40 overseas containers containing drums removed from Trench No. 2 were located into this deposit. 66 drums properly conditioned were stored inside each container. Conditioning included placing these items in plastic containers in order to prevent spread of radioactive material in case original drums get deteriorated.

Every operation was conducted with the proper monitoring of each container radiological inventories, and under strict safety and radiological protection controls.

AGE final disposal facilities

❖ Semi-containment System for Solid Radioactive Waste

In the previous National Reports, it has been informed that the Semi-containment System is constituted by two trenches, according to the following details:

Trench No. 1 (T1) finished operation stage in 1988 when the closure cover was completed. **Trench No. 2** (T2) started operating in 1988 and its operation was suspended in 1999.

In early 2010, tasks to remove the drums placed in sectors S and T of T2 (not covered) were completed.

These drums were encapsulated again and are located in the Deposit for Long Term Storage (DAP) especially built for this purpose. Said deposit is sited in Ezeiza Atomic Centre, and the conditioned waste will stay there until a new repository is built.

❖ Semi-containment System for very low level and very short lived Radioactive Liquid Waste

The system comprises three trenches filled with a bed of calcareous silt improved with clays, allowing the concentration of radionuclides for decaying to non-significant levels before they reach an environment accessible to the public.

The liquid Radioactive Waste generated at the Ezeiza Atomic Centre production plants were piped to AGE, where they were unloaded into the trenches. Trenches started operation in 1971; two of them finished their useful life in 1986.

On account of the factors above mentioned, in June 2001 the decision to suspend the operation of the third trench was taken.

❖ System for the Disposal of Structural Solid Radioactive Waste and Disused Sealed Sources

In previous reports the existence of two underground silos were mentioned, where structural parts from contaminated areas and some types of disused sealed sources were disposed of. These systems are not operative because of the same reasons above mentioned.

H.2.6 Facilities at the Ezeiza Atomic Centre

Decay, Pre-Treatment and Discharge Plant for Active Liquids from the Radioisotope Production Plant

This facility has been conceived to provide easier decay of the Radioactive Liquid Waste generated in the Radioisotope Production Plant and the Reactor RA-3[1] containing short half - lives and low activity radionuclides. This type of liquid Radioactive Waste may be discharged to the environment if its level of activity does not exceed the discharge values authorised by the Nuclear Regulatory Authority (ARN). Until June 2001, the liquid radioactive waste that could not be discharged was directed for disposal to the AGE Semi Containment System for Liquid Radioactive Waste. Since then, changes have been implemented in the processes of the Radioisotope Production Plant and in the radioactive waste management of the plants, so that the residence time in the storage decay tanks is sufficient for their subsequent discharge into the environment.

H.2.7 Pilcaniyeu Technological Complex (CTP)

This centre includes facilities devoted to uranium enrichment. Solid waste generated by previous campaigns conducted in these facilities and those generated eventually in the future are and will be stored in containers located in the CTP Low-level Radioactive Waste Deposit.

H.2.8 Uranium Dioxide Production Plant

Operating waste is that waste generated in different sections of the plant and with a radioactivity level higher than the limit established by the ARN for clearance. This waste are mainly gloves, clothes, plastics, disposable material from laboratories, hoses, gutter cleaning and filter and prefilter dismantling.

They are consolidated inside 200-litres drums, previously reduced in volume by pressing, and stored temporarily in the Raw Material Deposit, controlled by the Uranium Control Division – CNEA. This deposit was built with brick walls and a flagstone roof, cement floor, one overhead large door and one fixed large door, with ventilation from the windows located in the upper part.

H.3 Site of Projected Facilities

Considerations related to this point are the same developed in Section G.3.

H.4 Design and Construction of New Facilities

H.4.1 Atucha Nuclear Power Plant - Unit I

[1] At present this facility does not transfer its liquid effluents to this installation.

A New Interim Storage Deposit for process filters has been created. This project, proposed by the PNGRR, is operative since May 2013. It is a new concept in terms of interim storage of this kind of waste because it improves the safe storage for individuals and for the environment, and also an easy way to recover them with a mechanical facility that increases radiological protection for the operator.

H.4.2 Embalse Nuclear Power Plant

There has been progress in tasks involving component dismantling planning before the necessary changes that should be conducted for the life extension of the plant. Those tasks implied 4 silos for high rate exposure waste storage and 3 deposits, comprising a 1300 m^2 floor area for storage of low and intermediate level waste.

Relevant radioactive waste include the four steam generators, the feeders between steam generators and the reactor fuel channels, the channels with external tubes or calandria tubes, among others. All that waste will be kept in those silos for about 50 years, as estimated, or until a low and intermediate level waste repository will be in operation.

H.4.3 Ezeiza Waste Management Area

H.4.3.1 Treatment and Conditioning Plant of Radioactive Waste (PTARR)

A project (initially called PTAMB project) to build the necessary infrastructure to treat and condition low and intermediate level liquid and solid radioactive waste using the old plant building was developed. As the first stage of this project, the partial dismantling of the original facilities was authorised in 2010.

Throughout 2012, a comprehensive technical review of all the processes included in the PTAMB project was conducted according to the current needs. The results from the inspections performed in generators and the assistance to reduce waste volume, as well as the upgrade of management procedures, showed that the current inventory and its projection are less complex in terms of engineering than the previously estimated for the PTAMB project.

Based on this new situation, facilities were evaluated at basic and detail engineering levels in order to perform the necessary changes in every room of the existing building. This new simplified project is called PTARR. This study will be used to create the technical requirements specifications for the different areas: civil work, electrical assembly, mechanical assembly, and thermo mechanical assembly, which will be tendered during 2014.

All low and intermediate solid and liquid institutional waste generated in Argentina as a result of any productive activity, medical applications and R&D will be treated and conditioned in the PTARR, complying with the acceptance criteria specified for each facility and the conditioned product quality.

Waste originated within nuclear power plants will continue to be treated and conditioned in their facilities.

The following are the main processes to be conducted in the PTARR:

- Compaction
- Cementing
- Volume reduction of no compactable solid waste
- Thermal process to reduce organic waste
- Liquid waste transfer from transportation containers to cementing room tanks
- Processes for liquid waste adjustment
- Preparation of specimens with cemented waste

H.4.3.2 Characterization Lab (LabCar)

This new Characterization Lab was created to improve information about radionuclides present in waste stored in the AGE in the DAP, and in the newly generated waste, in order to determine the treatment and conditioning techniques, control conditioned waste quality, and provide a complete and updated radiological inventory, for all waste complying with the new ARN requirements. This lab will also be used to control characterization performed by the NPPs to the RW generated in them.

This new facility is under construction at the moment, and it is expected to be finished during second half 2014.

H.4.4 Research and Development Lab at CAC

This new laboratory is being built at the Constituyentes Atomic Centre, in order to develop new processes for radioactive waste treatment and conditioning, using radiotracers to simulate the different types of waste. During 2012 and 2013 the civil work was finished and the technical requirements specification for the Ventilation and Air Conditioning System was developed, with the aim of conditioning the air, allowing the safe operation of staff in the labs and filtering the air before it is released to the environment. The technical requirements specification to buy laboratory furniture, and globe boxes and radiochemical hoods have been prepared in order to start operations in the beginning of 2015.

H.4.5 CAREM-25 NPP

Section G includes the detailed features of this new facility. The main aspects associated with the safety measures of the radioactive waste management systems design of CAREM-25 are described in the following paragraphs.

The design of the solid radioactive waste management system complies with the ALARA principle. It includes collection, segregation, characterization, conditioning and interim storage processes of the radioactive waste generated by the operation and maintenance of CAREM-25. Radioactive waste will be managed so that an acceptable level of radiological protection of workers and public is achieved, as well as the preservation of the environment.

Radioactive waste to be generated in normal conditions in CAREM-25 will be low or intermediate level RW. The Solid Waste Management System will include equipment to perform tasks such as pressing, drying and immobilization. CAREM-25 design provides long interim storage for radioactive waste within the CAREM site.

Waste shall be characterized when generated in accordance with the PNGRR guidelines. During radiological characterization, radionuclides will be determined by direct methods (Gamma Scanner), semi-empirical methods (representative sampling, scale factors, correlation factors) or analytical methods (calculation program).

Radioactive waste shall be kept isolated, far from humans, during the necessary period of decay, using adequate multiple barriers in the future repositories.

H.4.6 RA-10 Reactor

This facility has been described in G.4.3. The Facility Radioactive Waste Management System has been designed in order to ensure safety for workers and for the public in general, and also to minimize the occurrence of potential impacts to the environment.

Waste generation has been considered since the design stage choosing the appropriate materials, taking into account all the ways in which waste is produced and providing waste management systems with all the necessary facilities.

Liquid radioactive waste volume minimization is part of the reactor design criteria, so water will be recycled every time possible. The system will comprise three circuits: Liquid Radioactive Waste Collection, Recycling Water Collection and LOCA Water Collection.

Solid waste will be segregated according to their classification as follows: inactive waste, low activity level waste and intermediate activity level waste. Some waste treated by this system will be the spent ion exchange resin, used components from reactor systems, filter elements from the ventilation system, etc.

Radioactive waste will be characterized and transferred to AGE site, fulfilment acceptance criteria established by PNGRR.

H.5 Mining Waste and Processing of Uranium Minerals

H.5.1 Uranium Mining Environmental Restoration Project (PRAMU)

The Argentine Atomic Energy Commission, within its program to protect the environment, conducts the Uranium Mining Environmental Restoration Project (PRAMU) with the aim of restoring the sites where uranium mining activities have taken place in the past.

Its purpose is that in all sites in which uranium mining activities were carried out the environment may be the object of the best possible restitution in terms of economic and technical feasibility. In the first place, studies are conducted to identify the problem of each site, determining the potential and the real impacts, the possible contamination routes, the

existing elements, etc. On the basis of internationally accepted techniques, the possible specific solutions to manage the tailings and the restoration of each site are being developed.

As mentioned in the previous National Reports, the sites under study are:

- MALARGÜE (Mendoza Province)
- HÜEMUL (Mendoza Province)
- CÓRDOBA (Córdoba Province)
- LOS GIGANTES (Córdoba Province)
- PICHIÑÁN (Chubut Province)
- TONCO (Salta Province)
- LA ESTELA (San Luis Province)
- LOS COLORADOS (La Rioja Province)

These sites are the result of the uranium mining activity that took place from 1951/52 until 1996, once tasks to keep their radiological conditions had been performed. Both CNEA and ARN conduct periodic environmental surveys in the areas around the industrial mining complexes that process uranium mineral.

By means of Decree No. 72 on January 14th, 2010, the Argentine President approved the modelling Contract of Loan No. 1583-AR to be entered into by and between the ARGENTINE REPUBLIC and the INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT (IBRD) for THIRTY MILLON AMERICAN DOLLARS (USD 30,000,000) and the modelling Subsidiary Execution Agreement between the MINISTRY OF ECONOMY AND PRODUCTION and the ARGENTINE ATOMIC ENERGY COMMISSION. This agreement was executed by the parties on March, 30th and the loan was ratified by the World Bank on April 28th, 2010.

The aim is to ensure environment protection, health and other rights of current and future generations making a rational use of resources. As part of this, PRAMU intends to improve current conditions of uranium mining tail deposits, considering that although those sites are currently controlled, in the long term different environment restoration actions have to be performed so as to ensure the protection of the environment and the citizens.

The project development entails different stages. The first one includes the continuity of building works at the Malargüe site and the studies necessary for environmental restitution engineering of the following sites: Córdoba and Los Gigantes, Tonco (Salta Province), Pichiñán (Chubut Province), La Estela (San Luis Province), Los Colorados (La Rioja Province) and Hüemul (Mendoza Province).

In 2013, the project activities aimed primarily to make progress in the restitution of the former Malargüe Industrial Complex and to finish the studies for the management projects of the former Los Gigantes Mining and Milling Complex and El Chichón, environmental liabilities deposited in Córdoba.

H.5.2 San Rafael Mining and Milling Complex (CMFSR)

This Complex operated until 1995, when for technical and financial reasons, it was suspended. As the infrastructure of the site is still preserved and it can be reactivated, it is not one of the sites considered for PRAMU. CNEA, as operator, presented in June 2004 an Environmental Impact Evaluation document (EIA) as required by the Province Legislation in order to restart its productive activity. In response to this, current authorities requested CNEA to present a new Environmental Impact Evaluation related to the “Management of Waste in Interim Disposal”, taking into account the treatment of quarry water and solid waste management. The possibility of starting production again is under evaluation.

This study was submitted in 2006 and the proposal was technically approved through reports from different sectors without attaining the Environmental Impact Declaration (EIA) since the Public Hearing required by law was not conducted.

Later on, the authorization to rebuild effluent dikes DN 8 and 9 was granted to enable safe and environmentally correct handling of effluents, even in these non-operational conditions. Also a permit was obtained to seal off an auxiliary dike for evaporation of effluents DN 3b.

Currently, advisory services to update the submitted Environmental Impact Statement is under the process of public bidding in order to complete the environmental evaluation process and obtain the EIA. This will allow starting quarry water and uranium purification solid waste management tasks. This update, called “Environmental Impact Statement: San Rafael Mining and Milling Complex - Remediation Stage - Phase I”, has already been approved by CNEA and will soon be submitted to the authorities of the Province. It also entails the remediation of quarry water and solid waste.

In order to manage the rest of waste at interim disposal, another EIA has to be conducted or the current one has to be updated.

H.6 Safety Evaluation of the Facilities

The considerations corresponding to this point are the same as those that have been described in Section G.5.

H.7 Operation of the Facilities

The considerations corresponding to this point are the same as those that have been described in Section G.6.

H.8 Institutional Measures after Closure

The institutional measures to be applied after the foreseen closure of the low level radioactive waste disposal systems have been described in the previous National Reports.

The Standard AR-10.12.1 Radioactive Waste Management describes the safety criteria to be complied with by the facilities in all phases of disposal, including after their closure.

At present, there are no Radioactive Waste management facilities under Institutional Control.

Disposal facilities located in the AGE are under radiological assessment, in safe conditions, waiting to have more accuracy in historical waste inventory in order to establish the conditions for the closure and the period of institutional control.

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SECTION I TRANSBOUNDARY MOVEMENTS

In Argentina Revision 2 of the Standard AR 10.16.1 *Transport of Radioactive Materials*, which agrees with the 2009 Edition in its Spanish version of the *IAEA (Safety Standards Series TS –R-1) Regulation for the Safe Transport of Radioactive Materials*, is already in force. This standard determines the regulations with reference to the transboundary movements of radioactive waste and spent fuel.

There are also national and international standards in force that regulate the transport of dangerous materials by land, air and water. The transport by road and railway is ruled by the following legal instruments:

- *National Transport and Transit Regulation*, enacted by Decree No. 692/92
- *Transit Law* No. 24449, regulated by Decree No. 779/95
- Resolution No. 195/97 on *Technical Standards for the Transport of Dangerous Goods by Road*, issued by the National Public Works and Transport Secretariat
- Other regulations determined by the National Transport Secretariat

For maritime, river and air transport, the Argentine Republic has adopted the regulations of the *International Maritime Organization* (*IMO)*, of the *International Civil Aviation Organization (ICAO)* and of the *International Air Transport Association (IATA),* incorporating the above mentioned *Regulation for the Safe Transport of Radioactive Materials* of the IAEA, edition 1996 (revised).

The agreements signed by Argentina and ratified by the law on transboundary movements are the following:

- The Chicago Agreement on Transport of Dangerous Goods by Air, in the framework of the International Civil Aviation Organization (ICAO)
- SOLAS Agreement, MARPOL, International Maritime Code, International Code for the Safety in the Transport of Irradiated Nuclear Fuel, Plutonium and High Activity Waste in Packages on Board of Vessels (INF Code), under the International Maritime Organization (IMO)
- Convention on the Physical Protection of Nuclear Materials, in the framework of the International Atomic Energy Agency (IAEA)
- Agreement between the Argentine Republic and the Federative Republic of Brazil, the Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials and the International Atomic Energy Agency for the application of Safeguards (Four Parties Agreement)

As previously mentioned (see Section B.1), the only transboundary movements that have taken place were associated with exports of SF containing HEU to the United States of America in the framework of the A*cceptance Program of Spent Nuclear Fuels from Foreign Research Reactors.*

As at the moment the Argentine Republic does not contemplate the reprocessing of spent fuel, no transboundary movements are expected in connection with said process.

For the case of the transport of radioactive sealed sources, see further details in Section J.

SECTION J DISUSED SEALED SOURCES

J.1 Introduction

Although the activities involving radioactive materials and sources started at the beginning of the fifties, it was Decree No. 842/58 that approved the *Regulation for the Use of Radioisotopes and Ionising Radiations* and made it effective to govern the use and application of radioactive substances and radiations emitted by them or from nuclear reactions and transmutations. At present, this decree has been replaced by the legal and regulatory framework determined by the ARN and described in Section E.2.

The Standard AR-10.1.1, “Basic Radiological Safety Standard” determines the basic radiological safety requirements for nuclear activities performed in the country, including the sealed sources. This standard classifies the facilities in three levels, according to the radiological hazards associated with the practices involving radioactive material, and assigns different degrees of control.

The Regulation determines that the license holder is responsible for complying with regulations, requirements, licenses, authorizations and permits issued by the ARN. The operation licenses / authorizations issued by the ARN expressly include responsibilities and conditions of operation. Some of them state that the Operation License Holder is responsible for radioactive waste management generated in the facility under its responsibility (which is the case of disused sealed sources in some facilities).

Likewise, the Operation License Holder, when applying for an authorization, assumes responsibility over those sources once they have reached the end of their operating and specific life. The ARN performs regulatory inspections and audits to verify that license holders comply with their responsibilities/fulfill their duties, in order to detect failures to comply with the standard and avoid situations that might derive in radiological accidents.

Furthermore, the procedure to grant licenses for the management of radioactive sources, in any of the utilization cycles, allows the ARN to control that the persons making use of them have the necessary qualifications and work in accordance with the responsibilities related to radiological safety. These qualifications are re-evaluated with regulatory inspections and audits every time the corresponding specific authorisation/individual permit is renewed.

Therefore, the existing regulatory system for the control of radioactive sources in use or in disuse acts preventively to avoid the loss of control thereon and, subsequently, to minimize the existence of orphan sources.

It may be underlined that since the Argentine Republic has voluntarily and non-bindingly adhered to the “*Code of Conduct on Technological and Security of the Radioactive Sources*” in the 2003-2004 period, the country complies with the recommendations formulated in it, a fact that reinforces the determination of exercising an effective control of radiation sources.

J.2 Basic Requirements for Radiological Safety

The basic radiological safety requirements for the use of radioactive sources are described in the Standard AR-10.1.1. Additionally, the ARN determines that:

- Radioactive sources cannot be purchased, imported, owned, transferred, stored, used, sold, exported or disposed of unless the source owner has previously obtained a license or authorization granted by the ARN for these purposes.
- Only facilities having appropriate resources may handle radioactive sources and the members of staff require adequate knowledge and training.
- License holders shall keep a detailed and updated inventory of radioactive sources and their movements, taking the necessary security measures to prevent human intrusion in storage sites and/or the loss of radioactive sources.

The specific requirements for the storage of radiation sources are shown in Section J.4.

J.3 Actions Aimed at Carrying out an Adequate control of Radioactive Disused Sources

The criteria determined by the ARN for radioactive disused sources for long periods of time are the following:

- The storage of radioactive disused sources is allowed only in the facility as long as the holder of the license is able to demonstrate that they have a specific program for its reuse or to use it in replacement of another source existing at the site.

- In this case, the holder of the license must provide a temporary storage area qualified as deposit, over which they have adequate control to prevent non-authorized access, and appropriate security measures to avoid the theft thereof. He must also keep auditable records of the regular controls made in the place of temporary storage.

In case the license holder does not have an adequate place for temporary storage of the radioactive sources or in case of any other situation determined by the ARN, the sources must be sent to a safe storage site. The ARN requires the source to be sent to CNEA in custody, so that it is safely stored in the AGE, area especially prepared for this purpose. It can also be transferred to other facility nearby, licensed for this purpose and, with an adequate deposit, accepting the responsibility.

J.4 Special Actions Aimed at Maintaining an Appropriate Control of the Radioactive Sources

The ARN has agreements with security forces and with organizations responsible for the control of the borders and airports to prevent undeclared radioactive sources from entering or leaving the country..

Within this context, the ARN has entered agreements with the customs authorities to ensure that:

- All imports or exports of radioactive materials are performed with ARN's authorization.
- Industrial plants, measurement instruments and laboratory equipment that could include radioactive sources to be imported shall previously submit a declaration to the ARN stating the content of such type of sources, which shall later be presented to the customs authorities once already authorised by the ARN.
- In the case that radioactive sources deposited in custom premises for more than 30 days exceed the time allowed by its internal procedures, the ARN must intervene in order to arrange for the storage at CNEA's authorized facilities.

The ARN pays special attention to cases where it is not possible to ensure the control of radiation sources, as for example, when a company having sources goes bankrupt and/or when a legal action orders a company an attachment on their assets. In such cases, the ARN and the Justice act together to confiscate the involved sources and send them to a safe storage, preventing accidental situations. This safe storage may derive in radioactive waste management of confiscated material provided the custody storage period exceeds the time determined previously by CNEA.

In the case of exports of radioactive sources and before granting the authorization for the pertinent export, the ARN interacts with the Regulatory Authorities of the countries involved. In the case of Type I and II sources, the procedures recommended by the IAEA's *Guidelines on Imports and Exports of Radioactive Sources* are applied. In the case of sources of other categories, procedures issued by the Regulatory Authorities of the importing countries are considered.

J.5 Security of Sealed Sources in Use or in Disuse

The security systems for radioactive sealed sources involve security measures. These measures are aimed at preventing intentional acts resulting in the loss of control of these radiation sources.

In October 2003, CNEA issued the Directive PF-02 *Security of Radioactive Sources*, in accordance with the Standard AR-10.13.1, Security of Nuclear Materials and Facilities, issued by the ARN in 1995. Said Directive was established as mandatory for all facilities developing activities that involved use and/or storage of radioactive sources in use or in disuse, under their responsibility.

In January 2007, the ARN issued the Standard AR-10.13.2 “Security Standard for Sealed Sources” Rev. 0. In said standard, the following measures are contemplated:

- In the case of a facility with high radioactive inventory (above the threshold mentioned for Type I, in accordance with the IAEA Safety Guide, No. RS-G-1.9 “Categorization of radioactive sources”), it is required to create a Security System similar to the physical protection systems implemented in facilities with nuclear material.

- In the case of radioactive sources not contemplated in the IAEA Type I Security Guide No. RS-G-1.9, but implying a radiological risk, the ARN requires the implementation of a Security System to ensure the early detection of any event that could involve the theft of those sources. Such security measures are compatible with the ones included in IAEA TECDOC-1355 “Security of Radioactive Sources”.

- For the transport of sealed radioactive sources, extra security measures, equivalent to those required for transportation of nuclear materials under the Standard of Physical Protection AR-10.13.1, Rev. 1, are applied. These measures, in addition to the radiological safety measures, were specifically created to prevent fraudulent acts, and include corrective actions in case of events involving Type I sources or sources implying a radiological risk.

- The ARN is paying special attention not only to the early detection of potential sabotages to facilities containing nuclear materials, but also in case of robbery and theft of radioactive sources, and the early detection of fraudulent acts in facilities with radioactive inventories entailing radiological risks.

In this regard, the ARN is carrying out different activities in the areas of prevention, legislation, response, training and exchange of information; including not only the control of nuclear material but also the security aspects of radioactive sources.

Among the most effective additional security measures for early prevention or detection of nuclear and/or radioactive material illicit traffic are the permanent contact and exchange of essential information between the ARN, border control organizations, intelligence services and security forces; which implies full knowledge and the assumption of responsibilities by all organizations that constitute the “Control System”.

Equally important is the coordination of inspection activities, which are planned according to the associated radiological risks.

J.6 Penalty System

The sections E.2.2.5 and E.2.2.6 describe the regulatory actions and the applicable penalty system for the use of radiation sources.

J.7 Abnormal Events and Emergencies

Argentine regulations determine that people or organizations using radiation sources must implement emergency plans or procedures. The criteria determined by the ARN to be used in case of emergencies includes the evaluation of scenarios for situations such as: theft or loss of the source, breakage of the integrity of the shielding containing the radioactive source, fire, explosion or any other event that could affect the safety of the radiation source.

The ARN is in contact with all organizations that could intervene in case of a radiological emergency and provides training activities related to such interventions.

ARN's *Intervention System in case of Radiological Emergencies* operates 24 hours a day, 365 days a year. This system is adequately equipped and includes a skilled team to perform its duties, carrying out periodic tests to check the correct operation of all parts of the System.

The ARN has cooperation agreements with organizations that intervene in case of an emergency, such as the Argentine Army, the National Gendarmerie and the Argentine Navy.

J.8 Readmission of Decayed Sealed Sources to the Country

The import of decayed sealed radioactive sources, as well as the import of any other radioactive source, is authorized by the ARN when all the requirements related to radiological safety and security determined by the regulations are fulfilled, the practice is justified and the importer complies with the legal provisions in force and the obligations determined by its import license.

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SECTION K GENERAL EFFORTS TO IMPROVE SAFETY

K.1 Introduction

This section describes the safety improvement actions in matters related to SF and RW management, in regular activities as well as for those in execution stage or for those that have been completed in the period between the presentation of the Fourth National Report and the present date.

K.2 Regular Activities

The permanent activities for the improvement of safety are common to all management facilities and include the following topics:

- ❖ Documentation updating
- ❖ Organization updating
- ❖ Operative inspection programs
- ❖ Emergency Plans
- ❖ Education, training and re-training of operating staff
- ❖ Quality assurance program
- ❖ Preventive, predictable and corrective maintenance program

K.3 Management Safety Improvements

In addition to the regular activities projects mentioned above, other projects and modifications have been developed and put into practice, which contribute to improve safety. Some of them are listed below:

K.3.1 Actions Taken in the Light of the Fukushima Daiichi Accident

As a consequence of the Fukushima accident and with the purpose of applying the corresponding lessons learned, the Regulatory Body requested to perform a stress test to each Argentine NPP, which consisted of a new assessment of the safety margins, assuming the existence of a sequential loss of the lines of defense in depth caused by severe accidents and, among other security-related topics, such evaluation includes:

- ✓ Describing the accident management measures currently available to address the successive steps in a scenario of failure in the cooling fuel pool (radiation protection, uncovering the top of the fuel and fuel degradation).
- ✓ Identifying any possible cliff edge effect.
- ✓ Assessing the adequacy of accident management strategies (guidelines and procedures developed to meet a serious accident, analyzing the possibilities of additional actions to be taken, suitability/availability of the required instrumentation, habitability and accessibility of essential areas, accumulation of hydrogen in different containment buildings).
- ✓ Organization (staff, resources and shifts; use of external technical assistance; and procedures, training, education and exercises).

- ✓ Availability of existing equipment.
- ✓ Planning for the use of mobile equipment.
- ✓ Management of supplies and their availability.
- ✓ Management of radioactive emissions and the possibility of reducing them.
- ✓ Management of potential doses to workers and provisions to limit them.
- ✓ Communication and information systems.
- ✓ Activities planned for the long term (after the accident).

The description of the ARN´s requirements in the "stress test" requested as a result of the Fukushima accident are described in detail in the 2013 Report to the Convention on Nuclear Safety. The summary included in this report highlights the actions related to issues within the scope of this Convention.

It should be noted that updating the seismic evaluation of Atucha and Embalse sites was in an advanced state when the accident happened. The progress of the analysis programs for the safety of the plants to earthquakes are described in the relevant chapters of the Convention on Nuclear Safety. The main results have been completed in CNA I and CNA II and the resulting changes are being implemented. Its completion in CNA I and CNA II is expected by the end of 2015, and in CNE it is expected before the restart and after the refurbishment outage.

In response to the regulatory requirement mentioned, the Operator of CNA I, CNA II and CNE (NASA) has conducted the required stress test and the reports were submitted to ARN.

Afterwards, said Regulatory Authority conducted an evaluation of these reports to verify compliance with the provisions of the regulatory requirements. As a result, opportunities for improvements related to severe accident management and recovery have been identified, but in no case weaknesses demanding urgent actions were identified.

Improvements and modifications proposed by NASA include an implementation schedule consisting of short, medium and long term actions, the latter being 2016, which were considered acceptable by the Regulatory Body. The improvements as a result of the stress tests are the following:

K.3.1.1 Loss of Safety Operations Functions Analysis

K.3.1.1.1 Loss of Offsite Power (LOOP)

As a result of the LOOP evaluation the Operator has decided to implement the following improvements:

CNA I

- **Restoration of External Power Supply**

In case of a network collapse, the company responsible for the supply management (CAMMESA) has a supply procedure for CNA I that states its priority due to the safety requirements of nuclear installations.

- **Passive Components Control**

  The proper functioning of the program for the verification of the vacuum breakdown/siphons associated with cooling was checked and found operative. In addition, the control of the vacuum breakdown/siphon system associated with the pipes of the cooling systems and the inventory control of the spent fuel storage pools was added to the periodic inspections program. Including the above mentioned issues, a procedure related to passive components control increasing the frequency of tests and inspections was implemented.

- **New Emergency Power Supply System (EPS)**

- **Electrical Interconnection Between of CNA I / CNA II normal rods**

- **External Electrical Supply Lines Availability Assessment**

CNA II

- **Restoration of External Power Supply**

  Similar to CNA I case.

- **Emergency Procedures Review and Improvements**

  Procedures review to extend the life of emergency diesel generators using an additional fuel tank, including maintenance programs and repetitive tests reviews, as well as ensuring the minimum reserves are conducted through the inspection and testing program.

- **Electrical Interconnection Between CNA I / CNA II normal rods**

- **Availability of the External Power Lines Assessment**

CNE

During the reconditioning outage (2014/2016) for the plant's life extension, some power supply improvements will be implemented. The most important are listed below:

- **Protection External Power Supply Devices**

  500 kV station protections, bars, lines and switches will be improved.

- **Class III Diesel Generators**

Replacement of the Diesel Generators (Class III) belonging to the uninterruptible power supply system, including modifications to the building, will be conducted during life extension shutdown (2014/2016).

- **New System Emergency Power Supply (EPS)**

K.3.1.1.2 Station Blackout (SBO)

As a result of the SBO studies, the Licensee has decided to implement the following improvements:

CNA I

- **Alternative Power Sources**

  A mobile diesel generator (MDG) to meet the power demand required in a severe accident caused by a SBO will be implemented as to provide alternatives to the existing sources to secure electricity supply. A nearby and safe storehouse for MDGs and the associated devices to allow a quick connection between MDGs and the supply lines will be available in order to ensure the core and the spent fuel storage pools are refrigerated in the long term. This improvement will be implemented by the end of 2014.

- **Preventive Strategies to Avoid Core Damage**

- **Fuel Elements Integrity Assessment**

  The SBO impact on the fuels that could be located inside the refueling machine, considering its full load, is being assessed. The study is planned to be implemented by the end of 2014.

  The measures necessary to ensure the integrity of the fuel located inside the refueling machine must be implemented in case the results from the assessments mentioned in the previous paragraph indicate that the fuel could suffer damage. This improvement is planned to be implemented by the end of 2015.

- **Batteries Availability Extension**

- **Instrumentation & Control (I&C)**

  The implementation of the means to ensure power supply to the instrumentation of representative signals of the variables needed to monitor the status and evolution of the plant in a SBO scenario is due to be conducted at the end of 2014.

CNA II

- **Alternative Power Sources**

  A MDG to meet the power demand required in a severe accident caused by a SBO will be implemented as to provide alternatives to the existing sources to secure electricity supply. A nearby and safe storehouse for MDGs and the associated devices to allow a quick connection between MDGs and the supply lines will be available in order to ensure the core and the spent fuel storage pools are refrigerated in the long term. In particular, the MDG should be able of be connected to a switch located in the emergency power supply bar, including a facility for the connection to each emergency output. This improvement will be implemented by the end of 2015.

- **Fuel Elements Integrity Assessment**

  Similar to CNA I case.

- **Connection among the DGs of CNA I and CNA II**

- **Batteries Availability Extension**

CNE

During the plant shutdown for the refurbishment activities (2014/2016), required for the plant life extension, some improvements related to the SBO scenarios will be implemented. The main activities are the following:

- **Abnormal Event Procedure**

  An abnormal event procedure to respond to the loss of cooling and / or loss of water inventory from the spent fuel storage pool was elaborated. This procedure includes the actions required to monitor the coolant level and the pool temperature from the secondary control room, assuming that the main control room and the pool building are inaccessible. Besides, to deal with a loss of cooling or inventory in the long term, suitable actions have been included to refill with water from alternative sources. These improvements are planned to be implemented by the end of 2014.

- **Fuel Elements Integrity Assessment**

  The SBO impact on the fuels that could be located inside the refueling machine, considering its full load, is being assessed.

  The measures necessary to ensure the integrity of the fuel located inside the refueling machine must be implemented in case the results from the assessments mentioned in the previous paragraph indicate that the fuel could suffer damage.

This improvement shall be implemented before the restart and after the reconditioning outage.

- **Alternative Power Sources**

  A MDG to meet the power demand required in a severe accident caused by a SBO will be implemented as to provide alternatives to the existing sources to secure electricity supply. A nearby and safe storehouse for MDGs and the associated devices to allow a quick connection between MDGs and the supply lines will be available in order to ensure the core and the spent fuel storage pools are refrigerated in the long term. This improvement shall be implemented before the restart and after the reconditioning outage.

- **Batteries Availability Extension**

K.3.1.1.3. Loss of Heat Sinks

As a result of the assessment above mentioned, the Licensee will implement the following improvements:

CNA I

- **Alternative Water Sources**

  Providing alternative water sources to the existing ones for reserve secured water supply (such as reservoirs, pools, tanks, etc.) in order to deal with severe accident situations caused by the loss of heat sinks. It must also have the appropriate accessories/devices to connect these water sources to the respective pumps and supply lines in order to ensure the cooling of the core and the spent fuel storage pools in the long term by implementing the following:

  - Spent fuel storage pools water refilling process using an alternative reservoir, such as groundwater, existing tanks or other sources. Besides, this process will include the monitoring of the water level and temperature in the pools. This process will be implemented by the end of 2014.

  - Installing an independent pump assigned to the process mentioned before which allows extracting groundwater to fill the spent fuel storage pools. The pump electrical supply will be possible thank to a secured bar and from a MDG operated by means of a manual simple connection. Furthermore, implementing an alternative power supply system to feed the necessary I&C to monitor the relevant parameters of the spent fuel storage pools from outside the pools building is also planned. This improvement will be implemented by the end of 2015.

  - Water inventory replenishment in the SGs through the SHS system in case of simultaneous loss in the tank, the residual heat removal chain and the

water injection secured system to the SGs. It should also provide water inventory replenishment to the SHS tank in those cases where the SHS integrity is not affected. Water inventory replenishment for the above cases must be implemented by injecting groundwater using one of the pumps belonging to the water supply system, considering the involved components must be fed through a MDG in case a SBO coincides with the unavailability of the DGs belonging to the SHS system. This improvement will be implemented by the end of 2014.

- Water replenishment in the SHS system, to ensure an independent 72-hours operation without external actions. This improvement will be implemented by the end of 2015.

CNA II

- **Alternative Water Sources**

  Providing alternative water sources to the existing ones to secure water supply (such as reservoirs, pools, tanks, etc.) to deal with severe accidents caused by the loss of heat sinks. There must also be appropriate accessories/devices to connect these water sources with the corresponding pumps and supply lines in order to ensure core and spent fuel storage pools cooling in the long term by implementing the following:

  - Providing an alternative water reservoir to keep water supply active to remove heat through the SGs and to keep the spent fuel storage pool cooling in the long term.

  - Implementing an additional system to replenish water in the spent fuel storage pools from an alternative reservoir, such as groundwater, existing tanks or other sources.

  These improvements are planned to be implemented by the end of 2015.

CNE

During the plant outage for refurbishment activities (2014/2016), required for the plant life extension, some improvements related to the loss of heat sinks will be implemented. The more relevant are the following:

- **Alternative Water Sources**

  Providing alternative water sources to the existing ones to secure water supply (such as reservoirs, pools, tanks, etc.) to deal with severe accidents caused by the loss of heat sinks. There must also be appropriate accessories/devices to connect these water sources with the corresponding pumps and supply lines in order to

ensure core and spent fuel storage pools cooling in the long term by implementing the following:

- Spent fuel storage pool water replenishment through a connection from outside the building pool including an isolation valve and a hose coupling from the fire extinguishing system.

- A facility to connect a fire truck from outside the building pool to replenish water in the spent fuel storage pool in case of events of cooling loss, flow loss or SBO. This improvement is foreseen to be implemented by the end of 2014.

- Two mobile cisterns containing 25,000 liters of stored water each. This improvement is planned to be implemented by the end of 2014.

- A water supply line to the calandria vault from outside the reactor building. This improvement is expected to be implemented before the restart and after the reconditioning outage.

- A connection through a hose line from a fire truck to the ECCS pipes to allow water addition to the dousing tank for feed water replenishment to the SGs to allow cooling for at least 72 hours. This improvement is expected to be implmented before the restart and after the reconditioning outage.

- An additional fire truck containing 17,000 liters of water to be used for replenishment. This improvement is planned to be implemented by the end of 2015.

- **Modifications to the Emergency Water Supply (EWS) System**

- **Abnormal Event Procedure**

An operational procedure for abnormal events aimed to increase up to seven days the water replenishment availability to both the dousing system and the SGs, by using the EWS pumps will be developed.

This improvement is expected to be applied before the restart and after the reconditioning outage. Severe accident management and recovery has been revised, but in no case weaknesses demanding urgent actions were discovered.

K.3.1.2. Accident Management and Severe Accidents Management Program

CNA I

- **Severe Accident Management Guidelines (SAMG)**

The Severe Accident Management Guidelines (SAMG) are being re-evaluated.

- **WANO SOER 2011-2 Recommendations**

  The availability of the existing SSCs for different accident scenarios was checked to meet the recommendations arising from the WANO SOER 2011-2.

  The Licensee compiled a list of 253 components that needed to be verified to deal with events included in the design basis, which were reviewed in expert inspections conducted during 2011.

- **Procedure for Operation in Perturbations and Accidents**

  The procedure for "Operation in Perturbations and Accidents" was modified in order to include the control of critical parameters of the spent fuel storage pools.

- **Accident Management Procedures Review and Improvement**

  The review of the following procedures is being carried out to ensure the operation of the systems that are necessary in the proposed scenarios to ensure the proper functioning and demand of the safety systems required in extreme events for at least the initial 72 hours:

  SBO: Manual action to inject the SHS in a short period of time with a cooling ramp of 100°C/h and manually deactivation of the boric acid injection shutdown system.

  Inventory replenishment of the SHS with an increase in the capacity of the SHS feed water tanks, using the two pumps of the water conditioning system (UA10 D20/D21) and replenishing those pools with groundwater using one of the pumps of the drinkable water supply.

  Low river level: This will allow systematic handling to conduct a plant outage and secure the cooling system.

These improvements are planned to be implemented by the end of 2014.

- **Severe Accident Management Program**

  An emergency operating procedure to deal with an event of loss of cooling or water inventory of the spent fuel storage pools intended to monitor water level and the temperature of the pools during an emergency, as well as the possibility of recovering its water inventory even in scenarios of SBO, earthquakes and flooding or low water level. This improvement shall be implemented by the end of 2014.

  To complete the severe accident management program including the corresponding guidelines for prevention and mitigation, considering the lessons learned from Fukushima. This includes the strategies to deal with extreme external events

beyond the design basis, which may lead to a loss of the safety functions and the conditions of severe accident. This improvement is due by the end of 2015.

- **Filtered Containment Venting System**

- **Instrumentation and Control**

- **DGs Alternative Cooling Mode**

- **Disconnection of Electrical Loads**

The procedure of disconnection of electrical loads to increase the batteries duration in the actual plant condition has to be reconsidered once the new EPS be installed.

- **Procedure to Passive Components Control**

This procedure was already incorporated to the Operations Manual to make possible for example to verify during each operational shift the vacuum breakdown / siphons piping associated with the spent fuel pool cooling as well as to increase the frequency of the corresponding tests and inspections.

- **Safety System Trip Parameters**

- **Operating Procedure for Abnormal Events**

  A new Operating Procedure for Abnormal Events to deal with loss of cooling in the spent fuel pool and/or loss of inventory will be developed. This procedure shall include actions to verify the coolant level and the temperature of the pool from the secondary control room in the event that the main control room and the pool room are unavailable. It shall include actions to replenish water from alternative systems (e.g. fire hydrants or fire engines) in the event of sustained loss of cooling or loss of inventory. Implementation is scheduled by the end of 2014.

- **Measures for Accident Management to Deal with Loss of Cooling in the Fuel Storage Pools**

  An emergency operating procedure to deal with an event of loss of cooling or water inventory from the spent fuel storage pools intended to monitor water level and the pools temperature during an emergency, as well as the possibility of recovering its water inventory even in scenarios of loss in the main control room, SBO, earthquakes and flooding or low water level. This improvement is planned to be conducted at the beginning of 2014.

- **Potential Effects on Other Nearby Plants**

  The potential effects of CNA I over CNA II and vice versa are being analyzed. Because CNA II is being commissioned, the results of these analyses are planned to be ready before starting the power uprating phase.

CNA II

- **Severe Accident Management Program**

  To complete the severe accident management program including the corresponding guidelines for prevention and mitigation, considering the lessons learned from Fukushima. This includes the strategies to deal with extreme external events beyond the design basis, which may lead to a loss of the safety functions and the conditions of severe accident. This improvement is planned to be applied before the end of 2015.

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- **Severe Accident Management Guidelines (SAMG)**

  The Severe Accident Management Guidelines (SAMG) has been re-evaluated. In December 2012, CANDU Energy performed a Severe Accident Management Guidance (SAMG) Training and Validation Exercise for the Severe Accident Management Program. The overall objectives of the SAMG validation exercises were to evaluate the effectiveness of SAMG framework, processes and training for emergency response.

- **Procedure to Passive Components Control**

  This procedure was already incorporated to the Operations Manual in to verify during each operational shift the vacuum breakdown/siphons piping associated with the spent fuel pool cooling as well as to increase the frequency of the corresponding tests and inspections.

- **Operating Procedure for Abnormal Events**

  A new Operating Procedure for Abnormal Events that covers response to loss of cooling in the spent fuel pool and / or loss of inventory will be developed. This procedure shall include actions to verify the coolant level and temperature of the pool from the secondary control room in the event that the main control room and the pool room are unavailable. It shall include actions to replenish water from alternative systems (e.g. fire hydrants or fire engines) in the event of sustained loss of cooling or loss of inventory. Implementation is scheduled by the end of 2014.

- **Facility to Connect a Fire-truck from Outside the Spent Fuels Storage Pool Building**

  A facility to connect a fire-truck from outside the spent fuel storage pool building will be installed. It will replenish water to the pools in the events of loss of cooling, circulation or SBO. Implementation is scheduled by end of 2015.

K.3.2 R&D Activity Program

In order to achieve the goals of safety, efficiency and continuous improvement, the PNGRR develops various R&D activities in compliance with the PEGRR. Section L includes a list of activities being conducted at present and those carried out jointly with the IAEA.

K.3.3 Public Communication Program

During the period 2011-2013 both the National Program for Radioactive Waste Management and the Environmental Restoration Project of Uranium Mining have been involved in various activities related to the implementation of communication activities, focused on the personnel as well as on the community in general.

The development of activities related to the fulfillment of the objectives of PEGRR depends mostly on the positions taken by the decision makers and the perception of the public opinion on the nuclear activity in general.

In this regard, CNEA has taken steps to plan and execute a plan of public communication at the national level, focusing on the community, e.g. workshops, lectures, participation in science exhibitions, events, activities with schools and universities. As the development of the communication plan is in the medium and long term, CNEA created a specialized office devoted to social communication.

One of the first and main tasks is to conduct surveys to determine the stage of public acceptance nationwide. This will assess the effectiveness of the Communication Plan in future periods and thereby adjust the chosen strategies.

As part of the activities of information, transparency, and broad dissemination of the subject, and specifically related to the Joint Convention, CNEA adopted as a common practice, since the First National Report published on the internet (available at the CNEA and IAEA websites), to publish on the web Reports and Q&A. The ARN is involved in the dissemination of the same scheme through the publication of that report link on its website as a means of strengthening the communication strategy at the national level and expand participatory information to several interest groups.

In addition, the PNGRR annually inform the national Congress on the activities performed during the previous year to fulfill the PEGRR objectives. These reports are also available in the CNEA website.

K.4. Commitments of Previous Revision Meetings

The commitments made by Argentina in previous meetings regarding to the progress in relation to:

1) Conducting a program to improve the characterization of radioactive waste generated and stored at nuclear power plants.
2) Achieving sufficient SF storage capacity compatible with CNA I operating life (dry storage, optionally in the short term, carrying capacity for transfer between the CNA I and CNA II).
3) Completing the construction and commissioning of the new RRII SF storage facility (FACIRI).
4) Continuing with the safety analysis of other disposal systems located in AGE.
5) Impact in terms of RW and SF from Embalse Nuclear Power Plant Life Extension.
6) Approval of the Strategic Plan for Radioactive Waste Management (2012 version).
7) Impact on planning due to the management of RW and SF of the Fourth Nuclear Power Plant.
8) Conducting a Public Communication Program to obtain the necessary approval and acceptance of the site for RW disposal.

They are in the following state situation:

1) Conducting a program to improve the characterization of radioactive waste generated and stored at nuclear power plants.

Implementing a Characterization and Registration System of Radioactive Waste generated in both plants will provide inventory and records of comparable quality to the international situation, and provide the National Program for Radioactive Waste Management within CNEA with the engineering options to take a decision for final disposal.

In the framework of implementing such a system, the stages of training, equipment acquisition and laboratory conditioning were completed; and sampling for analysis of radioactive waste generated began.

2) Achieving sufficient SF storage capacity compatible with the CNA I operating life (dry storage, optionally in the short term carrying capacity for transfer between the CNA I and CNA II)

As indicated in Section G.4.1, two projects are being implemented both for dry storage and for the transfer of SF from the CNA I and CNA II.

3) Completing the construction and commissioning of the new RRII SF storage facility (FACIRI).

This facility is completed and in preparation for its commissioning (G.2.6). Preliminary testing of components and systems were performed and the mandatory documentation for Commissioning License was completed. The first SF transfer is planned to be conducted in 2014.

4) Continuing with the safety analysis of other disposal systems located in AGE.

In the PEGRR (2012 version), actions are included to complete the evaluation of radiological safety assessment of all disposal systems at AGE.

5) Impact in terms of RW and SF from Embalse Nuclear Power Plant Life Extension.

As indicated in A.3, the new version of PEGRR has taken into account the impact produced by this activity. Regarding the safe storage of RW and SF originated from life extension on the site of the NPP, see Section H.4.2 and Section G.2.4, respectively.

6) Approval of the Strategic Plan for Radioactive Waste Management (2012 version).

The latest version of PEGRR for the year 2012 has been approved by CNEA's Presidential Resolution No. 461 in December 2012.

Subsequently, the plan has been reviewed and approved by the ARN and will be submitted to NA-SA to be sent later on to the national government highest authorities and to the National Congress.

7) Impact on planning due to the management of RW and SF of the Fourth NPP.

As stated in Section A.3, the PEGRR approved in 2012 has already taken into consideration the impact of the fourth nuclear power plant scheduled to be built in the country.

8) Conducting a Public Communication Program to obtain the necessary approval acceptance of the site for RW disposal.

In Section K.3.3, implementation details and communication program with objectives and progress are included.

K.5 IAEA Review Missions

The IAEA has implemented an advisory programme on all aspects of spent fuel management called IFMAP (Irradiated Fuel Management Advisory Programme).

In this framework, the IAEA conducted a mission called "Peer Review Mission IAEA IFMAP CNA I Spent Fuel Dry Storage Project", from 12 to 16 March 2012.

K.6 Synoptic Summary

In agreement with the determinations of the document *Guidelines relative to the Form and Structure of the National Report (item 12, part II of Annex to INFCIRC 604/Rev1)*, a synopsis of the present conditions in Argentina in relation to the contents of this Fifth National Report is included in the next page.

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ARGENTINA FIFTH NATIONAL REPORT – OVERVIEW

Type of Liability	Long Term Management Policy	Funding of Liabilities	Current Practices/ Facilities	Planned Facilities
Spent Fuel	▪ Reprocessing decision deferred (dead line 2030) ▪ Final Disposal 2060	▪ Facility Operator (Argentine State)[1]	▪ CNA I: NPP Wet Storage ▪ CNE: NPP 6 years Wet Storage ▪ CNE: NPP Dry Storage ▪ RRII: Wet Storage (DCMFEI/FACIRI)	▪ CNA I: Dry Storage
Nuclear Fuel Cycle Waste	▪ Final Disposal	▪ Facility Operator (Argentine State)[1]	▪ LLW: Storage + Final Disposal ▪ LLW: Treatment and Conditioning Facility ▪ ILW: Storage	▪ LLW: Centralized Repository ▪ ILW & HLW: Deep Geological Repository (feasibility) ▪ LLW: Treatment and Conditiong Facility (PTARR)
Non - Nuclear Fuel Cycle Waste	▪ Final Disposal	▪ Waste Generator when it is a private owner ▪ Argentine State when the generator is the State	▪ LLW: Storage + Final Disposal ▪ ILW: Storage	▪ LLW: Centralized Repository ▪ LLW: Treatment and Conditiong Facility (PTARR)
Decommissioning Liabilities	▪ Decommissioning Plan (regulatory requirement)	▪ NPPs, RRII and other State-owned Facilities: Argentine State ▪ Facility operator when it is a private owner.	▪ No Facility in Decommissioning Process	▪ LLW: Centralized Repository ▪ VLLW: Centralized Repository
Disused Sealed Sources	▪ Reuse or Recycling ▪ Final Disposal	▪ Source User	▪ Re-encapsulation: Sealed Source Plant ▪ Storage + Final Disposal (short-lived) ▪ Storage (long-lived)	▪ LLW: Centralized Repository ▪ ILW & HLW: Deep Geological Repository

(1) At present, all nuclear reactors and other nuclear fuel cycle facilities are operated by Argentine State Organizations, being the Argentine State responsible for their funding.

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SECTION L ANNEXES

L.1 National Laws

L.1.1 Law No. 24804/97 National Law of Nuclear Activity

CHAPTER I
Nuclear Activity. Duties of the National Government
Criteria for Regulations. Jurisdiction.

ARTICLE 1.- The National Government, through the Argentine Commission of Atomic Energy and the Nuclear Regulatory Authority, shall define the policy and be responsible for research and development, regulation and surveillance functions in the nuclear field.

All productive oriented nuclear activities related to research and development, which may be commercially organized, shall be performed by the National Government or by the private sector.

The nuclear policy shall meet all the obligations assumed by the Argentine Republic as a party to the Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (Tlatelolco Treaty), the Treaty on Non-Proliferation of Nuclear Weapons (NPT), the Agreement between the Argentine Republic and the Federative Republic of Brazil through the Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC) and the International Atomic Energy Agency (IAEA) for the Application of Safeguards, in addition to the commitments signed by Argentina as a member of the Nuclear Suppliers Group and the National Regime for the Control of Sensitive Exports (Decree No. 603/92).

ARTICLE 2.- The Argentine Atomic Energy Commission created by Decree No. 10936 dated May 31st, 1950 and reorganised by Decree-Law No. 22498/56, which was ratified by Law No. 14467, shall continue operating as an autarchic organism within the jurisdiction of the President of the Nation [1], and shall be responsible for:

a) Advising the Executive Power on nuclear policy issues.

b) Promoting training of highly specialised human resources, and scientific and technological developments in the nuclear field, which include the promotion and development programs for technological innovations.

c) Fostering technology transfer programs for technologies acquired, developed and patented by the Institution in compliance with the non-proliferation commitments signed by the Argentine Republic.

d) Exercising the responsibility of radioactive waste management activities in compliance with the specific legislation.

e) Defining the procedures for decommissioning of nuclear power plants and any other relevant radioactive facility.

f) Providing the services requested by nuclear power plants and other nuclear facilities.

g) Exercising the property rights of the National Government on special fissionable materials included in irradiated fuel elements.

h) Exercising the property rights of the National Government on special fissionable materials, which might be admitted or developed in the country.

i) Developing, building and operating experimental nuclear reactors.

j) Developing applications for radioisotopes and radiation in biological, medical and industrial uses.

k) Performing mineral prospecting for nuclear use, without excluding the private sector from said activity.

l) Developing materials and manufacturing processes for fuel elements to be used in advanced cycles.

ll) Developing basic and applied research programs in basic sciences of nuclear technology.

m) Subscribing cooperation programs with third countries, through the Ministry of Foreign Affairs, International Trade and Worship, for the programs mentioned in the above item, and for fusion technology research and development programs.

n) Fostering and developing any other study and scientific application for nuclear transmutations and reactions.

ñ) Continuously updating of technical information on nuclear power plants during all their lifetime, and ensuring its optimum use.

o) Establishing direct relations with other foreign institutions that share similar goals.

p) Signing agreements with nuclear power plant operators in order to carry out research.

ARTICLE 3.- The Argentine Commission of Atomic Energy shall manage its administrative, financial, proprietary and accounting matters in accordance with the contents of this Law and the regulations issued for such purpose by its Board of Directors. The Commission shall be subject to the public control regime.

The staff of the Commission shall be subject to the Labour Contracts Law and to the special conditions established in the regulations.

ARTICLE 4.- The duties of the Board of Directors of the Argentine Atomic Energy Commission shall be:

a) To perform the necessary actions in order to comply with the objectives and functions established in this Law.

b) To approve general work plans, strategic projects and annual budgets to be submitted to the National Executive Power.

c) To approve the annual activities report.

d) To advise the National Executive Power on matters related to atomic energy and its applications.

e) To establish relations with foreign institutions or with regional or international agencies that share similar goals, including the participation of the Ministry of Foreign Affairs, International Trade and Worship.

f) To accept assets and donations.

g) To sign agreements with public or private entities for the execution of the plans aimed at the achievement of the Commission's goals.

h) To propose the Commission's organisational structure to the Executive Power.

ARTICLE 5.- The Chairman of the Board of Directors of the Argentine Commission of Atomic Energy shall be vested with every necessary executive power to comply with the laws and regulations ruling the Institution and the resolutions issued by the Board of Directors. The Chairman shall:

a) Undertake the legal representation of the Argentine Atomic Energy Commission for all administrative, judicial and extrajudicial matters.

b) Manage and administer the Institution.

c) Summon and chair the meetings of the Board of Directors.

d) Present general work plans, strategic projects and annual budget drafts to the Board of Directors to be submitted to the National Executive Power.

e) Grant general and special mandates.

f) Integrate, either by himself or through representatives, national, provincial or sectorial commissions dealing with the tasks of the Institution, including environmental matters.

g) Inform the Board of Directors about the general distribution of the annually granted budget.

h) Inform the Board of Directors about the compliance with plans, projects and other scheduled activities.

i) Propose to the Board the Commission's organisational structure at the levels not defined by the Executive Power.

j) Appoint, promote, sanction and dismiss staff according to the applicable laws and regulations.

k) Appoint and promote staff that will perform hierarchical and co-ordination activities.

l) Appoint and send representatives, and nominate on assignment qualified personnel, to participate in regional or international conferences, meetings or congresses.

m) Partially delegate, to the internal bodies he may designate, the faculties entrusted to him by this Law.

ARTICLE 6.- Resources of the Argentine Atomic Energy Commission shall be made up by the following revenues:

a) Contributions from the National Treasury as determined for each fiscal year and by special laws.

b) Proceeds resulting from its own activities in the field of production and from the services rendered.

c) Subsidies, legacies, inheritances, donations and transfers received for any concept.

d) A royalty fixed by the Executive Power aimed at financing research and development activities performed by the Argentine Commission of Atomic Energy, calculated as a percentage of the income obtained from the sale of electric power generated by nuclear power plants in charge of Nucleoeléctrica Argentina S. A. (corporation) or by whoever legally substitutes it.

e) Interests and benefits accrued from the management of its own funds.

ARTICLE 7.- The Nuclear Regulatory Authority shall be responsible for regulating and controlling nuclear activities regarding radiological and nuclear safety, security and controlled use of nuclear materials, licensing and surveillance of nuclear facilities, and compliance with international safeguards. The Nuclear Regulatory Authority shall also be an advisor to the Executive Power on issues within its field of expertise.

ARTICLE 8.- The Nuclear Regulatory Authority shall have regulatory and control responsibilities, as stated in this Law in order to:

a) Protect human beings from harmful effects of ionising radiation.

b) Ensure that nuclear activities carried out in the Argentine Republic comply with radiological and nuclear safety requirements.

c) Ensure that nuclear activities are not to be performed for purposes other than those authorised by this Law, and that regulations issued in the future comply with international commitments and Argentina’s policy on non-proliferation of nuclear activities.

d) Prevent intentional actions that could lead to severe radiological consequences or to unauthorized withdrawal of nuclear materials or other materials, or equipments subject to regulation and control, as stated in this Law.

ARTICLE 9.- To develop any type of nuclear activity, all individuals and legal persons shall:

a) Comply with regulations issued by the Nuclear Regulatory Authority within its jurisdiction and, in order to operate, to apply for a license, permit or authorisation.

b) Comply with all the safeguards and non-proliferation agreements subscribed or to be subscribed in the future by the Argentine Republic.

c) Accept civil liabilities of nuclear power plant operators, as defined in the Vienna Convention on Civil Liability for Nuclear Damage, ratified by Law No. 17048, for a total amount of eighty million US Dollars (USD 80,000,000) per nuclear accident in each nuclear facility. This amount shall be guaranteed by an insurance policy or a financial warranty, to the satisfaction of the Executive Power or whoever shall be appointed by the Executive Power; the National Government shall be responsible for the remaining liability.

The Executive Power is hereby authorised to adjust the amount of the liability above mentioned if the conditions stated in the Vienna Convention on Civil Liability for Nuclear Damage are amended, provided said amendment is ratified by law.

Nuclear damages, as defined in the Vienna Convention on Civil Liability for Nuclear Damage, ratified by Law No. 17048, shall mean loss of human lives, bodily injuries and material damages directly or indirectly caused by radioactive properties, or by radioactive properties in combination with toxic, explosive or other hazardous properties of nuclear fuels, or by radioactive products or radioactive waste in a nuclear facility or nuclear products arising from or originated by said facility or sent to it, or other ionising radiation released from any other source of radiation within a nuclear facility.

It is considered that the operator of a nuclear facility shall be liable for nuclear damages in case of:

i) Damages caused to the operator’s employees and to the contractor and subcontractor’s employees as a result of the nuclear accident at a nuclear facility that is operated by said company;

ii) Damages caused by the nuclear accident to International Atomic Energy Agency’s officials while developing tasks to comply with the safeguards stated in the international agreements signed by the Argentine Republic;

iii) Damages caused by nuclear products when such accidents do not occur within a facility or during transportation, if at the time of the nuclear accident, said products were stolen, lost, jettisoned, or abandoned.

All operators of nuclear power plants shall contribute to a Fund for Decommissioning of Nuclear Power Plants. The funding, management and control of this Fund shall be determined by the National Executive Power.

ARTICLE 10.-As established in SECTION 11 of this Law, regulation and surveillance of nuclear activities concerning matters defined in SECTION 7 are submitted to the national jurisdiction.

ARTICLE 11.- Every new site for a relevant nuclear facility shall require a construction license authorizing its location issued by the Nuclear Regulatory Authority and approved by the Provincial Government in whose jurisdiction the new facility is scheduled to be built.

ARTICLE 12.-The Argentine Atomic Energy Commission shall suggest the location of the repositories for high, medium and low activity waste. The site shall be approved by the Nuclear Regulatory Authority regarding radiological and nuclear safety, and the Provincial Government in whose jurisdiction the suggested site is located shall pass a law approving the site. Said requirements shall be prior and essential for any approval requests.

ARTICLE 13.-The location of radioactive waste treatment plants and of their corresponding temporary and final repositories managed by the Argentine Atomic Energy Commission or by the Corporation Nucleoeléctrica Argentina S. A. have in operation at the time this Law is enacted, including their expansion and routes of access by land, sea, air and river, shall require no additional authorization to continue operating, and all deliveries to, or shipments from said repositories, shall not require any special approval from the National Congress or from Municipal or Provincial authorities in whose jurisdiction the repository or routes of access are located.

CHAPTER II
Nuclear Regulatory Authority

ARTICLE 14.-The Nuclear Regulatory Authority shall operate as an autarchic entity within the jurisdiction of the President of the Nation. Said Authority shall succeed the National Board of Nuclear Regulation.

ARTICLE 15.-The Nuclear Regulatory Authority shall hold autarchy and shall have full juridical capacity to act both in Public and Private Law.

Its property shall be constituted by assets to be transferred to the National Board of Nuclear Regulation and by those acquired in the future for any concept. It shall have its headquarters in the City of Buenos Aires. The Authority shall approve its own organisational structure with prior intervention of the Public Functions Secretariat of the Presidency of the Nation.

ARTICLE 16.-The Nuclear Regulatory Authority shall have the following duties, attributions and obligations:

a) Issuing regulatory standards related to radiological and nuclear safety, security and control of the use of nuclear materials, licensing and surveillance of nuclear facilities, international safeguards and transport of nuclear materials as far as radiological and nuclear safety and security are concerned.

b) Granting, suspending and revoking construction licenses, commissioning, operation and decommissioning of nuclear power plants.

c) Granting, suspending and revoking licenses, permits or authorisations concerning Uranium mining and concentration, safety of research reactors,

relevant accelerators, relevant radioactive facilities, including the facilities for waste or radioactive waste management, and nuclear applications in medical and industrial activities.

d) Performing regulatory inspections and evaluations of facilities subject to regulation of the Nuclear Regulatory Authority, with the periodicity it deems necessary.

e) Proposing to the Executive Power the transfer, extension or replacement of a concession for the use of a State-owned nuclear facility whenever there exist elements that advise to do so, or its expiration when based on non-compliance with the rules issued regarding radiological and nuclear safety matters.

f) Bringing civil or criminal lawsuits before the competent courts when licensees or authorisation or permit owners do not comply with what is ruled by this Law, as well as requesting for search warrants and for the aid of the security forces whenever such actions are deemed necessary to duly exercise the faculties granted by this Law.

g) Applying sanctions, which shall be graded according to the severity of the infringement; such as warnings, fines to be applied according to the severity of the fault and regarding the potential damage involved, suspension of a license, permit or authorisation or their revocation. Said sanctions shall be appealable only for returnable effect before the National Administrative Contentious Court of Appeals.

h) Establishing procedures for the application of sanctions corresponding to the violation of rules issued while exercising its competence, thus ensuring the principle of due process of Law.

i) Disposing the seizure of nuclear or radioactive materials, as well as the preventive closure of facilities subject to regulations of the Nuclear Regulatory Authority, whenever they lack the due license, permit or authorisation, or whenever gross negligence is detected regarding the compliance with radiological and nuclear safety standards or with the protection of facilities.

In this context, gross negligence means acts involving a serious threat to the safety of the population or to the environmental protection, or whenever the application of security or safeguards measures cannot be guaranteed.

j) Protecting restricted information in order to ensure a trustworthy preservation of technological, commercial or industrial secrets, and an appropriate application of safeguards and of security measures.

k) Establishing, in accordance with international parameters, radiological and nuclear safety standards for overland, river, sea or air transport of nuclear and radioactive materials, and for security of transported materials.

l) Establishing, in accordance with international parameters, radiological and nuclear safety standards related to staff working in nuclear facilities and granting specific licenses, permits and authorisations that qualify for performance of functions subject to licenses, permits or authorisations.

ll) Defining a procedure for consultation with owners of licenses for relevant nuclear facilities whenever new regulatory standards are proposed or the existing ones are modified.

Such procedure shall foresee that modifications to the existing standards and the issuing of new ones are supported by an evaluation criterion based on the cost/benefit ratio arising from the application of the new standard.

m) Evaluating environmental impact produced by any licensed activity, which involves monitoring, analysis and follow-up activities concerning the incidence, evolution or possibility of environmental damage that may arise from the licensed nuclear activity.

n) Submitting an annual report to the National Executive Power and the Honorable National Congress on activities performed, including suggestions about measures to be adopted for the benefit of public interest.

ñ) Requesting information to all license, permit or authorisation owners on topics subject to regulation.

o) In general, performing any other action aimed at achieving a better performance of duties and at accomplishing the purposes of this Law and its regulations.

ARTICLE 17.-The Nuclear Regulatory Authority shall be managed and administered by a Board of Directors of six (6) members as follows: a Chairman, a Vice-Chairman and four (4) voting members.

ARTICLE 18.-Members of the Board of Directors of the Nuclear Regulatory Authority shall be appointed by the Executive Power, two of them as proposed by the House of Deputies and the Senate, respectively. Said members must have a technical and professional background in this field. They shall be entitled to a six (6) year period, and one third of them shall be renewed every two (2) years. They shall only be removed on ground basis by the Executive Power and they may be successively and indefinitely appointed.

In the case of the first appointment, the Executive Power shall fix the term of duration by drawing lots.

ARTICLE 19.-Members of the Board of Directors of the Nuclear Regulatory Authority shall have full-time dedication and shall be subject to incompatibilities in force for public officials. License, permit or authorisation owners as per this Law and individuals with any direct interest connected with this matter cannot be appointed as members of the Board.

ARTICLE 20.-The Chairman of the Board shall be entitled to such position during a six (6) year period and may be appointed successively and indefinitely for legal periods. He shall be the legal representative of the Nuclear Regulatory Authority. In case of impediment or temporary absence, the Vice-Chairman shall replace him.

ARTICLE 21.-The Board of Directors shall be legally competent with a quorum of four (4) of its members, while one of them must be its Chairman or Vice-Chairman. Its resolutions shall be adopted by simple majority. In case of a draw, the Chairman or the person replacing him shall have a double vote.

ARTICLE 22.-The duties of the Board of Directors of the Nuclear Regulatory Authority shall be:

a) To exercise and to control the fulfilment of statutory rules and regulations governing the Authority's activities.

b) To issue the Board's regulations for its performance.

c) To administer all matters related to the Authority's staff.

d) To prepare annual budgets and to estimate resources to be submitted to the Honorable National Congress through the Executive Power for its approval along with the general budget of the Nation.

e) In general, to perform any other action aimed at a better fulfilment of its duties and at accomplishing the purposes of this Law and its regulations.

ARTICLE 23.-The Nuclear Regulatory Authority shall manage its administrative, financial, proprietary and accounting matters in accordance with the contents of this Law and the regulations issued for such purpose by its Board of Directors. The Authority shall be subject to the public control regime.

ARTICLE 24.-The Nuclear Regulatory Authority shall draft an annual budget proposal that shall be published and submitted to individuals bound to pay the regulatory rate foreseen in SECTION 26 of this Law, who shall be able to formulate grounded objections within thirty (30) calendar days after such publication.

ARTICLE 25.-Resources of the Nuclear Regulatory Authority shall be made up by the following revenues:

a) Regulatory rate created by SECTION 26 of this Law.

b) Subsidies, inheritances, legacies donations and transfers received for any concept.

c) Interests and benefits accrued from the Management of its own funds.

d) National Treasury contributions as determined for each fiscal year.

e) Any other funds, assets or resources assigned to it by virtue of applicable laws and regulations.

ARTICLE 26.-Licensees, owners of an authorisation or permit, or legal persons whose activities are subject to the control of the Authority shall pay in advance an annual regulatory rate to be approved through the general budget of the Nation.

In the case of nuclear power plants, such annual regulatory rate shall not be higher than a sum equivalent to the annual average price of one hundred megawatt-hour (100 MW/h) at the Wholesale Electric Power Market, fixed on the basis of prices in force during the previous year. Said sum shall be paid for every megawatt of nuclear nominal power

installed capacity until withdrawal of irradiated fuel from the reactor is finished during its decommissioning by the operator in charge of the facility.

Furthermore, new nuclear power plants shall also pay, annually and in advance, regulatory rates corresponding to construction and licensing process, which shall be approved by the Executive Power.

For the rest of licensees that are owners of an authorisation or permit subject to regulation, the Nuclear Regulatory Authority shall establish the corresponding regulatory rates for licensing and inspection, which shall not exceed zero point five percent (0.5%) of their income, or an equivalent indicator of the activity subject to regulation of the previous fiscal year.

Arrears of payment of the rate or fines foreseen in SECTION 16, item g) shall be automatic and shall accrue punitive interests as established by the enforcement authority. A debt certificate indicating lack of payment issued by the Nuclear Regulatory Authority shall be sufficient to bring an executive lawsuit before the Civil and Commercial Federal Courts.

ARTICLE 27.-Staff of the Nuclear Regulatory Authority shall be submitted to the Labour Contracts Law and to special conditions established in the regulations, while the Basic Juridical Regime for Public Function shall not be applicable.

ARTICLE 28.-The Nuclear Regulatory Authority shall rule according to procedures established in the Administrative Procedure Law and its regulatory provisions as regards its relations with individuals and with Public Administration.

ARTICLE 29.-Whenever, as a result of instituting legal procedures on own initiative or as a result of denunciation by third parties, the Nuclear Regulatory Authority considers that any act by a nuclear facility licensee, by an authorisation or permit owner, or by a legal person somehow subject to regulation and control as well as by those using or producing nuclear technology or managing nuclear wastes violate this Law, its regulations or resolutions issued by the Nuclear Regulatory Authority, it shall notify all interested parties, being said Authority empowered to take preventive actions as deemed necessary prior to solving the existence of such violation.

CHAPTER III
Definitions

ARTICLE 30.-As used in this Law, the following terms shall have the definitions assigned to them hereunder:

a) ***Nuclear activities:*** Use of nuclear transmutations at a macroscopic scale.

b) ***Nuclear material:*** Plutonium 239, Uranium 233, Uranium 235, Uranium enriched in Isotopes 235 or 233, Uranium containing an isotopic mix equal to the one found in nature, Uranium depleted in Isotope 235, Thorium with nuclear purity or any material containing one or more of the above.

c) ***Nuclear facility:*** Concept understood in the terms defined by SECTION 1, item j, of the Vienna Convention on Civil Liability for Nuclear Damage approved by Law No. 17048.

d) ***Relevant nuclear facility:*** It includes nuclear reactor, critical facility, relevant radioactive facility and relevant accelerator, as defined or to be defined by the Nuclear Regulatory Authority.

e) ***Restricted information:*** Any information delivered by an applicant or by a license, permit or authorisation owner to the Nuclear Regulatory Authority that is to be treated confidentially in virtue of legal or contractual obligations assumed by them or related to:

I. Processes and technologies for the production of special fissionable material;

II. Specific application of safeguards;

III. Specific security systems applied in nuclear facilities.

f) ***Special fissionable material:*** Plutonium, Uranium 233, Uranium enriched in Isotopes 235 or 233 and any other material containing one or more of the above mentioned elements.

g) ***Production of special fissionable material:*** Chemical separation of special fissionable material from other substances or production of special fissionable materials by means of isotopic separation methods.

CHAPTER IV
General Provisions

ARTICLE 31.-The responsibility for nuclear and radiological safety, safeguards and security remains unfailingly with the license, permit or authorisation owner. Fulfilment of this Law and of rules and requirements arising from them do not exempt him from such liability or from doing everything that may be reasonable and consistent with his possibilities in favour of radiological and nuclear safety, safeguards and security.
The license, permit or authorization owner may totally or partially delegate the execution of the tasks, but he still keeps the entire responsibility established in this SECTION.

ARTICLE 32.-The National Government shall be the sole owner of special fissionable materials contained in irradiated fuel elements when activities encompassed by this Law are performed, as well as of any special fissionable materials admitted or developed in the country.

ARTICLE 33.-SECTIONS 2, 5, 9, 11, 16 and 17 of Decree-Law No. 22498, dated December 19th, 1956, are annulled.

CHAPTER V
Privatisations

ARTICLE 34.-It is declared as subject to privatisation nuclear power generation activity performed by the Corporation Nucleoeléctrica Argentina Sociedad Anónima (Nucleoeléctrica Argentina S. A.), as an indivisible productive unity, either directly or in association with other entities, including its various aspects (construction, commissioning, operation, maintenance, and decommissioning of nuclear power plants), as well as management and execution of nuclear power plant construction being performed by the

Corporation Empresa Nuclear Argentina de Centrales Eléctricas Sociedad Anónima (ENACE S.A) [2].

This privatisation shall ensure the completion of the nuclear power plant, currently under construction, within a maximum term of six (6) years after the enactment of this Law.

ARTICLE 35.-"Nucleoeléctrica Argentina Sociedad Anónima (Nucleoeléctrica Argentina S.A.)", or corporation organized in furtherance of the execution of privatisation authorized in the previous SECTION, shall maintain up to twenty per cent (20%) of its capital and at least one (1) share as property of the National Government, and their possession as well as the exercise of corporate rights shall remain with the Ministry of Economy and Public Works and Services.

The company's employees shall receive from said capital the percentage that shall be fixed in the framework of the programme of participated property foreseen in Law No. 23696.

The National Government shall be the permanent owner of one (1) share of the society and its affirmative vote shall be required to take any decisions related to:

a) An expansion of capacity of an existing nuclear power plant and/or the construction of a new one.

b) Decommissioning for non-technical causes of a nuclear power plant, either temporarily or definitively.

ARTICLE 36.-Activities related to nuclear fuel cycle aimed at nuclear power generation, either at an industrial or research scale, and at the production and applications of radioisotopes and radiation presently performed by the Argentine Commission of Atomic Energy, either directly or in association with other entities, are declared as subject to privatisation, considering them both as a whole or as any of their constituent parts.

ARTICLE 37.- Corporations shall be constituted for the purpose of the privatisations mentioned in SECTION 36, and the National Government shall hold at least one (1) share and the right to veto any decisions involving discontinuation of such activities.

ARTICLE 38.-The licensee of the nuclear power plants or the corporation created for the purpose of privatisation authorised by SECTION 34 shall hire its supply of heavy water from the Industrial Plant for the Production of Heavy Water ("Planta Industrial de Agua Pesada - PIAP") installed in Argentina and shall be responsible for the restitution of heavy water hired for Embalse Nuclear Power Plant, according to technical quality features and prices of the international market.

ARTICLE 39.-Privatisation processes authorised in this Chapter shall be subject to conditions established by Law No. 23696, by SECTION 96 of Law No. 24065, by SECTION 14 of Law No. 24629 and by this Law.

ARTICLE 40.-Nuclear Power Plants shall use nuclear fuel originated or elaborated from radioactive minerals of mines located in the country [3].

ARTICLE 41.-This Law shall be enforced as from the date of its publication in the Official Bulletin.

ARTICLE 42.-To be communicated to the Executive Power.

[1] Jurisdiction of the President of the Nation was appealed by Decree No. 358/97 of the Executive Power enacting the present law.

[2] Law No. 26784 of 2012, in its Art. 61, repealed Art. 34 of Law No. 24804, by which the operation of the nuclear power plants cannot be privatised, the responsibility for financing the decommissioning of Nuclear Power Plants, research reactors, and other significant nuclear facilities would be assumed by the National Government with its own funds.

[3] Article 40 was appealed by Decree No. 358/97 of the Executive Branch enacting the present law.

L.1.2 Law No. 25018/98 National Law on Radioactive Waste Management Regime

General Provisions

ARTICLE 1.- This law sets forth the basic instruments for an adequate radioactive waste management that, in this aspect, assure the protection of the environment, public health and the rights of posterity.

ARTICLE 2.- For the purpose of the present law, Radioactive Waste Management means the ensemble of the necessary activities to isolate from the biosphere radioactive waste derived exclusively from the nuclear activity performed in the Argentine territory, the time required for the decay of its radioactivity to such a level that its possible re-entrance to the biosphere does not imply risks for man and his environment. Such activities will have to be performed in complete agreement with the limits established by the NUCLEAR REGULATORY AUTHORITY and with all the corresponding national, provincial and City of Buenos Aires regulations as well as with the international agreements.

ARTICLE 3.- For the purpose of this law, radioactive waste means all radioactive material, combined or not with non-radioactive material, which has been used in productive processes or applications, for which no immediate subsequent uses are foreseen in the same facility, and which, because of its radiological characteristics, cannot be dispersed in the environment in accordance with the limits established by the NUCLEAR REGULATORY AUTHORITY.

ARTICLE 4.- The ARGENTINE ATOMIC ENERGY COMMISSION (CNEA) is the enforcement authority of this law and will co-ordinate everything related to its application with the provinces or the City of Buenos Aires, as may correspond.

ARTICLE 5.- In all the activities of radioactive waste management the ARGENTINE ATOMIC ENERGY COMMISSION will have to comply with regulatory standards referred to radiological and nuclear safety, security and environmental protection and international safeguards established by the NUCLEAR REGULATORY AUTHORITY and with all the corresponding national, provincial and City of Buenos Aires regulations.

Responsibility and Transference

ARTICLE 6.- The National State, through the enforcement authority of the present Law, shall assume the responsibility of the radioactive waste management. The generators of radioactive waste will have to provide the necessary resources to undertake it in due time and manner. The generator shall be responsible for the safe conditioning and storage of the waste generated by the facility operated by him, in compliance with the conditions determined by the enforcement authority, until its transference to the ARGENTINE ATOMIC ENERGY COMMISSION, and shall notify the NUCLEAR REGULATORY AUTHORITY immediately about any situation that could lead to an incident, accident or operation failure.

ARTICLE 7.- The ARGENTINE ATOMIC ENERGY COMMISSION shall establish the radioactive waste acceptance criteria and transference conditions that are necessary to assume its responsibility, and these will have to be approved by the NUCLEAR REGULATORY AUTHORITY.

ARTICLE 8.- The transference to the ARGENTINE ATOMIC ENERGY COMMISSION of radioactive wastes, particularly irradiated fuel elements, will be done at the time and according to the procedures determined by the ARGENTINE ATOMIC ENERGY COMMISSION with the prior approval by the NUCLEAR REGULATORY AUTHORITY. Under no circumstances the operator of the generating facility will be released from the responsibility in case of eventual civil and / or environmental damages until the transfer of radioactive waste has been accomplished.

ARTICLE 9.- The ARGENTINE ATOMIC ENERGY COMMISSION must prepare, within a term of SIX (6) months as from the enacting of the present Law, to be updated every THREE (3) years, a Strategic Plan for Radioactive Waste Management, which will include the National Programme of Radioactive Waste Management created by SECTION 10 of the present Law. This Plan and its updated versions will be forwarded to the EXECUTIVE, who, after consulting with the NUCLEAR REGULATORY AUTHORITY, will send it to the NATIONAL CONGRESS for its enactment.

Likewise, it will annually present to the National Congress a report on the tasks performed, the progress of the Strategic Plan and the need of its update.

National Program of Radioactive Waste Management

ARTICLE 10.-The ARGENTINE ATOMIC ENERGY COMMISSION through the National Programme of Radioactive Waste Management created by this Law must:

a. Design the strategy of radioactive waste management for the Argentine Republic and the places under its jurisdiction.
b. Propose the research and development lines related to technologies and methods of high, intermediate and low level radioactive waste management.
c. Plan, co-ordinate, execute and assign the necessary funds, and control the execution of research and development projects related to radioactive waste management.
d. Study the need to establish repositories and facilities for the management of high, intermediate and low level waste generated by the nuclear activity from the public or private sector.
e. Promote studies on safety and preservation of the environment.
f. Project and operate the systems, equipment, facilities and repositories for the management of high, intermediate and low level waste generated by nuclear activity from the public or private sector.
g. Construct, by itself or by third parties, the systems, equipment, facilities and repositories for the management of high, intermediate and low level waste generated by the nuclear activity from the public or private sector.
h. Propose the acceptance criteria and transference conditions of radioactive waste for high, intermediate and low level waste repositories.
i. Determine the procedures for the collection, segregation, characterisation, treatment, conditioning, transport, storage and final disposal of radioactive waste.
j. Manage the waste originated by the nuclear activity from the public or private sector, including those generated at the closure of facilities, those derived from uranium mining and those originated in abandoned mining sites and out-of-service industrial plants.
k. Implement, maintain and operate an information and recording system containing the documentation to allow the reliable and continuous identification of the waste generators and transporters and other participants in all management stages. It

must also include the inventory of all radioactive waste existing in the country. Copies of the documentation, corresponding to their respective jurisdiction, must be forwarded to the competent authorities of the provinces and the City of Buenos Aires for their information.

l. Prepare contingency plans for incidents, accidents or operation failures and evacuation programmes for emergencies.
m. Permanently inform the community about the scientific and technological aspects of radioactive waste management.
n. Exercise the long term responsibility on the radioactive waste repositories.
o. In the case of a nuclear emergency, act as a support to the services of civil protection in the manner and circumstances that may be required.
p. Perform the necessary technical and financial studies, taking into account the deferred costs derived from radioactive waste management, with the objective to establish the adequate economic policy.
q. Perform any other activity needed to comply with the objectives of the management.

ARTICLE 11.- The National Programme of Radioactive Waste Management will incorporate the recovery of the sites affected by the activities of extraction, grinding, concentration, treatment and elaboration of radioactive minerals originated in operating mines sites and their respective manufacturing plants, as well as from abandoned mining deposits or out-of-service industrial plants.

The application of the principle “as low as possible environmental impact” must be integrated with complementary programmes of sustainable development for directly affected communities and shall continue under the evaluation procedures of environmental impact determined by the provinces or the City of Buenos Aires, as may correspond.

ARTICLE 12.- In the case that the ARGENTINE ATOMIC ENERGY COMMISSION proposes the need to locate facilities for the final disposal of high, intermediate or low level radioactive waste, the selected sites will have to be previously approved as an essential requisite by the law of the province or the City of Buenos Aires, as may correspond, in agreement with the NUCLEAR REGULATORY AUTHORITY.

For this purpose, the corresponding environmental feasibility studies will have to be undertaken, containing a description of the proposal and of the direct and indirect potential effects that it could cause to the environment, indicating in this case the adequate measures to avoid or minimise the risks and/or negative consequences, and informing about the scopes, risks and benefits of the project.

A public hearing shall be called with a notice of no less than TEN (10) calendar days, through a media of regional circulation giving the pertinent information related to the future site.

Financing of Radioactive Waste Management

ARTICLE 13.-This Law creates the Fund for the Management and Final Disposal of Radioactive Waste to be constituted when this Law is enacted and whose exclusive destiny will be the financing of the National Programme of Radioactive Waste Management under the responsibility of the ARGENTINE ATOMIC ENERGY COMMISSION.

Said Fund will be integrated with the contributions of the radioactive waste generators in the form to be determined by the regulation, according to Section 10, item p) of this Law respecting the principles of equity and equilibrium according to the nature, volume and other characteristics of the generation. Such contributions will be integrated at the shortest term as from the generation of the corresponding waste.

ARTICLE 14.- Taking into account the existence of deferred costs in the radioactive waste management, the National Congress will promulgate a law regulating the administration and control of the fund foreseen in Section 13 of this Law.

ARTICLE 15.- This Law revokes the Fund for Final Repositories of High Activity Nuclear Waste created by Decree No. 1540/94. The existing resources shall be transferred to the Fund established by this Law.

ARTICLE 16.- To be communicated to the Executive Power.

L.2 PNGRR R&D Program

L.2.1 R&D Activities

The R&D Program was created in order to comply with the PEGRR objectives. It includes activities and lines of action regarding disposal, final disposal and spent fuel. Listed below are all R&D activities conducted during 2013:

- Corrosion studies for high level radioactive waste containers.
- Hydrology modeling in sedimentary environments and from the unsaturated zone.
- Hydrogeochemistry characterization studies: pedological, hydrogeological, groundwater and geomorphological in sedimentary environments, whose knowledge shall be applied in determining the environmental baseline of new possible sites.
- Hydrological and hydrogeological characterization studies in fractured rocky environments of the frontal mountain range in Mendoza.
- Radiochemistry techniques selection for radioactive waste characterization.
- Development of equipment to verify conditioned waste quality by means of non-destructive tests, “Tomographic Gamma Scanner (TGS)”.
- Draft evaluation studies of the following spent ion exchange resin processing alternatives: thermal and biotic degradation methods.
- Studies about conditioning by cementation of liquid radioactive waste stored in the AGE.
- Review of the features of SF generated from spent research reactors and evaluation for their future management.
- Durability study of cement-based materials as an engineering barrier to build the low level radioactive waste repository.
- Studies about contaminated hydraulic oil solidification procedures.
- Feasibility study about monitoring through CNE’s spent fuel dry silos by tomographic images.
- R&D activities aimed at consolidating the design of a Research Reactor Spent Fuel Transport Package (called RLA4018), certified by the ARN.
- Monitoring activities for the corrosion of aluminum-based irradiated nuclear fuel under water.

- STORER Project development in order to update the database of radioactive waste managed in AGE.

- Studies about adsorption and immobilization of high level radioactive waste simulated over SiO_2 nanoporous.

L.2.2 Joint Activities with the International Atomic Energy Agency

In the frame of the cooperation programs with the Agency, Argentina participates in the following projects:

- Technical Cooperation Project (TCP) ARG/9/012 “Consolidating National Technical Capacity for the Management of Radioactive Wastes”.

In the frame of this project the following technical meetings were conducted:

- “Meeting on treatment and conditioning of radioactive waste”

The meeting was carried out in the Constituyentes Atomic Center from 17 to 21 September 2012. Six IAEA experts were part of the meeting: Michael Ojovan, IAEA; Klaus Büttner, Nukem, Germany; Jan Deckers, Belgoprocess, Belgium; Bruno Fournel, CEA Marcoule, France; Caroline Jantzen, DOE, United States; Nobuyoshi Takeuchi, Fuji Electric, Japan.

About 50 specialists from CNEA, ARN and Nucleoeléctrica Argentina (NASA) attended the Meeting aimed at exchanging information about radioactive waste treatment and conditioning methods currently used in the nuclear industry worldwide.

- Technical Cooperation Project (TCP) ARG/9/012 “Consolidating National Technical Capacity for the Management of Radioactive Wastes”. In the frame of this project, the “Meeting on the characterization of radioactive wastes” was conducted at the Constituyentes Atomic Center from 21st to 25th October, 2013. Four IAEA experts were part of the meeting: Dr. M. Ojovan (Department of Nuclear Energy, IAEA); Dr. Peter Ivanov, National Physic Laboratory, United Kingdom; Dr. Pierre van Iseghem, SCK/CEN, Belgium; and Dr. Ramiz Aliev, Skobeltsyn Institute of Nuclear Physic, Russia. About 50 professionals from CNEA, the ARN and Nucleoléctrica Argentina (NASA) attended the meeting. The aim of the meeting was to exchange information about radioactive waste characterization methods used in the nuclear industry worlwide.

In the frame of the Project, the IAEA also provided a low background hyperpure coax Germanium detector and a hand and feet contamination detector that will be used in the Waste Characterization Lab (LABCAR).

In addition, the following visits have also been carried out:

- SCK/CEN, Belgium, Myriam Lavalle, November 2012.
- SCK/CEN, Belgium, Omar Sharif Ayrad, November 2012.
- Radiochemistry Department, Moscow State University. Walter Di Paola, 27th May to 21st June, 2013.

- Savannah River Laboratories/Idaho National Laboratories, USA, Hugo Bianchi, 8th to 12th July, 2013.
- University of Sheffield, UK. Rodrigo Curi, 1st September to 31st November, 2013.
- CEA France, France, Ayelén Manzini, 1st November 2013 to 31st January, 2014.
- CEA France/Institut de Chimie Separative Marcoule/SOCODEI, France. Dr. Vittorio Luca, 16th to 20th November, 2013.

- Research Contract Proposal No. 17338, “Feasibility study of an emission tomography monitoring systems for dry-stored spent nuclear fuel”. In progress (2012-2014), 3-year renewable. Researchers in charge: Claudio Verrastro, Esteban Venialgo, Martin Belzunce, Lucio Martínez Garbino, Augusto Carimatto.

- Coordinated Research Project (CRP): “Demonstrating Performance of Spent Fuel and Related Storage System Components (T13014)”. Main scientific Researcher: Roberto Haddad. Start date: June 25th, 2012.

- Technical Cooperation Regional Project RLA/3/008 (former RLA/4/020) “Engineering of a Research Reactor Spent Fuel Transport Cask”, started in 2007 and extended to 2012. It is related to and complements the development activity of a Research Reactor Spent Fuel Transport Item called RLA4018, aimed at validating its design and to be given the license by the regulatory body.

- Technical Cooperation Project (TCP) ARG/9/013 “Treatment of radioactive waste by thermal processes” for the period 2014-2015.

End of the

Fifth National Report

of the Argentine Republic

in furtherance of the

Joint Convention

on the Spent Fuel Safety

and on the Radioactive Waste Management Safety