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

SEVENTH NATIONAL REPORT

2020

República Argentina

Argentine Republic

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

SEVENTH 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 afore mentioned Convention.

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

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ACRONYMS

ABACC	**Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials**
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**
BAGER	**Registration, documentation and database system applied to the managment of radioactive waste**
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**
CONUAR	**Combustibles Nucleares Argentinos S.A.**
CSA	**Canadian Standards Association**
CTP	**Pilcaniyeu Technological Complex**
DAP	**Long Term Storage Deposit**
DATRR III	**Temporaly Storage Deposit for Radioactive Waste**
DCMFEI	**Central Storage of Special Irradiated Fissionable Material**
DECRA-1	**Spent Fuel Storage from RA-1**
DAIFRR	**Interim Storage Deposit for Spent Sources and Radioactive Waste**
DG	**Diesel Generator**
DIN	**German Standards Institute**
DLM	**Master Logical Diagram**
ECCS	**Emergency Core Cooling System**
ENREN	**Nuclear Regulatory Entity (Former Nuclear Regulatory Body)**
EPS	**Emergency Power System**
ESC	**Structures, Systems and Components**
EWS	**Emergency Water System**
FACIRI	**Research Reactors Irradiated Fuel Storage Facility**
GRR	**Radioactive Waste Management**
HEU	**High Enriched Uranium**
ICRP	**International Commission on Radiological Protection**
IRRS	**IAEA's Integrated Regulatory Review Service**
ISO	**International Standard Organization**
KPF	**Liquid Radioactive Waste Treatment System**
KPK	**Liquid Waste Storage System**
LABCAR	**Radioactive Waste Characterization Lab**
LILW	**Low and Intermediate Level Waste**
VLLW	**Very Low Level Waste**
LLW	**Low Level Waste**
LOOP	**Loss of Offsite Power**
LQMN	**Nuclear materials Chemistry Laboratory**
LUE	**Enriched Uranium Laboratory**
LWR	**Light Water Reactor**
MCNP	**Monte Carlo Neutron Particle Code– Calculation Code**
MDG	**Mobile Diesel Generator**

MTR	**Material Testing Reactor**
NASA	**Nuclear Power Plant National Operator (Nucleoléctrica Argentina)**
NEWMDB	**Net Enabled Waste Management**
NORM	**Natural Occurring Radioactive Material**
NPPs	**Nuclear power plants**
NUSS	**IAEA Nuclear Safety Standards**
OIEA	**International Atomic Energy Agency**
OSART	**Operational Safety Review Team**
PEGRR	**Radioactive Waste Management Strategic Plan**
PFS	**Sealed Source Production Plant**
PHWR	**Pressurized Heavy Water Reactor**
PMEB	**Handling Yard and Stowage of Items**
PNGRR	**Radioactive Waste Management National Program**
POEA	**Operating Procedures for Abnormal Events**
PPCC	**Cementing and Compacting Pilot Plant**
PPMo-99	**Molybdenum-99 Production Plant**
PPR	**Radioisotope Production Plant**
PPRS	**Radiological Protection and Safety Program**
PPUO$_2$	**Uranium Production Plant**
PRAMU	**Uranium Mining Environmental Restoration Project**
PTARR	**Treatment and Conditioning Plant of Radioactive Waste**
RA-0	**Argentine Reactor 0**
RA-1	**Argentine Reactor 1**
RA-3	**Argentine Reactor 3**
RA-6	**Argentine Reactor 6**
RA-8	**Argentine Reactor 8**
RA-10	**Argentine Reactor 10**
RNA	**High Level Waste**
RNM	**Intermediate Level Waste**
RRSF	**Research reactor spent fuel**
MDG	**Mobile Diesel Generator**
SHS	**Secondary Heat Sink**
ECCS	**Emergency Core Cooling System**
EWS	**Emergency Water Supply**
EPS	**Emergency Power Supply**
SGA	**Plant firefighting system**
GHC	**Demineralized water supply system**
COG	**CANDU Owner's Group**
CANDU	**Canada Deuterium Uranium**
SAMP	**Severe Accident Management Program**
SAMG	**Severe Accident Management Guidelines**
ORE	**Emergency Response Organization**
SNR	**Sixth National Report**
RW	**Radioactive waste**
SARPECQ	**Alternative Cooling System for Spent Fuel Assemblies**
SBO	**Station Black Out**
SF	**Spent fuel**
SFE	**Spent fuel element**
SSRRS	**Semi-containment System for Solid Radioactive Wastes**
STOReR	**Traceability system in radioactive waste**
ZERR	**Radioactive waste exclusión zone**

GLOSSARY*

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

- *"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;

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

- *"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;

- ‘‘*Radioactive waste"* For legal and regulatory purposes, material for which no further use is foreseen that contains, or is contaminated with, radionuclides at activity concentrations greater than clearance levels as established by the regulatory body.

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

- *"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;

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

- *"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;

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

- *"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;

- *"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 it is required to take safety into consideration;

- *"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;

- "*Clearance of radioactive materials*" means those radioactive materials that, due to their activity concentration and/or total activity, can come out of regulatory control from regulatory body, either after a limited period of storage for decay to generic clearance levels, or due to their direct compliance with these levels or with the dose criteria for clearance.

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

- *"Regulatory body"* means anybody 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;

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

- *"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;

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SECTION A INTRODUCTION

A.1 Summary of the Main Topics of the Report

The structure of this Seventh 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.

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 such 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 present modifications with respect to declarations in preceding National Reports.

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

Section E explains the Legislative as well as the Regulatory framework. 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 describes 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
- Reprocessing or final disposal of spent fuel

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

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

- 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.

A summarized description of the situation of Uranium mining waste has also been included in this Section.

In general, 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 planned activities to improve safety and specifies measures to be adopted in the future.

Section L includes the Annex containing the relevant Laws related to nuclear activity in the country, and Research, Development and Innovation activities related to Spent Fuel Radioactive Waste.

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 preceding National Reports which are considered necessary in order to comply with this objective.

The Argentine Atomic Energy Commission (CNEA) was created in 1950, initiating research

and development activities 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 three nuclear power plants. In addition, reprocessing programs were undertaken at demonstrative scale.

These activities gave rise to the creation of other entities – both private and public - in which different types of radioactive waste are generated and managed in accordance with the provisions of current legal and regulatory provisions in force, in agreement with obligations derived from the Joint Convention.

The legal framework applicable to radioactive waste management is stated by the National Constitution and legislation issued by the National Congress, mainly by Law No. 25279, which approved the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management; Law No. 25018, which establishes the Radioactive Waste Management Regime, and by Law No. 24804 which regulates Nuclear Activity, as well as various laws related to nuclear activity, in accordance with international treaties, conventions and agreements, and by national regulations. In addition, a number of provincial and municipal regulations are in force with impact on the development of the management of spent fuel, radioactive waste and radiation sources in the country.

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 or objects generated by authorized practices which, on account of their concentration of radioactivity and/or total radioactivity may not require further regulatory control.
- **discharges**: liquid and gaseous effluents containing radioactive materials originated during normal operation of a facility and which, due to their total activity may be discharged in the environment in a controlled and planned way.
- **radioactive waste**: materials which contain -or are contaminated with- radioactive substances for which no future use is foreseen and that on account of their concentration of activity and/or total activity, cannot be dispersed in the environment. Due to their radiological characteristics, they must be adequately managed to protect the population and the environment and therefore, they require the application of stages of characterization, treatment, conditioning, storage and final disposal.

By Law No. 25018, CNEA is appointed the implementing authority to perform all activities related to radioactive waste management and sets up the *National Radioactive Waste Management Program* (PNGRR), responsible for the compliance with the *Specific Strategic Plan* (PEGRR).

The National Law of Nuclear Activity No. 24804 assigns CNEA the state ownership of spent

fuel and the responsibility for the management of radioactive waste as well as determining the way in which nuclear power plants and any other relevant facilities (Type I Facilities) should be 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 confers ARN the authority to supervise the use of nuclear materials, the licensing of persons and facilities, and the verification of national and international safeguards.

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

As previously mentioned, the Argentine State designated CNEA as the implementing authority for the management of spent fuel and radioactive waste and established the obligation to develop a Strategic Plan for Radioactive Waste Management (PEGRR), subject to the approval of the Honourable Congress of the Nation, through Law No. 25018, enacted on September 23, 1998.

Regarding the PEGRR, preparation of the third version began in 2017, updating dates and deadlines. This new version is expected to be finalized in 2020.

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 PEGRR takes into account the commissioning of a Fourth Nuclear Power Plant and its commercial start-up, life extension of Embalse and Atucha I Nuclear Power Plants, as well as 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 shall include relevant adjustments to Atucha NPP, Units I and II; research and production reactors; other facilities of the ARGENTINE ATOMIC ENERGY COMMISSION, CONUAR S. A. and DIOXITEK S. A.; as well as changes related to URANIUM MINING ENVIRONMENTAL RESTORATION PROJECT (PRAMU) and PILCANIYEU TECHNOLOGICAL CENTRE, among others.

The PEGRR establishes the mechanisms and guidelines for the safe management of spent fuel and radioactive waste originated from the development of practices during the operation of facilities as well as those generated in decontamination activities and decommissioning of nuclear and radioactive facilities.

Moreover, it proposes research, development and innovation plans associated with technologies adopted for every management stage, suitable human resource training, availability of necessary funds in furtherance of the Strategic Plan and inherent social communication activities.

This document must present technological solutions which, in the light of current knowledge, allow ensuring efficient management of radioactive waste and spent fuel generated in the country.

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

Furthermore, PEGRR must encompass within the environmental policy of our country which, 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 generated in them and set up cooperation and advisory systems for the competent bodies.

With reference to the sites where future facilities for final disposal of spent fuel and radioactive waste shall be located, Law No. 25018 sets forth that CNEA, in its role of Responsible Organization, shall propose the potential sites that may result from studies performed in this regard. These sites must be approved both by ARN, from the radiological and nuclear safety point of view, and by Law issued by the Provincial Government where the proposed repository is to be installed.

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SECTION B POLICIES AND PRACTICES

B.1 Spent Fuel Management Policy

In Argentina, spent fuel due to its fissile contents is considered to be a potential energy source and not radioactive waste. The National State is the owner of the special fissile materials contained in the spent fuel (Article 2, Law No. 24804).

In relation to the PEGRR, the second version dates to December 2015 and it was approved through an Executive Order emanating from the President of CNEA on December 4th, 2012 and was later returned from the Executive Branch of the Government to CNEA. Since 2017 a draft version of the PEGRR is under production which will update dates and due times. It is foreseen that this new version will be finished in 2020.

With regards to spent fuel generated in research reactors or as a result of radioisotopes production, the strategy presents three alternatives which are all preceded by wet storage:

- Uranium isotopic dilution for its use in light water nuclear power plants.
- Return of the enriched Uranium to the supplying country, whenever that opportunity comes forth.
- Preparation through isotopic dilution for its final disposition in a deep geological repository.

B.2 Spent Fuel Management Practice

The practice adopted in Argentina with reference to management of spent fuel generated in power reactors has been wet storage during the time necessary to allow 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) until it is disposed of in a repository.

At CNA Unit I, spent fuel is subject to wet storage at the power plant itself. Its capacity was enough to store spent fuel in CNA Unit I until 2015. In 2012 the Spent Fuel Dry Storage System (ASECQ) Project was launched. It involves building an annex next to the pool area of CNA Unit I. It will comprise dry vertical storage silos for the in-transit storage of 2844 fuel elements and will allow to transfer the spent fuels that possess a longer period of decay from the pool building. However, taking into consideration that this project will not be completed before 2015, 1435 fuel elements, with a power under 6740 MWd/TnU and with a decay of 33.5 years, have been transferred to the pools of Unit II, thus allowing storage until ASECQ is completed (see chart 4.1).

At CNA Unit II, the Spent Fuel generated during normal operations will be stored in wet storage at the pools on-site until a dry storage facility becomes available for that Unit (See chart G.2.2).

Spent fuel generated 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. Spent fuel generated in reactor RA-3 is later transferred to a new wet spent fuel storage facility, Research Reactors Irradiated Fuel Storage Facility (FACIRI). This facility possesses an operating license granted by ARN on 29th November 2016.

FACIRI possess 608 storing positions and has a capacity for 25 to 30 years of RA-3 operation. This research reactor unloads in average 13 fuels per year. Furthermore, FACIRI can house the spent fuel of other research reactors in operation in the country.

RA-3 research reactor spent fuels that had been stored in the Main Storage for Special Irradiated Fissile Material (DCMFEI), have all been transferred to the new facility FACIRI. This task was completed on 21st March 2019.

Throughout several campaigns carried out with the same final purpose, all the Spent Fuels of the Research and Power Reactors which contain Highly Enriched Uranium (HEU) provided by the United States have been returned to its country of origin.

As for the remaining SF which contains low enriched uranium (LEU below 20%), as mentioned previously there is a first stage in wet storage where it will remain until isotopic dissolution of Uranium is decided for its use in light water power reactors, its return to the origin country of the enriched uranium or its preparation through isotopic dissolution for final storage in a deep geological repository.

Whichever decision is taken, the Strategic Plan foresees developing activities of research and development associated with the final disposition of the spent fuel or the high level waste which result from the reprocessing of the spent fuel of the power reactors or from the intermediate level waste which are an outcome of the preparation of isotopic dissolution of the spent fuel of the research or radioisotopes production reactors.

B.3 Radioactive Waste Management Policy

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

- The radioactive waste generated exclusively from all nuclear activities performed in the country, including waste arising from the decommissioning of related facilities, will be managed safely, ensuring the protection and the rights of present and future generations and the environment.
- The Government, through the Argentine Atomic Energy Commission is responsible for the management of radioactive waste. Moreover, the generator is responsible for the treatment, preparation and safe storage of the waste generated by the facility under its operation according to the terms established by the PNGRR, which must be complied with at the moment of its transfer to CNEA.
- The sustainable 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 to ensure complete tracking of inventories of radioactive waste generated and to be generated from all nuclear activities in the country.
- A communication and information program which includes the development and implementation of the plans developed to achieve the participation and acceptance of stakeholders, including the public, for the siting and characterization of the candidate sites for the establishment of repositories.

It is important to underscore that regulation and control of radioactive waste management are responsibilities of the National State, and are enforced by the Nuclear Regulatory Authority (ARN).

The implementation of the policy on this matter will follow the guidelines established in the National Program for Radioactive Waste Management according to Law 25018. The radioactive waste management in Argentina will be completed pursuing a holistic approach.

In order to accomplish its objectives, the National Program, created by Law 25018, must take into account the following considerations:

- 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 and providing relevant information to interested parties, including the public.
- Assessment of the costs associated to all these activities, determination of the financial sources and the financial and management methods.

The PEGRR defines the treatment methodology and the final disposal technological systems for the different types of waste. The update of the PEGRR conducted, as set forth in the provisions of the Law, 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 will establish the communication channels and will provide the necessary information which in place will allow the stakeholders, including the public, to value the reach of the proposed plans and the benefits fruit of these, thus providing an adequate environment for the participation of society. The communication and information program will include the development and implementation of the plans aimed at

gaining support for the candidate sites for the emplacement of repositories; and to achieve the participation and the acceptance of the stakeholders, including the public for the siting and characterization of such sites.

Currently, the PNGRR reports on the common practices in spent fuel management and radioactive waste in the Nuclear Power Plants and in the Radioactive Waste Management Area (AGE) at Ezeiza Atomic Centre.

In regards with the management of environment residues in Malargüe, an extensive communication program was implemented before, during and after the completion of the work. On a different matter, ´Los Gigantes´ Site has a Communication Plan ready to be implemented when the works begins. For the remaining sites to be restored, PRAMU is developing the communication plans necessary to be implemented when the decision to implement the management of the residues.

B.4 Radioactive Waste Management Practice – Criteria

The following criteria are applied to radioactive waste management:

- The materials that contain or that are contaminated with radioactive substances, which according to its activity and/or surface contamination are liable to obtain the release, authorized by ARN, will be placed outside the regulatory scope.
- The systems to limit discharges of liquid and gaseous radioactive materials released into the environment must be optimized in compliance with the authorized discharge limitations determined for each facility and significant radionuclide.
- 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.

The criteria used by ARN is that the materials that can be release without later examination, should under all reasonable circumstances maintain the effective doses, which any person might receive as a consequence of such materials, below the magnitude of 10 µSv/year, and in the case of low probability occurrence situations 1 mSv/year (Guide AR8).

ARN recently published a regulatory guide AR 6 “Generic levels of exemption” Rev. 1 (2018). The values found in these Guide where established as a result of three different scenarios set in the document “Radiation Protection N° 56” of the European Community and are the same as those established in IAEA´s document “Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, General Safety Requirements Part 3”.

ARN published the Regulatory Guide AR 8 “Generic Levels of Clearance” Rev. 1 (2019). The generic levels of clearance as a result of activity concentration considered in it take into account the Safety requirements established in Basic Regulatory Standard AR 10.1.1 “Basic

Safety Standard". The clearance levels was approved by IAEA, the Safety requirements of the IAEA GSR Part 3, the implementation guide for the concepts of exclusion, exemption and clearance published by IAEA (Safety Guide N° RS-G-1.7) and the technical report on the calculation of activity concentration levels for exclusion, exemption and clearance published by IAEA (Safety Report Series N° 44). Likewise, in the recent revision of the Guide it was included the exemption of materials due to values of surface contamination.

The Regulatory Guide AR 6.1.2 Limitation of Radioactive Effluent in Type I Radioactive Facilities establishes that in the design stage:

- The release of radioactive material to the environment should be as low as reasonably achievable.
- 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, discharges originated by all the facilities of the site do not exceed the annual dose in a person, equivalent to more than 0.5 mSv.

In the operating licensing process of a relevant facility, the ARN establishes authorized discharge limits to release gaseous and liquid effluents with which the facility should comply. These annual values are understood as an operating restriction and arise from the radioactive level of each significant radionuclide during discharge. In order to achieve this, the reference is the optimized discharge level, considering an appropriate flexibility margin that guarantees the public protection without interfering with the operation of the facility.

In the Operating Licenses granted to the relevant facilities by ARN, these limits are established.

Facilities include storage and/or decay tanks for liquid effluents in order to control the effluent discharge into the environment in agreement with authorized values established in the license.

Finally, the Regulatory 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

A classification system proposed by the International Atomic Energy Agency (Classification of Radioactive Waste, General Safety Guide, N° GSG-1, Vienna, 2015), has been adopted. It entails six classes of radioactive waste, mainly based on long term safety considerations and on the disposal of radioactive waste. While the generic relations is entailed between

different classes of waste and disposal options, the acceptance of waste for a particular disposal facility requires to be proved by means of a safety assessment.

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

- EXEMPT WASTE (EW): those generated from different activities. This waste shall not be considered radioactive waste once they have been released from regulatory control.

- VERY SHORT LIVED WASTE (VSLW): Solid and liquid biological waste generated from research centres, medical applications, etc., containing radioisotopes with periods of disintegration lesser than 100 days such as 192-Ir, 99m-Tc, 131-I, 59-Fe which may be released from regulatory control after decaying below the authorized limits.

- VERY LOW LEVEL WASTE (VLLW): This category includes waste generated in extracting operations and processing of uranium ore. Mill tailings, along with low grade uranium ore (not economically exploitable) and the discovery of ore deposits, 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 exemption levels.

- LOW LEVEL WASTE (LLW), SHORT- LIVED or LONG- LIVED: This waste may be classified as:
  a) Conditioned Waste: conditioned under procedures framed into a quality system, packed in containers, specially designed and safely stored in authorized facilities. These waste include:
     - Solid and liquid waste originated in nuclear power plants, in radioisotope production facilities, in radioisotope 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 Unit I, conditioned on site with cement matrixes within 200 L drums;
     - Liquid waste from laboratories and radioactive facilities with radionuclides, mostly, beta and gamma emitters which activity concentrations does not require biological yielding to be manipulated, conditioned with cement matrixes in 200 L drums;
     - Short-lived decayed or disused sealed sources ($T_{1/2}$<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 and other facilities.

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 fluids originated from radioisotope production and manufacture of nuclear fuels, stored in stainless steel containers;
   - Solid wet waste: sludge originated as precipitation product from the liquid effluents treatment plant at CONUAR S.A. during fuel manufacturing, placed in 200 L drums and currently stored at AGE; and
   - Spent ion exchange resins coming from RA-3; which are drained in the facility itself and placed in 400 L drums, and from the Semi-Industrial Irradiation Plant (PISI) currently stored at AGE.

- INTERMEDIATE LEVEL WASTE (ILW), SHORT- LIVED or LONG- LIVED: This kind of waste consists of alpha emitters from the experimental development of mixed oxide fuel (MOX) and other materials containing long half-lived isotopes as those used in medicine (226-Radium tubes, cells and needles, 238-Pu 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 (HLW): This type of waste is generated at the reprocessing of spent nuclear fuels from nuclear power, research and production reactors. It contains are fission products and part of actinides and has a heat generation greater than 2 kW/m^3.

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 liters drums.

Non-compactable solids such as metal parts, cables, pipes, debris, wood, parts of equipment or tools are also stored in metallic containers (usually 200 liters drums or larger containers for bigger volumes).

The sludge generated from drainage channels cleaning, which have low dose rates and are treated by common dewatering for lowering moisture, are conditioned in 200 liters drums.

Contaminated oils, which also have low level dose rates, are stored in 200 liters drums or 50 liters tanks (both made from stainless steel), up to its conditioning.

In the case of low level liquid waste generated in nuclear power plants, the management differs depending on the technologies used in each plant. At CNA Unit I, liquid waste generated from operation and maintenance activities is collected in tanks and characterized. In CNA Unit II, liquid waste is collected and decontaminated by the Liquid Waste Storage System (KPK) and the Liquid Radioactive Waste Treatment System (KPF).

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 lowered activity level 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 radioactive waste from small reactors (non NPP) is stored. The storage facility is designed to allow non-conditioned waste storage before treatment, characterized as non- conditioned package waiting to be transported to final disposal site.

Radioactive waste from the three nuclear power plants is stored on site, in specially designed facilities on NPP´s site.

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.

The Long Term Storage Disposal was designed based on the safety assessment for different scenarios (flood, intrusion and fire). It is operational since 2010.

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 very 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 waste (generally metal pieces coming from contaminated areas), which was periodically immobilized with a concrete casting in order to avoid dispersion.

High and Intermediate Level Waste

Intermediate level waste properly conditioned and treated will be disposed together with high level waste.

Fission products and actinides from spent nuclear fuels produced during power and research reactors operations, are safely stored at NPP´s wet or dry stores up to be transferred to CNEA. In case that the National State decides to reprocess the spent fuel, they will generate high level waste. In this sense, the State is the solely owner of the fissile materials contained in the spent fuel (Law No. 24804).

The PEGRR is performing with other areas of CNEA, research and development studies which include conditioning processes for two options of spent fuel management: final disposal or reprocessing.

Deep Geological Repository

Currently, works are being undertaken in the third PEGRR version, which is expected to be finalized in 2020. So, new dates for the nuclear power plants spent fuel final disposal will be proposed in this PEGRR version -in case it is not reprocessed - or from the high level waste generated at the reprocessing.

B.5 Spent fuel and radioactive waste management communication policy

Currently, it is out of questioning the importance of informing to the stakeholders, including the general public, about spent fuel and radioactive waste management safety issues. Joint Convention´s Prologue gives account on that need.

In 1998, when the Argentine National State, through the Law No. 25018, appointed CNEA as the main authority for spent fuel and radioactive waste management issues, it established within its obligations to “permanently inform to the community about scientific and technological aspects about radioactive waste management” (Point m, Article 10). Likewise, CNEA –through the PNGRR- considers information accession as a fundamental right for a democratic society development.

However, it is worthy to mention that the complex scenarios set by contemporary societies, are showing the need not only of informing, but also of establishing reciprocal communication channels with spent fuel and radioactive waste management stakeholders, such as: dialogue and interaction spaces, able to provide verified information to society and, at the same time, receive feedback through proposals, claims and concerns.

Local, regional and world experiences offer countless evidence that outreach to stakeholders on this issue, far from being a proxy aspect of political and technical dimensions, turn to be the most decisive approach for final disposal projects success, involving candidate sites localization for underground laboratories and repositories.

Due to PNGRR institutional insertion in CNEA, currently, public communication policy regarding spent fuel and radioactive waste management is carried out within the frame of the communication policy established in its Strategic Plan, and it is developed within its possibilities and conditionings.

Regarding the actions performed in this report´s timeline, we suggest consulting section K3.3, where it is described a set of practices aimed to inform and communicate. Most of them were developed by the PNGRR and PRAMU, together with CNEA´s Communication Management.

Guidelines for a spent fuel and radioactive waste management communication program will be presented in the third version of PEGRR, which is expected to be finalized in 2020.

SECTION C SCOPE OF APPLICATION

This Seventh National Report deals with safety measures applied to the management of spent fuel and radioactive waste originated exclusively from nuclear activity carried out in Argentine, according to the scope of Article 2 of the Law No. 25018 “"Radioactive Waste Management Regime" both inside and outside the fuel cycle, including waste derived from nuclear power generation; nuclear fuel manufacturing; uranium mining and processing; the production of radioisotopes for medical applications; industrial uses and research and development activities, as well as planned and controlled radioactive discharges, originated from the normal operation of the facilities in which the aforementioned practices are carried out.

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, due to what was mentioned in the first paragraph.

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
	Storage silos (ASECQ)
CNEA	Storage facility of RA-1 fuel elements (DECRA-1)[1]
	Central Storage Facility for research reactors SF (DCMFEI)[1,2]
	Research Reactors Irradiated Fuel Storage Facility (FACIRI)

[1] Facility from the Ezeiza Radiactive Waste Managment Area (AGE).
[2] Since March 21, 2019, the date on which the last MTR item was transferred to the FACIRI, this facility did not store CGRI.
.

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

D.2 Spent Fuel Inventory

D.2.1 Atucha Nuclear Complex

Unit I

INVENTORY at 11/01/2019(*)			
SYSTEM	QUANTITY	U total	Pu (**)
		kg	kg
Piletas I y II	10689	1632071.199	6287388

(*) Inventry consolidation date (PIV: verification of physical inventory, OIEA)
(**) Estimates obtained by means of a calculation code, on the basis of SF burn-up, residence time and position in the core.

Unit II

INVENTORY at 08/01/2019(*)			
SYSTEM	QUANTITY	U total	Pu (**)
		kg	kg
Pools	2917	493122.485	1784605

(*) Inventry consolidation date (PIV: verification of physical inventory, OIEA)
(**) Estimates obtained by means of a calculation code, on the basis of SF burn-up, residence time and position in the core.

D.2.3 Embalse Nuclear Power Plant

INVENTORY at 07/31/2019(*)			
SYSTEM	QUANTITY	U total	Pu (**)
		kg	kg
Pool	17397	325636.093	1059.125
Silos	128520	2398709.912	8775.656
TOTALES	145917	2724346.005	9834.781

(*) Inventry consolidation date (PIV: verification of physical inventory, OIEA)
(**) Estimates obtained by means of a calculation code, on the basis of SF burn-up, residence time, and position in the core.

D.2.4 Radioactive Waste and Spent Fuel Management Area from CAE (AGE)

INVENTORY AT 10/08/2019(*)		
TYPE	QUANTITY	Kg
PINS(**)	232	14.188
FILTERS(****)	120	17.728

(*) Inventry consolidation date (PIV: verification of physical inventory, OIEA).
(**) Pins: Fuel type needle of RA-1 Research reactor.
(****) Filters: From ^{99}Molybdenum Production Facility.

D.2.5 Research Reactors Irradiated Fuel Storage Facility (FACIRI)

INVENTORY AT 10/31/2019(*)		
TYPE	QUANTITY	Kg
MTR(**)	245	291.29999

(*)Inventry consolidation date (PIV: Verification of physical inventory , OIEA)
(**) All ítems in the facility are considered

D.3 Radioactive Waste Management Facilities

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
	Liquid Radioactive Waste Treatment & Conditioning System
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)	Radioactive Waste Treatment and Conditioning Plant (PTARR)(**)
	Radioactive Sources and Waste Interim Storage Facility (DAIFRR)
	Handling Yard and Stowage of Items (PMEB)
	Long Term Storage Deposit (DAP)
	Final Disposal System for Structural Solid Radioactive Waste and Sealed Sources(*) (FDRRSEFS 1 y 2)
	Pozo de Estructurales y Biológicos (*)
	Semi Containment System for Solid Radioactive Waste (*)
	Semi Containment System for Very Low Level and Very Short Lived Liquid Radioactive Waste (*)
	Cementing and Compacting Pilot Plant (PPCC)
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 the process of back-fitting.

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 Ore

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

SITE	FACILITY
MALARGÜE (Mendoza Province)	Malargüe Former Industrial Mining Complex(*) 1954-1986
HUEMUL (Mendoza Province)	Hüemul 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

(*) The “Tail Managment and rehabilitation of the area, Malargüe site” was finished in June, 2017.

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(**)

(**) The production ended on 1995. The complex still has uranium reserves, so in the Complex only maintenance and remediation has been ongoing since then.

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

D.4 Radioactive Waste Inventory

The following is the radioactive waste inventory until December 31st, 2019. The presentation of data has been prepared with information in accordance with the shape of the NEWMDB of the International Atomic Energy Agency. (http://www-newmdb.iaea.org).

D.4.1 CNA – Unit I

ATUCHA I NUCLEAR POWER PLANT UNIT I											
Type of Waste	Place of Facility	Processed	Est.	Volume (m^3)	RO %	FF/FE %	RP %	NA %	DF %	DC/RE %	ND %
LLW	Storage	No	Yes	122.29	100	0	0	0	0	0	0
LLW	Storage	Yes	Yes	688.60	100	0	0	0	0	0	0
HLW	Storage	No	Yes	49.12	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.4.2 CNA – Unit II

CENTRAL NUCLEAR ATUCHA UNIT II											
Type of waste	Place of facility	Processed	Est.	Volume (m^3)	RO %	FF/FE %	RP %	NA %	DF %	DC/RE %	ND %
LLW	Storage	No	Yes	9.80	100	0	0	0	0	0	0
LLW	Storage	Yes	Yes	33.80	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 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	414.83	100	0	0	0	0	0	0
LLW	Storage	Yes	Yes	2767.80	100	0	0	0	0	0	0
HLW	Storage	Yes	Yes	149.76	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.4.4 Pilcaniyeu Technological Complex

PILCANIYEU TECHNOLOGICAL COMPLEX INVENTORY AT 12-31-2019	
Stored Waste (#)	Volume (m^3)
Process Waste	29.48
Miscellaneous Waste	5.21

(#) Contaminated material with natural Uranium

D.4.5 Uranium Dioxide Production Plant

UO_2 Production Plant INVENTORY AT 12-31-2019	
Stored Waste (#)	Volume (m^3)
Operational Waste *	120

(#) Contaminated material with natural Uranium
* The disassembly of the filters and pre-filters continues in order to reduce the volume of the contaminated material and therefore the inventory of filters and pre-filters is nil, having become part of the inventory of operating waste
.

D.4.6 Ezeiza Radioactive Waste Management Area from CAE (AGE)

EZEIZA RADIOACTIVE WASTE MANAGEMENT AREA from AGE– 12/31/2019											
Type of Waste	Place of Facility	Processed	Est.	Volume (m^3)	RO %	FF/FE %	RP %	NA %	DF %	DC/RE %	ND %
LLW	Storage	No	Yes	294.15	11	43	0	46	0	0	0
LLW	Storage	Yes	Yes	797.1	51	24	0	25	0	0	0
LLW	Disposal	Yes	Yes	2397.3	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.
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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 spent fuel and radioactive waste management, and that also determines 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 performed in the national territory.

Later, various legal regulations defined CNEA's competence also as the Regulatory Body for nuclear and radiation 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 imply different commitments and obligations to the State in the nuclear field. These are strict commitments and obligations regarding the control of: **(a)** non-proliferation of nuclear weapons; **(b)** nuclear security; **(c)** spent fuel and radioactive waste safe management; **(d)** security of nuclear materials; **(e)** cooperation in case of nuclear accidents and radiological emergencies and **(f)** liability in case of nuclear damage. Argentina has expressed its political commitment and its adherence to the Code of Conduct and supplementary guidelines. **(g)** import, export and handling of spent radioactive sources.

- **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, 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 to Decree No. 1390/98** that regulates Law No. 24804, enacted on 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 nuclear power plant, 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.

- **Law No. 25018**, enacted on 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 Unit I (CNA I) NPPs, and the activities involved in the construction, commissioning and operation of Atucha Unit II (CNA II) Nuclear Power Plant. 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.

- **Law No. 26784**, Article No. 61, 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 Radiation 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 64 (mandatory) Standards and 10 regulatory guidelines (recommendations). ARN regulations comprise licensing of radioactive and nuclear facilities, and it´s staff. As well it includes requirements related with safety, nuclear security, use of radioactive sources, radioactive waste management, safeguards, security and radioactive waste transport. Standards and guidelines are available and can be downloaded as a PDF document from ARN´s website: https://www.argentina.gob.ar/arn/marco-regulatorio/normas-regulatorias/. Since 2019, ARN has added to its site information notifications to warn about amends, updates and publication

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

of standards and guidelines. These alerts are published along public news that are published in the press and social networks.

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 the appropriate decisions taken by the Responsible Organization and complementing this process with ARN surveillance in different stages of licensing a facility. 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.

Regulatory Standard AR 10.1.1, Basic Safety Standard, determines the requirements and provisions on the matter which are consistent with the recommendations of the International Commission on Radiation protection (specifically with its publication N° 103).

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 and guides:

Table N° 1: Standards and Guides Updates 2017-2019

CODE	DESIGNATION
Standard AR 10.1.1 Rev. 4	Basic Safety Standards
Guide AR 6 Rev.1	Generic Exemption Levels
Guide AR 8 Rev.1	Generic Clearance Levels

Standard AR 10.1.1 has been updated according to the part 3 of the document GSR of the IAEA, recommendations from the International Commission on Radiological Protection, 103 Publication (ICRP 103) and the experience acquired by ARN.

Guides AR 6 and AR 8 were updated according to part 3 of document GSR of IAEA.

In addition, the following regulatory guide has been incorporated:

Table N° 2: New guides introduced 2017-2019

CODE	DESIGNATION
Guide AR 14	Design and Development of an Environment Radiological Monitoring Programs.

Recommendations included in Guide AR 14 contribute to the fulfilment of the current regulatory framework (Law 24804; Nuclear Activity National Law, chapter II, article 16, part m and Standard AR 10.1.1).

E.2.2.2 Licensing System

Hereinafter the fundamental concepts of the system are summarized:

In Argentina, the licensing system for safety is defined in the Basic Standard AR 10.1.1 Rev 4. Radioactive waste management facilities, spent fuel of nuclear power plants and spent fuel management of research reactors are categorized by this standard as Type I or Relevant facilities. 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, start up, 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 International Atomic Energy Agency (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 could require the implementation of corrective measures, and in case they are not complied with may lead, as a last resort, to the imposition of sanctions provided in the regulatory system.

E.2.2.4.1 Documentation and Reports

During the licensing process, the License Holder must 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 radioactive waste managment and the spent fuel generated by the facility, are the following:

- Safety Report
- Operation Principles and Manual Policies
- Quality Manual
- Operational Organization Chart, Missions Tasks and Duties of the Personnel
- Operation Manual
- Code of Practice including the Emergency Plan, Environmental Monitoring and Waste Management
- Maintenance Manual
- Probabilistic Safety Assessment
- Management of Operational Experience Program
- Staff Training Manual and Staff Training Program
- 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 detail of the documentation sent to ARN such as the chronogram for its presentation is set in Standard AR 3.7.1. This 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 Licensee, 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:

- Planned Inspections: Programmed inspections offer the opportunity to examine the operator’s activities to corroborate its proper performance and discover possible problems at an early stage. These inspections consist of observation and evaluation of routine activities in terms of safety to assess the effectiveness of the licensee performance.
- Reactive Inspections: Reactive inspections, by individuals or teams, are usually fostered by the regulatory body in response to an unexpected, unplanned or unusual situation or an incident, in order to assess its significance and implications and the

adequacy of corrective actions. A reactive inspection may be caused by an isolated incident or by a series of minor events taking place in the considered facility, or for a complaint from a third party.

- ❖ Non-routine inspections: These are regulatory inspections related to a safety assessment in the stage of licensing or to particular situations of licensed facilities.
- ❖ 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 planned outages.
- ❖ Technical Evaluations: They involve the analysis of data collected during inspections or from other sources. For example, evaluations of the radiation 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 radiation 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 Licensee in the form of a requirement, recommendation or request for additional information, as the case may be; in this document the ARN urges the Licensee to take the required corrective measures within a determined term. These documents have the following scopes:

- ❖ Requirement: It is a regulatory order that the Licensee must comply with in the requested manner.
- ❖ Recommendation: It is an order that ARN regards as advisable to be implemented by the Licensee. The Licensse or the License Holder has certain flexibility to comply with it, 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 AR Standards and requirements set out in the respective licenses or permits authorizes ARN to impose the appropriate Sanction System.

Article 16 section g) of Law No. 24804 establishes that the enforcement of sanctions should be graded according to the seriousness of the reported offence. In case a fine is implemented it should be in accordance with the gravity of the offence and in accordance with the probability of damage, suspension of licence, permit, authorization, or repeal. Such sanctions shall be subject to appeal only as a reimbursement in front of the National Chamber of Appeals of the Administrative Federal Court. Likewise, part h) of the mentioned article 16 authorizes ARN to establish the procedures for the implementation of sanctions in relation to the breach of regulation as its attributions, guaranteeing the principle of due process. Part i) of Article 16 also authorizes ARN to resolve on the confiscation of nuclear or radioactive materials, and to pre-emptively shutdown facilities under ARN jurisdiction, when in place without the corresponding license, permit or authorization or in the face of serious offences to radiological and nuclear security and facilities protection. The above-mentioned law considers serious offence a breach that involves a serious threat to the security of the population or the protection of the environment or when it is not possible to guarantee the implementation of security and safeguards regulations.

Implementing Decree 1390/98 authorizes ARN to establish a penalties system. The group of regulatory penalties regimes is summarized hereby:

- Penalties Regime for Class II and III Facilities, non-routine practices, and transport of radioactive materials; passed by ARN Board Resolution 32 (26/08/02).
- Penalties Regime for Nuclear Power Plants, passed by ARN Board Resolution N° 63 (5/5/99)
- Penalties Regime for Key Facilities passed by ARN Board Resolution 24 (11/11/99).

The sanction system represents the last link of the safety chain. ARN considers that if the regulatory system is really effective and the Licensee 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 Licensee and Primary Responsible 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

The Argentine Atomic Energy Commission (CNEA) is an autarchic body which depends on the Energy Secretary of the Ministry of Productive Development. Its powers and functions are set mainly in the National Law of Nuclear Activity (Law No. 24804). Law No. 24804, in its Article 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 Licensee, with a 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 facility 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. 24.804), 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 Executive Branch 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". 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 radiation 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 radiation safety and security.
- Granting, suspending and cancelling licenses for the construction, commissioning, operation and decommissioning of nuclear power plants.
- Granting, suspending, and cancelling licenses, permits or authorizations for mining and uranium concentration matters, safety of research reactors, significant 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 radiation safety and security of materials and nuclear facilities.
- Creating, in accordance with international parameters, nuclear and radiation 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, which 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 as well as radiation activities with exception to X Ray and NORM activities. 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 radiation safety, safety in the transport of radioactive materials and in radioactive waste management, as well as safeguards and security.

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 facilities.
- Development of scientific and technical aspects related to radiological, nuclear transport and radioactive 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.

ARN´s structure is organized in seven (7) Departments. Up to 75% of staff is committed to technical duties in the mentioned Departments.

In the technical area related with spent fuel and radioactive waste management, three of those Departments possess a crucial role, their activities are:

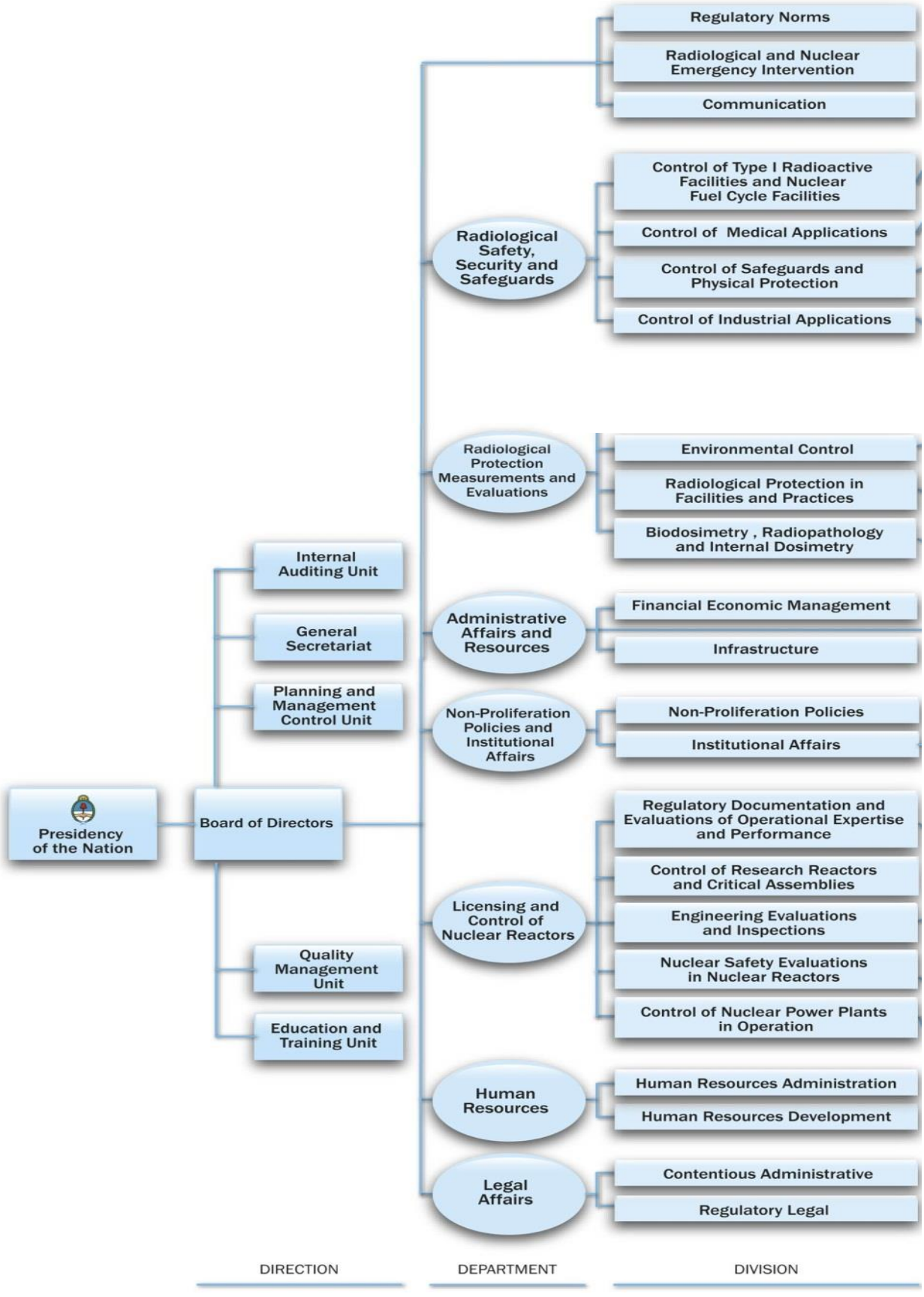
The main tasks performed by the Radiation Safety, Security and Safeguard Department are to license and control all facilities and practices which involve radioactive material, as established in the Basic Safety Standard, with the exception of nuclear reactors. With this purpose, the Department undertakes regulatory inspections and evaluations concerning the Radiation Safety of Radioactive Facilities (medical, research and industrial facilities), Transport, Safeguard Control and Nuclear Safety Control. Furthermore, the Department is responsible for the safeguards enforcement of all nuclear facilities in the country and the regulation of security in all nuclear facilities and of those which possess radioactive sources, in line with a graded approach related with associated risk.

The Measurements and Radiation Protection Evaluations Department participates in the regulatory control of the compliance to the adequate levels of protection of people and the environment related to those facilities supervised by the ARN.

It is also responsible for conducting radiation safety assessments, modelling, and measurements along with evaluations in the scope of radioactive waste management and spent fuels as well as radioactive facilities shields, criticality accidents and ventilation systems. Likewise, it is responsible for the completion of radiological safety appraisals, modelling and measurements and its respective evaluations under the scope of spent fuel and radioactive waste management. It is also in charge of the verification of the environmental discharges and associated systems, and of the shielding of radioactive facilities and the assessment of criticality accident risks. Furthermore, it oversees the activities of control of fulfilment of safety during the scheduled stops of the Nuclear Power Plants and it evaluates the environmental radiological impact on nuclear and radioactive facilities. Moreover, it coordinates the activities to control radiation protection compliance during the programmed NPP outages and conducts the environmental radiation impact evaluation and development over radiation safety aspects in order to support and improve the knowledge and techniques necessary for regulatory purposes. The Department also develops research and development associated with the radiological safety, with the purpose of justifying and improving the knowledge and technics required for regulatory purposes.

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 2020



Regarding ARN workforce, until December 2019, the organization had 375 workers. Out of which 56% are professional. Of these, 49% possess post-graduate studies, 4% possess a master's degree and 3% a PhD. Within the professionals, 37% are engineers, 27% are professionals of Nature Sciences, Mathematical Sciences and related specializations. Regarding Engineering professionals, the degrees that are more represented are Chemical Engineering, with a 29%, Electronics 24%, Industrial and Mechanical with 10 and 9% of graduates, respectively.

The structure of the Agency is composed of 7 Departments, 3 Divisions which depend directly from the Board of Directors and 5 other Divisions. Under this umbrella, 3 Departments and Divisions are fully committed to technical activities related with the regulatory activities, comprising 59% of the staff.

Geographically, staff is distributed along the different offices as follows: 76% work at Headquarters, 20% work at the Ezeiza Atomic Centre, 3.5% at Atucha Nuclear Power Plant and Embalse Nuclear Power Plant and 0.5% is distributed in the remaining offices. The complete geographical distribution of the staff is shown in Table N° 3.

Table N° 3: Geographical Distribution of ARN employees

HEADQUARTERS	76 %
EZEIZA ATOMIC CENTER	20 %
CNA & CNE NUCLEAR POWER PLANTS	3.5 %
OTHERS	0.5 %

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

Distribution of activities and resources required to implement the control activities on the regulated facilities through inspections, assessments, and regulatory audits, throughout all stages, during operation and licensing are comprised in the ARN Work Plan.

Control was implemented on four regulatory areas: nuclear safety, safety and radiological protection, safeguards and non-proliferation, and security.

Regulatory activities required inspections and assessments for a total of 24153 day/worker.

E.3.3.1 Training of ARN Staff

Specialization Courses in Radiation protection and Radiation Sources Safety and 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 program known as on the job training (OJT), as well as with the participation, both at national and international level, in specific courses, congresses, seminars and research projects both in the national and international spheres.

Moreover, in order to train all of the personnel working in the technical area, there is at least one edition per year of the Technician Level Radiation Protection Course (TLRP) of ten weeks which offers an excelling opportunity for workers with a university postgraduate course and which is also of interest for technicians and professionals working in the nuclear industry or who start to work in nuclear.

All of the trainings offered by the Nuclear Regulatory Authority through its Regional Training Centre for Latin America and the Caribbean are offered for all of the nuclear industry in Argentina and in the region, as the regulation of the responsible personnel of facilities fosters safety culture.

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

Despite not being part of its legal mandatory activities, ARN has organized and developed courses which provide education and training to future workers, and has trained the trainers in order to create a trickle-down effect which in turn puts training as a part of its ongoing policy.

Argentina's experience in education and training in radiological and nuclear safety is based on its postgraduate courses in Radiation Protection and Safety of Radiation Sources, and in Nuclear Safety, which, during the last 35 years provided education to 1239 professionals, 46% of whom are Argentine and 54% are foreigners, most of them from the region.

As a milestone in the pursue of the highest education standards, the above-mentioned courses have been recognized as Specialization Careers, granting its graduates a postgraduate degree which in turn has been officially recognized by the Ministry of Education.

In 2006, the first IAEA mission of EduTA in a Latin American country took place in Argentina. This peer international evaluation of the national education structure on safety concluded with very positive results for our country. In 2008 as a direct consequence of this mission the Argentine Government signed a Long Term Agreement (LTA) with IAEA, by which Argentina agreed to become the Regional Training Centre in Latin America and the Caribbean in terms of Nuclear, Radiological, Transport and Waste Safety. The Education and Training Unit of ARN oversees this Centre.

In November 2017, a follow-up mission of EduTA took place in Argentina. The team that conducted the mission underscored the fact that ARN has taken a key role in the development of capacities in radiological protection in the region. Also, the continuous development of postgraduate courses along with the Engineering Faculty of the University of Buenos Aires (FIUBA), under the sponsor of IAEA, for the past 37 years represents a unique case of association between IAEA and a regional centre which provided assistance to other Member States in order to build their capacities.

Furthermore, ARN also offers training courses in Radiological Protection to its own technical personnel, CNEA´s and other local institutions, public or private related to the nuclear sector.

As a member of the Latin American Network for Education and Training in Nuclear Technology (LANENT), the ARN Unit for Education and Training has made available a System for the Knowledge Management (LMS) for all Programs and Careers offered.

Between January 2017 and December 2019, 70 professionals completed the Radiological Protection and Safety of Radioactive Sources Degree, 31 the Specialization in Nuclear Safety and 80 passed the Basic Course on Radiological Protection.

Figure N° 2: Professionals trained in Argentina according to the country of origin

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 Standard IRAM-ISO 9001.

The requirements of said system are described in the “ARN Quality Manual”, which was last updated in 2018. In this document, the Board states, among others, the Quality Policy.

QUALITY POLICY

The Nuclear Regulatory Authority assumes the responsibility of guaranteeing the protection of the society and its habitat, in the present and in the future, against the harmful consequences of ionizing radiations and to control that the regulated activities are only performed with peaceful purposes.

We promote a safety culture based on an enquiring attitude, a rigorous approach and careful regulatory behaviour and in the transparency towards access to information in relation to radiological safety and nuclear matters for involved stakeholders.

In view of its strategic objectives, the Nuclear Regulatory Authority plans, performs, verifies, and acts in order to continuously improve its Quality Management System.

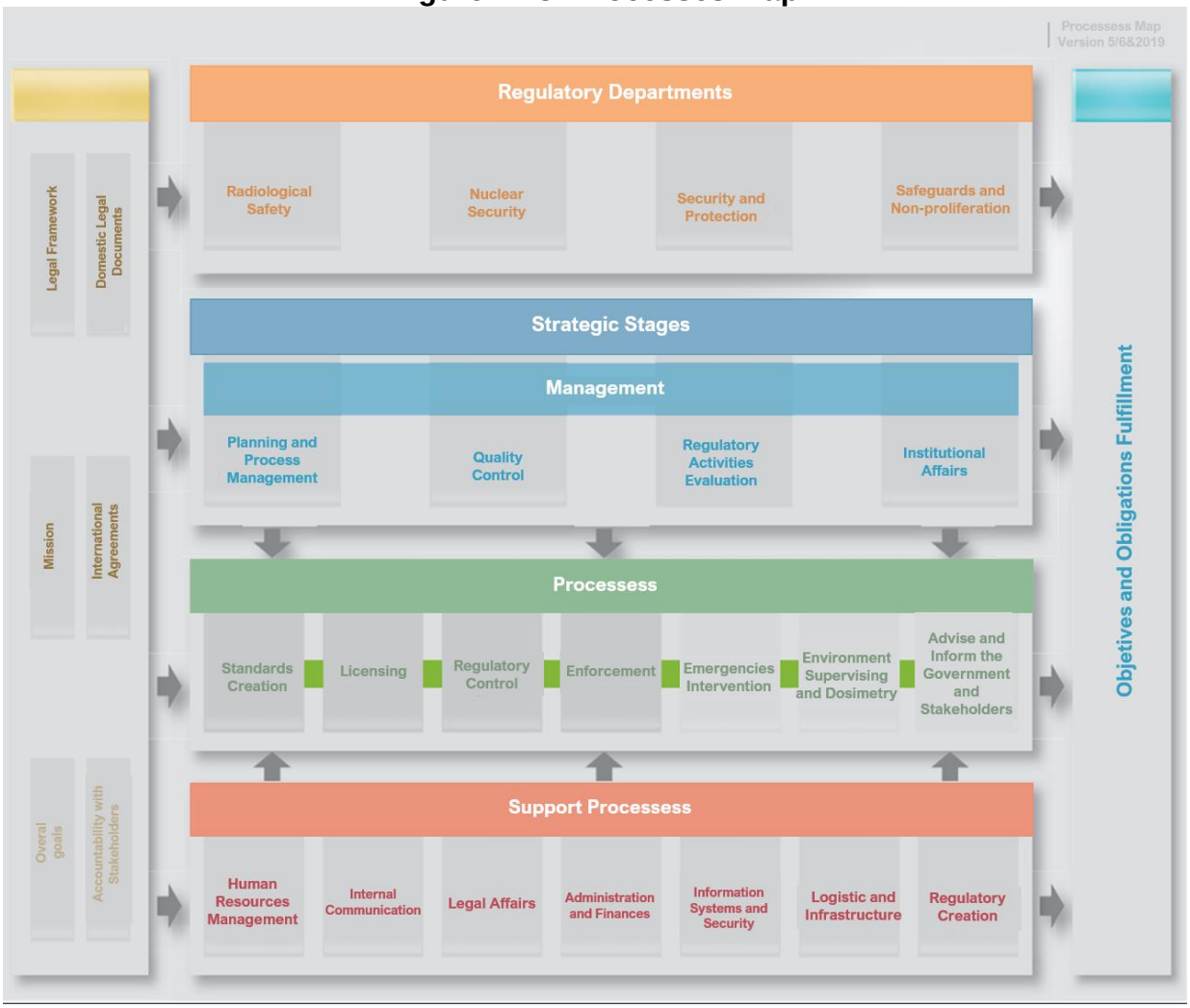
Processes Approach

ARN implements its SGC with the objective of continuously improve the efficiency and effectiveness of its regulatory actions, focussing on incrementing the satisfaction of the stakeholders.

The SGC is executed through the implementation of a processes approach. In this sense, comprehension, and management of interrelated processes as a system contributes to the efficiency and effectiveness of the organization towards reaching its expected results.

With the objective of achieving the implementation of Standard ISO 9001, 2015 edition, the map of processes was updated in the year 2019.

Figure N° 3: Processes map



In this sense, the order and interaction between processes is established and is represented in the file cards of the processes.

Each process is described in its corresponding card, in which the following items are considered: objective, responsible and vice responsible, process- provider, input, output, activities, product characteristics, proof of characteristics control, process/destinee, performance criteria and intervening positions in the process indicators.

Follow-up, measurement, analysis, and evaluation

The performance evaluation of processes is completed through different methods: internal audits, processes follow-up, board review, quality control, processes objectives fulfilment indicators evaluation, surveys analysis, among others.

ARN fulfils internal quality audits to:

- prove the products and processes compliance in relation with the requirements of the implemented documentation,

- guarantee the fulfilment of the Quality Management System,
- continuously improve the efficiency of the Quality Management System,
- identify improvement opportunities, in order to continuously enhance the efficiency of the quality management system, via the implementation of quality objectives and,
- verify the compliance with corrective measures and evaluate its effectiveness.

The audits are performed by certified staff and are independent of the reviewed area. During the period comprised by the present report 23 internal audits have been performed.

The follow-up of the processes is performed through work meetings with the involved responsible and other members, with the purpose of verifying that the adequate management tools are being implemented for the treatment of the audits findings.

The Board reviews the SGC, in scheduled dates, and due adjustments are performed, if needed, to make sure of their convenience, adaptation and efficiency.

Finally, quality verifications can be performed to obtain information regarding a certain activity or a group of them, with the purpose of validating that the specified provisions founded in the originally chosen documentation have been complied with.

Documentation management

End-certification and Credentials

- Up to August 2017 ARN possessed 13 certified processes. Afterwards, and according to the budget assessment performed, it was decided not to continue with certifications, but to maintain the norm by which all processes should be adapted to the requirements of Standard ISO 9001, according to its last version.
- On a different page, in the Department Measurements and Evaluations in Radiological Protection the more relevant laboratory technics have been certified before the Argentina Certification Organism (OAA) under Standard ISO ISO/IEC 17025:2005, in order to guarantee the quality of trials and calibrations, abiding by the highest international standards. During 2019, ARN laboratories successfully completed the first round of audits in order to be recognised as a multi-site laboratory, according to Standard ISO/IEC 17025:2017.
- Up to date, the Environment Control (LE 116) and Biological Dosimetry Laboratories (LE147) have successfully completed the evaluations required for the 4th full norm maintenance (re- evaluation). The Dosimetry Laboratory by Thermal Luminescence (LDF) successfully completed the 3rd maintenance to Full Standard (re-evaluation), thus completing the first certification round. Furthermore, the Calibrations Laboratory (LDF) successfully passed the 2nd maintenance evaluation.

Documentation management

The documentation structure of the SGC is comprised by external documentation which offers a legal framework and/ or as a reference to the development of different activities of ARN. This structure is quoted in the internal documentation produced by the different processes.

In this sense, and with the purpose of fulfilling the cited documentation required by Standard ISO 9001 and the documentation established by the organization as mandatory for the efficiency of the SGC, the following criteria must be included in the processes.

The registry associated with documentation are part of the fundamentals and the foundation for the completion of activities.

During the reference period, 2017-2019, 106 documents have been produced or updated (Guides, Regulations, Procedures and Work Instructions), 4 File Cards and 8 Documented Information Controls.

By December 2019, 226 approved Documents, 20 Process Cards, and 21 Documented Information Registries are available.

Stakeholders Satisfaction

ARN will keep in mind the expectations of the interested parties in the activities and participation during the SGC processes, with the purpose of increasing the satisfaction level and at the same time guaranteeing the fulfilment of safety.

ARN Board ensures that the requisites of the stakeholders are recognized and fulfilled by the Organization, notwithstanding, the priority is the fulfilment of the Nuclear Activity National Law 24804, safety of the population, the workers and the protection of the habitat.

During the meetings that take place with the different processes for the production of documents, the need to develop a methodology to measure the stakeholders satisfaction is proposed.

Continuous improvement

To improve SGC, ARN analyses the data produced by the quality internal audits, the fulfilment indicators, board reviews, surveys analysis, suggestions, and improvement opportunities presented by the stakeholders.

From the analysis results, it is determined whether there are needs or opportunities that should be considered for continuous improvement.

Likewise, all other diversions (non-conformity, corrective action) which are detected whether internally or during an internal quality audit must be worked out to perform the necessary adjustments and to take the corrective needed actions.

E.3.3.5 Financial Resources

Law No. 24804, Section 25 establishes that the financial resources for the proper functioning of ARN shall originate mainly from:

- The regulatory fee created according with article 26 of the above-mentioned Law.
- Subsidies, heritage, legacies, donations, or transfers acquired under any title.
- Interests and benefits deriving from the management of its own funds.
- Contributions from the National Treasury determined according to the budget of each financial year.
- Other funds, assets or resources that may be assigned according to applicable laws and regulations.

In this sense, the first paragraph of Article 26 of the Law 24804 establishes that the Designated Licensees of an authorization or permit, or Corporate Body whose activities are under the purview of the Authority will pay a yearly and in advance Regulatory Fee which will be approved through the National Budget.

Likewise, Article 26 of the Annex I of Decree 1390/98 establishes that ARN will set the Audit Fee and shall remit through the NATIONAL PRESIDENCY its Budget in order to be approved by the HONOURABLE CONGRESS OF THE ARGENTINE REPUBLIC.

In order to fulfil this, the Board of ARN through Article 1 of the Executive Decision 76/08 approved the System of Fees by Audits and Inspection which is applied to Natural Persons or Body Corporations which request the granting or are Owners of Licenses, Operation Authorizations, Specific Authorizations and Individual Permits, but also to Natural Persons or Body Corporations which request the granting or are Owners of Certifications of Approval of Radioactive Waste Material Transport granted by ARN.

Annex to Executive Decision of the Board of ARN 76/08, Chapter I, Article 6 establishes: “The value of Regulatory Hour (VHreg), in Argentine Pesos, is the result of the product of the Regulatory Hour of the previous year, multiplied by a coefficient which represents the highest value between the yearly average of the wage increase in the regulatory activity or the Wholesale Prices Index published by INDEC (National Institute of Statistics and Census) in the past year”.

Finally, in the Annex of the above mentioned Executive Decision, the Regulatory Hours (Hreg) shall be applied according to the following*:*

- Chapter 4 – To relevant facilities, grant of the individual license and for the release or renewal of the specific authorization.
- Chapter 5 – To non-relevant and other facilities and authorized activities. To the supervision of transfers, to the release or renewal of the individual permit.
- Chapter 6 – Transport of radioactive material.

In this sense, ARN approved a “Licensing and Inspection System of Fees”. This system establishes a rate for the granting of licenses and permits according to the type of facility or activity, in addition to the corresponding yearly fee for the operation of those facilities or practices.

The system establishes a yearly fee for the operation of certain facility or activity. This fee is determined by a simple formula which takes into account two factors: “the Regulatory Effort”, expressed as the number of hours of inspection/evaluation that ARN determines for the regulatory control of such facility or practice; and the rate of that effort, which is calculated according to the monetary value of the inspection/evaluation, which is set yearly.

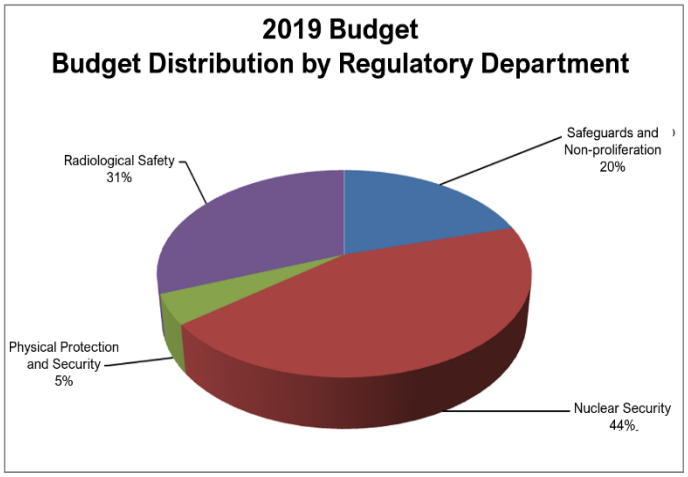
Every year, ARN prepares a draft budget where all expenses and resources needed for the next year are detailed.

The Budget granted to ARN for the year 2019 was of **$ 676.558.705** (Argentine Pesos), as detailed in Table N° 4. Following in graphs N° 1 and 2 is possible to visualize the budget distribution for regulatory areas and sections.

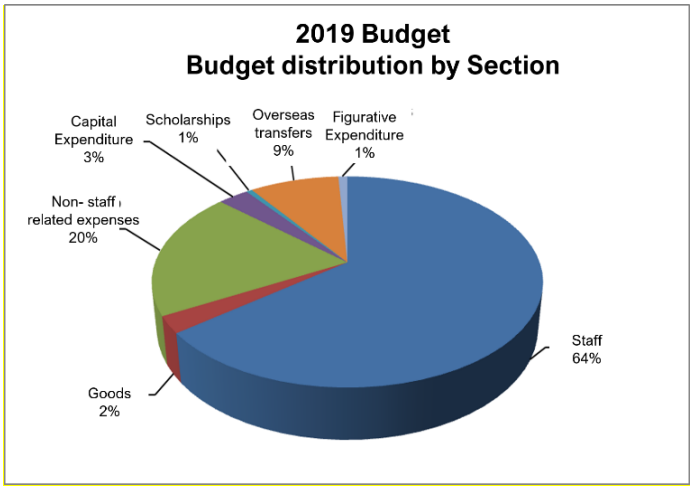
Table N° 4: ARN Budget for the year 2019

Part	Financing Source			Total
	National Treasury 11	Own Resources 12	External Transfers 21	
1- Staff	$ 327253864	$ 106163.611	$ 2509399	$ 435926874
2- Goods		$ 16459000	$ 950000	$ 17409000
3- Non– staff Services	$ 10000000	$ 112985000	$ 10007000	$ 132992000
4- Capital Expenditure	$ 18868514	$ 953389	$ 634928	$ 20456831
5.1.3- Scholarships		$ 4000000		$ 4000000
5.9- Overseas Transfers		$ 59740000		$ 59740000
9.1.2 Figurative Expenditure		$ 6034000		$ 6034000
Total	**$ 356122378**	**$ 306035000**	**$ 14101327**	**$ 676558705**

Graph N° 1: Budget distribution by Regulatory Department



Graph N° 2: Budget distribution by section



E.3.4 Relationship with Other Organizations

The Department of Non-proliferation Policies and Institutional Affairs participates in the definition and implementation of the country policies in regulatory matters in national and international fora.

During the period 2017-2019 ARN continued the cooperation activities with other organizations. In this framework, the participation and contribution of ARN in the projects and activities of the Fora of Radiological Regulators Organisms of Ibero- America (FORO) was maintained. The mentioned Fora is constituted by the radiological and nuclear regulatory organisms of Argentina, Brazil, Chile, Colombia, Cuba, Spain, México, Paraguay, Perú y Uruguay and has the objective of sustaining high levels of nuclear, radiological safety and security in the Ibero-American region.

ARN actively participates in its technical program, which is made jointly and continuously in coordination with the action plans of the International Atomic Energy Agency (IAEA) and sustained by a knowledge network on nuclear, radiation safety and security which enables information exchange among regulatory agencies from the region. In this framework, leading and interesting projects in the international arena have been conducted in areas of Radiation Protection in Medical Applications, Occupational Radiation Protection, Nuclear Safety and Control of Radioactive Sources, Waste Management, Emergency Preparedness and Response, Human and Organizational Factors and Radioactive Material Transport.

ARN has kept strong links with other national and international agencies, which sometimes translate into cooperation agreements. During the period of this report, ARN subscribed seven (7) national agreements and four (4) international agreements. Moreover, different actions were undertaken to implement binding commitments, mainly through bilateral meetings, technical visits and specific trainings.

In addition, ARN high level specialists and experts participate, as nominated experts, in the following international committees and IAEA advisory groups:

- Commission on Safety Standards, “CSS”
- Radiation Safety Standards Committee, “RASSC”
- Nuclear Safety Standards Committee, “NUSSC”
- Waste Safety Standards, Committee “WASSC”
- Transport Safety Standards Committee, “TRANSSC”
- Emergency Preparedness and Response Standards Committee “EPReSC”
- Permanent Advisory Group on Safeguards Implementation, “SAGSI”

Furthermore, ARN representatives participate in:

- United Nations Scientific Committee on the Effects of Atomic Radiations, “UNSCEAR” (UN)
- International Commission on Radiological Protection (ICRP)

During the period 2017-2019, 23 Safety Standards Drafts were received from IAEA in order to appraised by the State Members: 12 of those during 2017, 4 during 2018 and 7 during 2019.

E.3.5 Annual Reports

The Communication Division promotes the spread of ARN´s institutional image among the different sectors and interested social stakeholders through the strengthening of internal and external communication of the institution.

ARN publishes every year a report which details the main activities performed in order to fulfil its mission and the tasks assigned according to the Nuclear Law, as the national organization in charge of controlling the nuclear activity in the Argentine Republic, in the field of radiological and nuclear safety, safeguards and security.

The Annual Report of Activities is prepared according with the specifications set in article 16 of the National Nuclear Activity Law, 24804. This public document is sent every year to the executive authorities, legislative and those belonging to the argentine nuclear sector, to keep informed the involved stakeholders in regards with regulatory activity.

In the same sense, the Report is published in ARN´s website www.argentina.gob.ar/arn/informe-anual where all Annual Reports published since 1994 are available, this is an example of transparency and access to information of the interested stakeholders.

In 2016, a new section on the website was created to host technical reports on radiological and nuclear events as part of the open source and transparency of information made available to all citizens concerned on regulatory activities. Furthermore, ARN engages and is also in contact with the public through its official Facebook, (www.facebook.com/AutoridadRegulatoriaNuclear), which was created in 2015. Facebook is the social network with more users in Argentina. The presence in social networks has the purpose of opening new channels of communication and to reach out with more information on regulatory activities, important news of the nuclear sector, events and courses, and to also promote more spaces for the public participation via messages, suggestions and commentaries. A different consultation channel with citizenship is ARN´s information mail, where all questions and requests for information of the citizens are answered directly. Furthermore, there are available for the public projects for the production and modification of regulatory Standards. Citizens can participate presenting their opinions and proposals in the process of manufacturing ARN´s Standards.

Likewise, nuclear power plants possess a wide program of public communication. The details of these activities can be found in www.na-sa.com.ar.

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SECTION F OTHER GENERAL SAFETY PROVISIONS

F.1 Responsibility of the Licensee

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 relied on a single person, 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 acquired the appropriate means, equipment, and trained staff, the area responsible for the safety assessment approved the operation license granting.

Even though the above mentioned concepts are still essentially valid, a number of significant improvements have been introduced to the regulatory system throughout the years. Thus, depending on the magnitude of the nuclear facility, the Regulatory Body demands that the people who occupy specific positions as 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 as the facility was conceived. 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 Licensee was established.

F.1.2 Licensee and Primary Responsible

The ARN requires that every 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 and 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 relies on the Licensee, 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), Unit II (CNA II) and Embalse Nuclear Power Plant (CNE), including the nuclear fuels storage systems and the management of waste generated in these facilities. CNEA is the Licensee 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 Licensee, amongst which the most significant are:

- The Licensee shall make every reasonable effort within 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 Licensee, which shall make every reasonable effort, within its possibilities, to improve safety. The Licensee 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 Licensee 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 Licensee shall appoint a Primarily Responsible, who should be one person from its staff, and shall be in charge of the radiological and nuclear safety of the facility, as well as with the licenses compliance and regulatory requirements applicable thereto. In the case of nuclear power plants in operation, their managers are the Primary Responsible.
- The Licensee shall provide the necessary assistance to the Primary Responsible, so that the Primary Responsible may exercise its responsibilities. The Licensee must supervise the Primary Responsible to verify that it complies with its safety-related responsibilities.
- The Licensee 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 /radioactive facility related to radiation or nuclear safety may be made without ARN's prior authorization.
- The Licensee and the Primary Responsible shall facilitate the inspections and audits required by the ARN.
- Any change in the organizational structure of the Licensee that may affect its capacity to comply with its responsibilities shall require ARN's prior consent.

Besides the Licensee and the Primary Responsible responsibilities, 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, the public and the environment. 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 Nuclear Regulatory Authority (ARN) performs different types of controls as follows:

- ARN is permanently updated about the operational organizational structure. In case of any modification, the Licensee shall send to ARN a document stating the new operational organizational structure, the missions, functions and requirements of the staff. Every proposed change must be duly justified. ARN evaluates the documents and its justifications and, in the case of not finding any observations, the document enters into force when the facility acquires the capacity to cover all the posts to be licensed.
- Regulatory Standard AR 0.11.1 determines the requirements to be fulfilled by Type I (relevant) facilities 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, a process related to the validity of the psychophysical aptitude certificate, annual retraining and the adequate task development.
- 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.
- The ARN undertakes specific inspections to verify the fulfilment of safety aspects during planned outages of NPPs.
- Standards AR 10.14.1, AR 10.13.1 and AR 10.13.2 state the requirements to be fulfilled by facilities regarding Safeguards, Safety and Physical 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 regarding 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* (PNGRR) was created by Law No. 25018, which appoints CNEA as the responsible authority for the development and periodic updating of the *Strategic Plan for Radioactive Waste Management* (PEGRR). CNEA, since late 2019, is under the National Secretariat of Energy of the Ministry of Development, which is responsible for the designing, presentation and execution of national policies related to

energy. The Ministry of Development, also participates in the nuclear policy designing, among other tasks (Decree 7/2029).

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 Licensee that reports for the operation of Nuclear Power Plants (NASA), has the responsibility of having trained and qualified personnel in accordance with the current legal and regulatory framework, and to provide the necessary financial resources for the development of operation activities, which include the storage of radioactive waste and the storage of SF until those are transferred to CNEA.

Financing of the National Program for Radioactive Waste Management

CNEA has implemented the PNGRR and the PRAMU, financed with the National Treasury contributions included in the regular budget, and approved by the Executive Power.

CNEA Organizational Structure and Human Resources

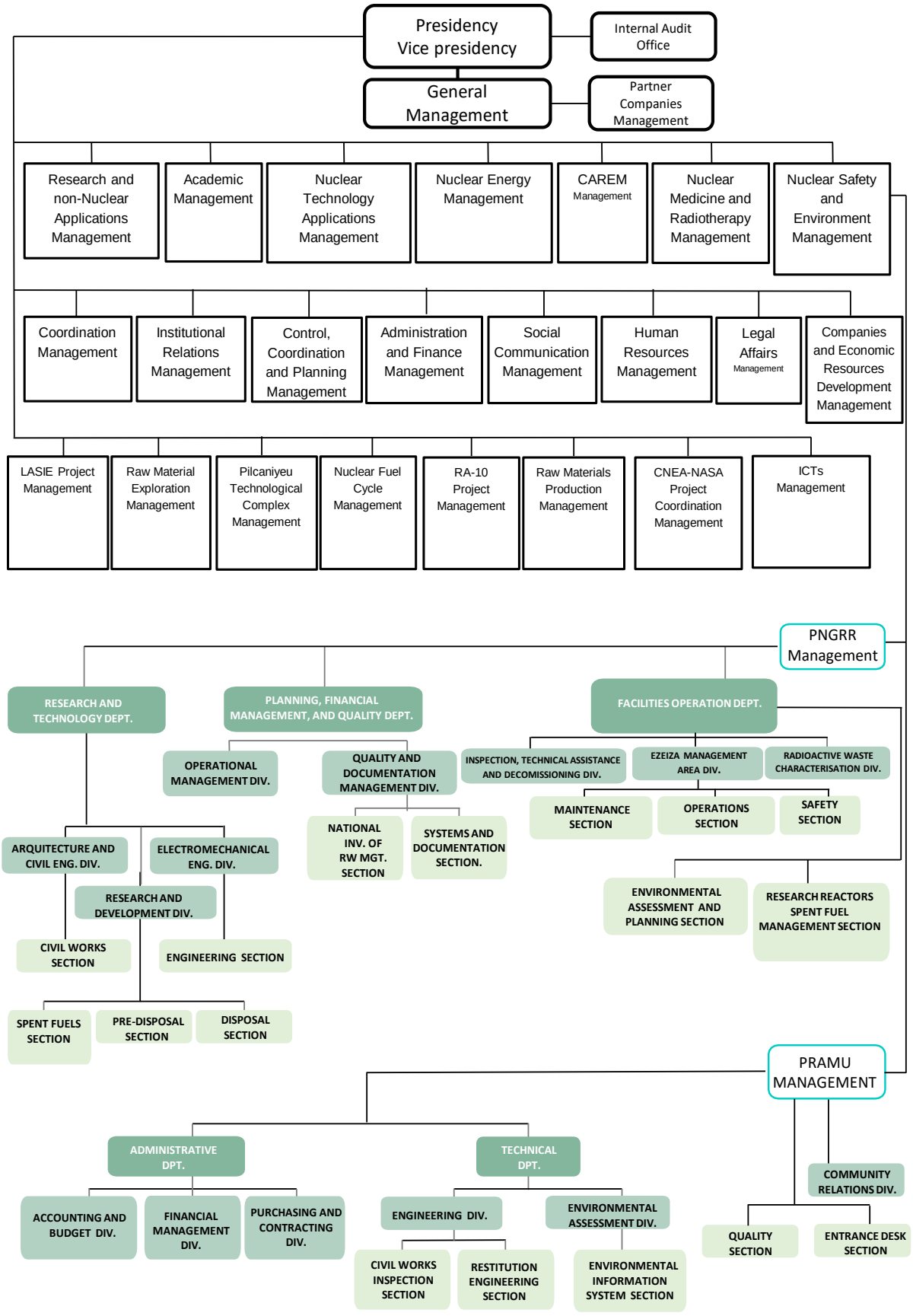
The PNGRR and the PRAMU managements are under the Nuclear Safety and Environment Management.

The Nuclear Safety and Environment Management undertake the following activities:

- Establishing methodologies of management and criteria for Safety, Environment and Quality.
- Conducting the follow-up of performance in Safety, Environment and Quality.
- Coordination, advising and provision of technical assistance on these topics to other Managements and Sites.

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

Figure N° 6: CNEA Organizational Structure



On this regard, CNEA has implemented a Quality Management, Safety and Environment Integrated System, 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-making to improve its performance.

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 personnel competence through training, awareness and application of methodologies of communication and participation, safety culture strengthening, documentation and recording control, processes establishing and monitoring, operational control and emergency response, incident research, non-conformities, corrective and preventive actions and, internal auditing and systematic performance revision conducted by each Department in furtherance of their duties.

The PNGRR Department is responsible for conducting activities of management of radioactive waste and spent fuel, originated in research and radioisotopes production reactors, in CNEA´s and external facilities such as nuclear power plants and other small facilities.

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

Table N° 5: Financial Resources of CNEA devoted to RW and SF management (2019) (Included PRAMU)

ITEM	RESOURCES (ARS)*
Research Development	3022608
SF and RW Management	5505931
Foreseen Improvements	14132942
Personnel	12175881
TOTAL	**34837362**

*Funds sources: PRAMU (National Treasury) $20.760.370, CNEA´s $232528, plus PNGRR resources

Table N° 6: Human Resources of CNEA devoted to Radioactive Waste Management and Spent Fuel Management (2019) – (Including PRAMU)

QUALIFICATION	Full Dedication	Partial Dedication
Professionals	51	23
Technicians and assistants	46	9
Fellowshipholders	7	6
TOTAL	104	38

Training of Human Resources

Most of employees devoted to RW and SF Management have taken a postgraduate educational course (PGECs) on Radiation Protection sponsored by the IAEA (currently the Specialization Course on radiation protection and the safety of radiation sources) and the postgraduate course on Nuclear Safety for professionals (currently the Specialization Course on Nuclear Safety) or the Radiation Protection Course for technicians offered by the ARN. The specializations are offered by the University of Buenos Aires and 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 as lecturers in 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, as well as AGE staff, 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 and CNEA send 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 the three Atomic Centres and Headquarters of CNEA, 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, Regulatory Standard AR 3.6.1 Nuclear Power Plant Quality System, issued by the regulatory body ARN, determines the quality system requirements applicable to Nuclear Power Plants.

Regulatory Standard AR 3.7.1 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 Licensee 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 Licensee through regulatory assessments and regulatory audits.

1) Through the regulatory assessments, the regulatory body assesses whether the program and the quality manuals sent by the Licensee comply with the requirements set forth in the Regulatory Standards AR, mainly the Regulatory Standard AR 3.6.1 (Quality System in NPPs). These assessments are conducted under the procedure regulatory assessments in order to grant a licence / a building authorization / start-up / use of the site of NPPs. The most important actions in this procedure are writing reports and assessments (with and without external technical support), the approval of the relevant technical report, the follow-up and conclusion of relevant findings produced by the evaluations.

2) Through the regulatory audits periodically conducted in the Licensee, the regulatory body verifies the degree of compliance of quality systems according to the requirements set forth in the AR regulatory standards, mainly the AR 3.6.1 regulatory standard. These audits are conducted under the quality regulatory audits in nuclear power plants procedure. The most important actions of these procedures are the approval of an annual program of quality audits, undertaking of audits, sending approved audit reports to the Licensees and follow up and conclusion of corrective actions developed after the regulatory audits.

F.3.2 Nucleoeléctrica Argentina Sociedad Anónima (NASA)

Since its creation in 1994 (Decree No. 1540/94), NASA has been operating CNA (Atucha Nuclear Power Plant – Unit I and II), and CNE (Embalse Nuclear Power Plant).

Law No. 26566 determined that NASA would build, start-up and operate a fourth nuclear power plant, extend the lifetime of the Embalse Nuclear Power Plant, finished in January 2019, and finalize Atucha Unit II Nuclear Power Plant construction and start-up, in operation since May 2016.

NASA, as the Licensee, has a General Quality Assurance System, which is the reference framework for specific quality assurance programs for each organizational unit. The system is described in the General Quality Assurance Manual, which was approved and made effective in November 1997. Subsequently, the General Quality Assurance Manual has been reviewed on different opportunities.

Currently, Revision 5 of the Quality Assurance Manual is in force and includes the requirements of ISO 9001:2015 at a corporate level. As mentioned above, the General Quality Assurance Manual complies with the requirements of AR 3.6.1 regulatory standard Nuclear Power Plant Quality System and IAEA Practice Code 50-C-Q.

The Quality Policy was adapted to meet the requirements of ISO 9001:2015, and unified with the Environment Policy. Revision 2, is in effect since 2019.

Table N° 7: NASA's Quality Assurance Program Status

ORGANIZATION UNIT	DOCUMENT	REVISION	NUMBER OF PROGRAMMING PROCEDURES
NASA	Quality Assurance Manual	5	42
CNA Unit I and II	Quality Assurance Manual for Operation of CNA Units I and II	5	216
CNE	Quality Assurance Manual for Operation of CNE Embalse	7	163
DPN*	UG Management Manual	0	64
NPPs Services Management	Management System Manual	9	20

*By NASA Board of Directors resolution, UG-PN (Nuclear Projects Management Unit) changed it denomination to Nuclear Projects Direction (DPN), in October 2018.

F.3.3 Argentine Atomic Energy Commission (CNEA)

CNEA Quality Management System

CNEA has established a quality policy, whose current version has been approved by CNEA's authorities by Resolution 84 on March 17th 2017.

Each sector of the Institution, including those which as part of their activities manage spent fuel or manage radioactive waste, develop its Quality Management System in agreement with institutional policies.

The Quality Management Department responsibilities include, among its responsibilities, coordinating the activities of quality management performed in CNEA and centralizing information on this topic. Authorities are periodically informed of the development of quality management system of the sectors of the Institution.

Obligatory documents of the Institution must be integrated to its Management System and fulfilled by different sectors.

CNEA Quality System documentation is completed by those issued by different sectors of the organization, such as management system manuals, quality plans, general procedures, operative procedures and work instructions. They are all developed in accordance with CNEA applicable standards, applicable external documents such as regulations or specific codes and the applicable regulatory legislation, particularly ARN regulations and requirements.

Document Tracking System is implemented in two different ways:

- ❖ Internal: As set forth in AR 3.6.1, Revision 2, standard (points 48, 49 and 50), the authorities in each sector are responsible for conducting a "Management Self-Assessment" and also must get the results of an "Independent Assessment" of the efficiency in applying the Quality System in order to improve it.
- ❖ External: The areas in CNEA 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).
- There are some sectors with management systems that are certified, as well as laboratories with Management Systems and activities which are accredited. In these cases, these sectors also get an assessment from the external agency (i.e., a Certifying Agency or the Argentine Accreditation Agency).

<u>Radioactive Waste Management National Program (PNGRR).</u>

The PNGRR, organization implemented by CNEA in order to comply with its waste management responsibilities, has designed a Quality System for all spent fuel and

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 the head of the Planning, Financing Management and Quality Department of PNGRR. To date, the Quality System includes 99 operational procedures and 202 work instructions which correspond to several activities developed in the Program.

This Section has 5 workers directly engaged in quality management and documentation, not taking into account Project and Operation inspectors. 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 memories, reports and other technical documents are included. The regulations and legislation issued by regulatory and other authorities, which provide the frame for radioactive waste management, are included in other Database. At the moment, the former Data Base has 1258 records, out of which 495 are from current documents. In the later database, there are 57 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 blanks derived from uranium mining.

The Quality Management System, developed in PRAMU is being redesigned, 22 documents (procedures) have been produced and revised.

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. Under special circumstances, a higher value could be considered for one year, always that average dose in five consecutive years does not exceeds 1 mSv. 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 (AR 3.1.2, AR 4.1.2 y AR 6.1.2 standards).

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 (ARN 191/2013 Resolution). This is expressed, particularly for nuclear power reactors, in the standards AR 10.10.1 “Nuclear Power Reactors Site Assessment”

When the design of the radiation protection systems assures that, under normal operating conditions, no worker may receive an effective dose higher than 5 mSv in a year; and that no member can receive an effective dose higher than 100 microsievert in a year, the AR 10.1.1 Radiation Safety Basic Standard Rev. 4 sets that it is not necessary to prove that systems are optimized, except that the Regulatory Authority expressly requires it. Even in those cases in which such demonstration is not required, facilities must implement systems and actions to keep the doses as low as reasonably achievable, even though these implementations do not necessarily arise from an optimization analysis.

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 of 20 mSv year for crystalline, taking this value as the average in five consecutive years (100 mSv in five years), not exceeding 50 mSv in one year.
- The equivalent dose of 500 mSv year for skin and extremities.

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 the annual activity of each significant radionuclide in the effluent shall not exceed the authorized value for discharge duly established by the ARN.

The authorized discharge values are understood as an operative restriction and are derived from the representative person estimated doses due to optimized gaseous and liquid discharges considering an appropriate flexibility margin that guarantees the protection of the public without interfering with the operation of the facility. For this, specific mathematic models are applied.

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

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 a control verification program of discharges conducted by the operator, which includes sampling procedures revisions, uncertainties measurement, measurement equipment assessment (calibration, pattern sources, etc.). Also, the revision includes radionuclides activity concentration in discharge samples and an independent environmental monitoring plan of the operator’s plan, which includes collecting and measuring of water, sediment, and foods, such as vegetables, fish and milk samples.

The following Table shows the annual average activity discharged to the environment corresponding to the 2017-2019 period, discriminated by type of discharge and group of radionuclides.

Table N° 8: Anual average discharges

ANUALAVERAGE DISCHARGES TO THE ENVIRONMENT FOR THE PERÍOD 2017-2019								
FACILITY	**LIQUIDS**			**GASEOUS**				
	TOTAL ACTIVITYL [Bq]			**TOTAL ACTIVITY [Bq]**				
	H-3	**Emisores β/γ**	**Emisores α**	**Noble Gases**	**H-3**	**Iodine**	**C-14**	**Others**
CNAI	$1.8.10^{15}$	$8.5.10^{10}$	$3.0.10^{8}$	$2.4.10^{13}$	$5.7.10^{14}$	$1.3.10^{8}$	$4.5.10^{11}$	$1.9.10^{6}$
CNAII	$4.4.10^{14}$	$9.7.10^{10}$	$6.2.10^{7}$	$8.9.10^{13}$	$5.8.10^{14}$	$3.2.10^{9}$	$3.2.10^{11}$	$3.5.10^{7}$
CNE*	$1.7.10^{14}$	$1.2.10^{9}$	---	$1.3.10^{14}$	$2.5.10^{14}$	$2.7.10^{4}$	$3.0E.10^{8}$	$1.0.10^{1}$
RA3	---	$3.6.10^{7}$	---	$6.3.10^{13}$	---	$1.7.10^{6}$	---	$4.2.10^{7}$
RA6	---	$9.2.10^{6}$	---	$1.5.10^{10}$	---	---	---	---

References:
--- = Not Applicable
* . Discharges values belong to 2019, due to the plant, after its refurbishing stop, begun the start-up stage in January 2019, and its second life cycle in August 2019

F.4.1.2 Clearance of Solid Materials

AR 10.1.1 regulatory standard mentions solid materials clearance and its relation with the dose applicable criteria, as follows:

“Radioactive material or any object containing radioactive components will be able to obtain clearance, if in every reasonable foreseeable circumstance, the expected effective dose received by any person from these materials, doesn´t exceed 10 μSv for year, whenever the Regulatory Authority doesn’t understand otherwise. For low probability occurrence scenarios, the exemption is applied if the expected effective dose received by any person doesn’t exceed 1 mSv for year”

ARN´s published the Regulatory Guide AR 8 “Generic Values of Clearance” Rev.1 (2019). The generic values of Clearance for activity concentration take into account the radiologic safety requirements established in the Standard AR 10.1.1 “Basic Standard of Radiological Safety”, the clearance values, the safety requirements (GSR Part 3), exclusion, exception and clearance concepts application guide (Safety Guide No. RS-G-1.7) and the technical report on activity concentration values calculus for exclusion, exception and clearance (Safety Reports Series No. 44), published by IAEA.

AR 08 Rev.1 Guide establishes general conditions for clearance, terms explanation, clearance materials suggestions considering its activity concentration and suggestions for material activity concentrations determination.

Among the changes in the Guide, we can find clearance values of surface contaminations for alfa, beta and gamma radionuclides, and considerations for applying these values.

Additionally, it states that the Regulator can consider necessary to concede the clearance of materials with superior values to those suggested in the Guide trough a conditional clearance.

F.4.1.3 Exemption of Practices

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

"Provided the ARN does not understand otherwise, every practice or related-radiation source could be exempted, if in every reasonable circumstance, the effective dose that any person is expected to receive due these practices or related-radiation sources, doesn´t exceed 10 μSv in a year. For low probability occurrence scenarios, the exemption is applied if the effective dose that any person is expected to receive, doesn´t exceed 1 mSv in one year".

ARN published the regulatory guide "Generic Levels of Exemption" Rev.1 (2018). These levels were derived from 3 scenarios established in the document "Radiation Protection 65" from the European Union which appear in the following IAEA document: "Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, General Safety Requirements Part 3. The exemption levels derive from total activity and activity concentration. They apply to moderated masses of radioactive material in the order of 1 ton in any physicochemical state (liquid, gaseous or solid). For those materials that do not exceed 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.

Regulatory Standards AR 3.1.1, AR 4.1.1 and AR 6.1.1 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 limits.

Regulatory standard 10.1.1 establishes the conditions to be satisfied in order to verify dose limits compliance. These conditions were provided in previous national reports to this Convention.

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 periods 2017, 2018 and 2019, the effective collective doses were of 0.0050 Sv.p, 0.0006 Sv.p and 0.0025 Sv.p. Regarding personal effective doses during the same period and annually averaged were the following: 0.23 mSv, 0.03 mSv and 0.14 mSv.

F.4.3 Radiological and Nuclear Safety at CNEA

The Argentine Atomic Energy Commission (CNEA) is responsible for the management of SF and RW generated in the national territory, as well as the Licensee 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.

In order to achieve this objective, the GSR&N 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.
- Radiological monitoring programs of the personnel of radioactive facilities and neighboring areas.
- Occupational health system.

Consolidate:

- A system of radiological public health medicine.
- 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 the 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 Licensee prepares a response plan 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 Type I facility must submit an emergency plan to be approved by the ARN. For The case of Type II Facilities and some non-routine practices, they must have at least one procedure to deal with emergency cases. In nuclear power plants, an external emergency plan is necessary to evaluate the probability of radiological consequences occurrence in neighboring inhabitants.

Regulatory standards AR 10.1.1, AR 3.7.1 and AR 4.7.1, operating licenses and requirements presented to Licensees 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. 1.390 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 Law. In 2003, a Provincial Plan on Nuclear Emergencies was approved in Córdoba Province where the Embalse Nuclear Power Plant is located. The Provincial Plan on Nuclear Emergency is to be approved in Buenos Aires Province where Atucha NPPs (CNA Units I and II) are located.

In August 2019 was signed a framework agreement between the Nuclear Regulatory Authority and the Civil Protection Secretary, which is under the National Ministry of Security, that is an original member of the National System for Risk Management (SINAGIR).

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. These are the cases for Lima and its neighboring areas surrounding Atucha NPP, 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. 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.

Facilities under ARN regulatory control conduct periodic emergency drills. Periodicity and characteristics of drills depend on the risk associated to the activities conducted in these facilities. Drills in Nuclear Power Plants operating in Argentina are annually conducted, while those drills which include members of the public and response organizations (external) are conducted every two years.

The purpose of drills in Nuclear Power Plants is to train the population and response staff, evaluate the performance of the Emergency Plan in the NPPs and neighboring towns, and trying new concepts, ideas and equipment. Moreover, opportunities for development improvement are expected to be identified during the response and during the coordination of participating organizations.

F.5.3 International Agreements

The Argentine Republic signed a multiplicity of multilateral and bilateral international agreements. Among them:

- 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.
- Agreement between Argentina and Brazil for the Exclusively Peaceful Use of Nuclear Energy (also known as Bilateral Agreement). Signed and ratified in December 12, 1991. Approved by Law No. 24046.
- Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (also known as “Tlatelolco Treaty”). Approved by Law No. 24272 ratified in January 18, 1994.
- Agreement between the Argentine Republic and the Federal Republic of Brazil, the Argentine-Brazilian- Agency for Accounting and Control of Nuclear Materials and the IAEA for the Application of Safeguards (also known as the “Quadripartite Agreement”). Signed in 1991, it was approved by Law No. 24113, ratified in March 4, 1994.
- Treaty on the Non-Proliferation of Nuclear Weapons (NPT), approved by Law No. 24448. In force since February 10, 1995.
- Convention on Nuclear Safety (CSN), approved by Law No. 24776. In force since July 16, 1997.
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, approved by Law No. 25279. In force since June18, 2001.

- ❖ Convention on the Physical Protection of Nuclear Material, approved by Law No. 23620. In force since May 6, 1989.
- ❖ Amendment to the Convention on the Physical Protection of Nuclear Material, approved by Law No. 26640. In force since May 8, 2016.
- ❖ Convention on Early Notification of a Nuclear Accident, approved by Law No. 23731. In force since February 17, 1990.
- ❖ Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, approved by Law No. 23731. In force since February 17, 1990.
- ❖ Vienna Convention on Civil Liability for Nuclear Damage, approved by Law No. 17048. In force since November 12, 1977.
- ❖ Comprehensive Nuclear Test Ban Treaty (CTBT), approved by Law No. 25022. It has not yet entered into force.

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 the 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 Licensee 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

CNEA has informed the ARN about its decision to decommission the RA-8 reactor in the short term, and summit to ARN a Decommissioning Plan in addition to the Radiological Practices Code. In 2019, it was summited a final report and the clearance requirement. Currently, CNEA is waiting for ARN´s devolution.

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 Licensee 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 nuclear power plants should be decommissioned.

Regulatory standard AR 0.0.1 "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, regulatory standard AR 3.17.1 "Nuclear power plant decommissioning" determines the basic requirements for the decommissioning of those facilities. The main conditions are as follows:

- The Licensee, 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 Licensee 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 Licensee 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.

During 2019, a document which details what a preliminary decommissioning plan should take into account was uploaded to ARN´s open website. This is based in OIEA´s GSR Part 6 and Safety Guide WS-G2-1.

F.6.3 Background

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

As informed in previous National Reports, in compliance with the Nuclear Activity Act Law Nº. 24804, the responsibility for the execution and decommissioning activities performed relies on CNEA.

F.6.4 Planning for Decommissioning of Significant Nuclear Facilities

The reactor RA-8 has stopped operating since the nineties. A final report and clearance request were summited to ARN, which its response is pending.

F.6.5 Financing

CNEA has financed PNGRR and PRAMU works with the National Treasury funds, included and approved in its budget by the National Executive Power, because since the sanction and promulgation of Law No. 25018 in 1998, the Final Disposal of Radioactive Waste Management Fund has not been created and established yet, which its final goal is to finance the Radioactive Waste National Management Program.

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. Thus, the responsibility for financing the decommissioning of Nuclear Power Plants, research reactors, and other significant nuclear facilities is assumed by the National Government with its own funds.

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SECTION G SAFETY IN SPENT FUEL MANAGEMENT

G.1 General Safety Requirements

It is worth mentioning 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.

As a consequence of the accident at the Fukushima Daiichi Nuclear Power Plant and in order to apply lessons learned, ARN requested a stress test for each Argentine NPP in operation. It consisted in a new safety margins assessment, assuming there was a sequence loss of defence lines in depth caused by the heat sinks, lines of external electricity provision, and finally the simultaneous loss of both resources, which could eventually lead to severe core accidents.

The description of the ARN requirements during the stress test requested as a consequence of the accident in Fukushima is described in detail in the 2013 Report of the Nuclear Safety Convention. Such assessment included several aspects related to safety, which were mentioned in the Sixth National Report.

G.2 Existing Facilities

As described in previous Reports, SF management consists in wet or dry storage, depending on each case. Wet storage is performed in spent fuel pools for the period required for the decay of the fission products in order to enable its subsequent 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)
Embalse Nuclear Power Plant (CNE)	Storage Pool
	Storage Silos (ASECQ)
Ezeiza Atomic Centre (CAE)	RA-1 Spent Fuel Storage (DECRA-1)*
	Research Reactors Irradiated Fuel Storage Facility FACIRI

*Located within the Ezeiza Radioactive Waste Management Area.

G.2.1 CNA I Spent Fuel Storage Pools

SF described in this section come from the CNA Unit I, type PHWR, with an installed capacity of 362 MWe that started operating 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 of 3240 positions.
- Pool Building II: Constituted by four decay pools. Storage capacity of 8304 positions.

Both pool buildings include a manoeuvring pool or working area.

SF storage takes place in pools, which have a stainless steel lining of several millimetres thick, in a double tier arrangement. SFA 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 SFs within the pools is performed using an overhead travelling crane with a telescopic mast fitted with the SFA handling tools. By manoeuvring 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, 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 Operating 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 Unit I (See Section G.4.1).

G.2.2 CNA II Spent Fuel Storage Pools

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

SFAs are hung in a beam and stored in cooled demineralized water.

The number of positions in the four (4) pools is 6048. Storage maximum capacity of SF elements during normal operation is 4536 in three (3) pools; and in pool 2, that capacity is of 1061 SFEs. In this pool, 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.

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 assemblies.

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.

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. During the planned outage of the CNE, all the epoxy resin of the walls and the floor of the concrete pool was renovated, not causing any change to its storage capacity.

Failed SFEs are encapsulated and stored under water in the failed spent fuel storage pool. Unloading and transfer of SF 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. SFEs are stored under water in stainless steel trays.

During the planned outage, a third heat exchanger was added to the spent fuel pools system and an alternative cooling system (Alternative Cooling System for Spent Fuel Assemblies - SARPECQ) was also installed. The heat exchanger can be cooled with water from the Process Water System (SAP) or from the SARPECQ; this system was designed to keep water temperature stable in the pools once all the fuel of the core has been stored. This change enabled to retire the Process Water System (SAP) during the CNE life extension for maintenance and reconditioning without affecting SFEs cooling, considering that at that moment they were the only decay heat source.

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

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

SFEs are stored in these silos after 6 years of being cooled in the pool. The capacity of each silo is 540 SFEs housed in 9 baskets, with 60 SFEs per basket.

This system is in operation since 1993. There are plans to build the necessary silos to store the SF generated during the whole lifetime of the power plant. At present, 248 silos have been built, and towards the end of 2019, 239 silos were full already.

Upon request of ARN, the ASECQ 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. During the period included in this Report, the "Ageing Management Manual" was issued as part of the mandatory documents required by ARN for the Operating License of the second cycle of operation.

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 behaviour of these components. As it has already been mentioned, the dry storage for SFE is located within Embalse Site.

G.2.5 Centralized Storage of Spent Fuel from Research Reactors

G.2.5.1 Central Storage of Special Irradiated Fissionable Material (DCMFEI)

Since 1972, CNEA has the "Central Storage of Special Irradiated Fissionable Material" DCMFEI, which is located at the Ezeiza Radioactive Waste Management Area (AGE). This facility was designed and built to store SFEs from research reactors type MTR.

It comprises underground storage of 2.10 meters long and 0.141 meters diameter stainless steel tubes, with capacity to hold two (2) spent fuel elements type MTR or one (1) control element assembly in each tube. The tubes are closed with lead filled steel plugs.

Since March 21st 2019, this facility does not store any SFEs from research reactors. They have all been transferred to the FACIRI (see G.2.5.3).

At present, it stores 120 filters from the PPMo-99.

G.2.5.2 Spent Fuel Storage from RA-1 (DECRA-1)

Additionally, within the AGE, there is a storing area for SFEs from research reactors where 232 LEU spent fuel rods are stored, corresponding to the permanently discharged first core from RA-1 research reactor.

G.2.5.3 Research Reactors Irradiated Fuel Storage Facility (FACIRI)

This facility came to replace the DCMFEI and it has been conceived as a facility for centralized wet storage of spent fuels permanently discharged from the research reactors, enabling a better control of the maintenance of research reactors spent fuel and an adequate

monitoring of the quality of the water, as well as incorporating major safety improvements.

SFEs showing failures are encapsulated before being stored. Before unloading SFEs to the FACIRI pool, they are visually inspected, and the report previously prepared in the DCMFEI is assessed as part of the documentation to transfer the SFEs to the FACIRI. That DCMFEI report is based on a visual inspection and a test conducted in a device that removes external contamination by means of a water flow of 5 m^3/h to evaluate the integrity of the SFE based on the gamma radiation increase measured in the water flowing through the device. If the SFE is considered to be encapsulated due to its possible lack of integrity, it is covered by an aluminium cylindrical cladding before being transferred to one of the positions for encapsulated SFEs.

The FACIRI storage capacity is based on the depth of the pool (16 meters) and on the design of the grids pilled one upon the other, forming a column of grids. Up to 608 SFEs can be stored, distributed in 2 columns of 19 grids storing 32 SFEs 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 and a treatment system that keeps the quality of deionized water at adequate levels in order to preserve the integrity of SFE during storage. Furthermore, there is a monitoring station that, by means of an underwater camera, enables visual inspection of the stored SFEs.

The design of the FACIRI ensures that SFEs 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, as well as complying with the requirements concerning conventional safety and security.

On March 21st 2019, the last SFE was transferred from the DCMFEI to the FACIRI, and up to December 31st 2019 this facility stored 233 SFEs: 26 of them were encapsulated due to their possible lack of integrity, and they occupied 26 of the 96 positions available for encapsulated SFEs.

G.3 Siting of Projected Facilities

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

RA-10 is another of the projected facilities. For its siting, a specific research study was conducted, and it is part of the design documents required by ARN for the licensing of every new facility.

The evaluation was 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 facilities.

As mentioned in the previous National Reports, the safety requirements for the remaining facilities for SF management have not been modified.

G.4 Design and Construction of New Facilities

G.4.1 ASECQ within Atucha Nuclear Power Plant Unit I

The available positions in SFE pools at CNA Unit I will be full before the end of the lifetime of the unit; therefore, a new option for SF storage should be available.

CAN I's Special Projects Division and CNEA have developed the project conceptual engineering for the Spent Fuel Dry Storage System (ASECQ).

The ASECQ is under construction and it will enable SF transfer with a major decay located at the Pool Building I to an annex which will be the Interim Dry Storage Building. This building will include vertical subterranean silos and will be an extension of the controlled area that will have the same features of the existing pool zone.

In consequence, and considering the information included in the 2019 Report of the NSC stating that the CNA Unit I is in Phase A of the Long Term Operation Project, the ASECQ Project includes not only finishing Phase A, but also extending the plant operation during Phase B of the Long Term Operation. The construction of a new Dry Storage System compatible with both NPPs (CNA Unit I & II) is planned afterwards.

According to the ASECQ project conceptual engineering, SF will be located in a rectangular stainless steel storage unit (basket) with capacity for nine (9) SFs; this unit will be hanging from a supporting grid in the upper part.

In order to handle the baskets with SFs, 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 unit will be made up of stainless steel, with a storing capacity of one basket with nine (9) SFEs inside each.

Some silo units will include instrumentation for obtaining information about SF cladding temperature. Likewise, the silo will include a temperature and radiation monitoring system independent from those of the silo units.

Currently, the responsibility for financial management and final work supervision is in charge of Atucha Nuclear NPP Complex. The continuity and finalization of the development of engineering, surveillance and follow-up of the building work is in charge of the Nuclear Projects Management Unit. Its main stages are the following:

- Execution of the detail engineering project.
- Execution of civil works.
- Execution of electromechanical assembly.
- Start-up.

Civil works are almost finished by now and the mechanical assembly stage has started (See Section K.4).

As the facility abovementioned would not be ready to start up as planned, and with the aim of protecting the operation of CNA Unit I, the Nuclear Safety Department of CNA Unit II has created the following alternative that has been developed in the previous report:

1) Reorganization of the reactor's internal components placed in the decay pools hangers within the Pool Building I and II.
2) SFEs transfer from Unit I to Unit II: a total of 1435 SFEs have been transferred.

In a first stage, ARN authorized the transference of 620 SFEs from Unit I to the pools of Unit II, and then authorized a total of 1477 SFs. This last authorization was required because there is no dry storage available yet. The requisites for the transference were a burnup degree lower than 6740 MWd/tU and a minimum decay time of 33.5 years. A total of 1435 SFEs were transferred, and thus the transfer was finished during 2019.

G.4.2 CAREM-25 Nuclear Power Plant

CAREM-25 is an innovative design prototype 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 CAREM reactor prototype is located in Lima, Zárate, Buenos Aires Province, next to CNA Unit I and II NPPs.

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 refuelling and it comprehends the whole core. Qualification of enriched uranium fuel pellets fabrication process began towards the end of 2018.

Within the containment building, there is a spent fuel storage pool designed to store the SFEs 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 SFs stored in the SF pool as a safety measure.

- If required, it will enable 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.
- Compensating water loss by evaporation.

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

In case of emergency (loss of normal supply water line), it is planned to include a support facility that may be temporal.

CAREM civil work is in an advanced stage of the building of the containment (60%).

G.4.3 RA-10 Reactor

RA-10 reactor is a 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 power will be of 30 MW, and it will include a core made up of MTR type fuel reflected by heavy water.

SFs will be stored in pools inside the facility (enough to cover 10 years of operation) until they are transferred to a proper storage facility. The 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 assemblies during normal and abnormal conditions.

G.5 Safety Assessment of Facilities

The requirements for the safety assessment of SF and RW management facilities have not been changed since the presentation of the previous National Reports. They are described in Section H.6 and 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 SF and RW management facilities have not been modified with respect to the previous National Reports.

G.7 Final Disposal of Spent Fuel

The safety requirements stated in the First National Report continue in force so long as spent fuels are stored in facilities specially designed and operated for that purpose.

As already mentioned in Section B.1, related milestones would be proposals in the Third Version of the PEGRR, planned to be finished by 2020. In consequence, there are several projects under execution to increase storage capacity in order to meet the lifetime of reactors and provide a period of several decades until SFs have been transferred to a reprocessing plant or to a deep geological repository.

Up to date, R&D&I activities in relation to the geology of sites have been conducted in order to locate the deep geological repository for final disposal of SF, in case it is decided not to reprocess it.

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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 very low, low and intermediate level on account of their radiological characteristics (half-life, 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:

- Minimizing radiation doses
- Minimizing environmental impact
- Reducing costs

For that purpose, minimization of waste at the site and moment it is generated (minimization at source) and, consequently, the activity and volume of the different streams are taken into account. Moreover, as part of the minimization strategy of waste management, 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. Other examples from NPPs operation are the following: reuse of special suits with a segregation criterion for disposal and processing; reuse of supplies such as bags and cloth items (e.g. cleaning cloths); dismantling of filter units to reduce volume and to reuse their main structure to reassemble filters; and drying of clay to avoid immobilization with a cement matrix that greatly increase waste volume.

In addition, the PNGRR assists waste generators with the implementation of new processes or with making changes to the current processes with the aim of minimizing waste generation. The operational procedure PO-SNA_PNGRRC-006 019-R Rev.: 3 “Minimization and Segregation of Radioactive Waste at Source” in force since May 30th 2013 determines the criteria and requirements for a proper minimization and segregation of radioactive waste at source.

Another strategy for RW mimization used in Argentina is the clearance levelsof radioactive material based on the Regulatory Guide AR 8.

The principle of minimization is a regulatory requirement established in the mandatory Standard AR 10.12.1 “Radioactive Waste Management”, criterion 33: “Radioactive Waste Generation must be minimized as low as reasonable achievable (ALARA). Compliance of this requisite should be considered from the design phase to the operation and decommissioning”. In addition, Criterion 12 of the Regulatory Guide AR13 “Radioactive Waste Storage” determines that “The design of a radioactive waste storage facility and its safety systems should minimize radioactive material dispersion during the planned time of storage, e. g. using accordingly double-wall containments, waterproof walls and/or lining, etc.”.

H.1.3 Interdependence between Different Radioactive Waste Management Stages

Interdependence between the different management stages (e.g. transport, interim and long-term storage and final disposal) is considered when establishing operational procedures associated with the treatment and conditioning stages.

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

H.1.4 Efficient Protection for People, Society and Environment

The ARN Standard AR 10.1.1, Criterion 32, determines that “The Licensee must justify practices, optimize safety and observe dose limits and dose restrictions”.

Standard AR 10.12.1 determines that the RW generator shall be responsible for:

- Safe handling of the RW generated until they are transferred to the RW Manager.
- Obtaining a RW management system and any necessary ARN previous authorization in any stage.
- Conducting all necessary operations before RW treatment, characterization and conditioning stages.
- Ensuring proper maintenance of any documentation and records of interest.

Furthermore, said Standard determines that the RW generator could delegate, in full or in part, the execution of RW management activities, but shall assume total responsibility for radiological safety.

The RW Manager is responsible for:

- Segregation, characterization, treatment, conditioning, recording, transport and storage of RW whenever applicable.
- Determining waste acceptance criteria for RW Repositories.
- Conducting safety assessments of the Repository during the licensing stages, satisfying the requirements of ARN. The safety assessment of the Repository shall

considerate a scenario of normal migration of radioactive material along with the situation resulting from disruptive events occurring during the planned isolation period. In the safety assessment of the normal migration scenario, estimated doses for future generations shall not exceed the dose restrictions set in the design of the Repository. Such safety assessment must fulfill the requirements of ARN in terms of doses, risk or other safety indicators adequate for the required isolation periods.

- ❖ Keeping inventories of the RW transferred by the RW Generators, RW stored and finally disposed, permanently updating them during the operating stage of the Repository.
- ❖ Bearing responsibility during the activities related to the Repository closure and, whenever applicable afterwards, during the institutional control stage authorized by ARN.
- ❖ Delegating, in full or in part, when applicable, the execution of RW management activities, but shall assume total responsibility for radiological safety.

The Standard AR 10.12.1 determines that the Licensee of a facility that generates RW shall undertake safety assessments during the applicable stages of licensing under the approval of ARN.

H.1.5 Biological, Chemical and Other Risks Related to 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, Defense and Improvement of the Environment which has jurisdiction over the Embalse Nuclear Power Plant (CNE) located in this province.

H.1.6 Avoiding Actions with Greater Impact on Future Generations than Those 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 determines that in the safety assessment related to the normal migration scenario, the estimated doses received by future generations shall not exceed the dose restrictions set in the design of the Repository.

Moreover, by foreseeing that the present technologies used for radioactive waste management do not imply a potential risk for future generations, diverse studies and assessments 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 Avoiding Imposing Undue Burdens on Future Generations

The aim of Standard AR 10.12.1 “Radioactive Waste Management” is to determine requirements for the management activities to be performed with an appropriate level of radiological protection for individuals and for the environment, and of radiation sources safety for current and future generations.

Criterion 62 (related to safety assessment of RW final disposal facilities) of said Standard determines that in the safety assessment related to the normal migration scenario, the estimated doses received by future generations shall not exceed the dose restrictions set in the design of the Repository. Such safety assessment must fulfill the requirements of ARN in terms of doses, risk or other safety indicators adequate for the required isolation periods.

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. This Law provides the legal foundations for the existence of a fund for the management and final disposal of spent fuel and radioactive waste based on the contribution of the generators, either they are private or state-owned entities.

In this sense, Article 11 of the same Law considers the recovery of sites affected by industrial mining activities of uranium ores.

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

Furthermore, in order to ensure 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 SF and RW 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 ensure the availability of sufficient resources for CNEA to deal, when necessary, with the expenditure and investments to finance the management of SF and RW from NPPs.

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)
- Bariloche Atomic Centre
- Constituyentes Atomic Centre
- Ezeiza Atomic Centre
- Pilcaniyeu Technological Complex
- Uranium Production Plant

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H.2.2 Facilities of Atucha Nuclear Power Plant Unit I

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

Within this framework and as part of the Probabilistic Safety Assessment for Atucha Unit 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 with the events related to the safety of the radioactive waste management systems is two orders of magnitude below the dose constraint value determined as reference value. In such report the Handling and Storage System for Spent Fuels was also included.

Along the 2017-2019 period, the following activities were continued: periodic management of low level solid and liquid waste; treatment and storage of spent mechanical filters; and bulk storage of spent ion exchange resins. During this period no wet RW cementation was carried out. Activity levels of discharges of effluents continued being sufficiently low and below the limits, so there was no need to apply any concentration treatment.

There has been progress in the development of the activities conducted in the LABCAR. With the analyzed samples of spent ion exchange resins of the primary circuit crud, of contaminated oils, and of the silica gel filters, radionuclide relations were elaborated in order to determine RW characterization.

The radiological inventory of the RW from CNA Unit I was officially submitted during 2019, considering direct measurements and both own and bibliographic scaling factors.

Furniture and fume hoods of the LABCAR are being renovated; and the development of volatile radionuclide determination techniques in the samples is being continued.

H.2.3 Facilities of Atucha Nuclear Power Plant Unit II

Along the 2017-2019 period, periodic management of low level solid and liquid waste, storage of spent mechanical filters; and bulk storage of spent ion exchange resins were continued.

To date waste liquids were not processed by evaporation in the liquid waste treatment system (KPF) nor liquid or resin cementing campaigns were conducted with the processing system of radioactive concentrates (KPC), because, as in CNA Unit I, activity levels of discharges of effluents were sufficiently low and below emission limits, so there was no need to apply any concentration treatment.

The radiological inventory of the RW from CNA Unit II was officially submitted during 2019, based on the characterization from CNA Unit I. Characterization of samples from this operating unit is still in progress.

H.2.4 Facilities of Embalse Nuclear Power Plant

During the progress of the Life Extension Project of this NPP, storage facilities described in the SIN were used as expected, and they were adapted according to the needs and observations from audits and requirements produced during that period of time, which ended in some restructuration and reorganization.

As the Deposit for Storage of Steam Generators and Heat Exchangers of the Moderator was full as expected, it was ultimately closed, replacing the entrance gates that have been used during the Life Extension Project with fixed and sealed walls. The same happened with the Storage Silos for High Radiation Waste, which was full after some retubing was performed (some pressure and calandria tubes were changed), ending with the sealing of themanhole.

In the Controlled Area, in the room created as RW Interim Storage Deposit, there is an operating equipment to grind used and clean yellow bags. This process is performed in order to prevent these bags from being used out of the CNE, complying with the waste management procedure.

The Radioisotopes Analysis Lab is currently analyzing samples taken during the life extension period of the NPP in order to obtain scaling factors from the CNE.

H.2.5 Ezeiza Radioactive Waste Management Area (AGE)

The Ezeiza Radioactive Waste Management Area (AGE) is the facility exclusively destined for the treatment, conditioning and storage of solid and liquid radioactive waste, and disused

sources; and also for final disposal of historic waste. It is located in the province of Buenos Aires in an area of 8 hectares within the CAE.

In addition, low and intermediate level waste is safely stored in the AGE, awaiting the construction of an appropriate Repository as foreseen in the PEGRR.

Safety Re-evaluation of the AGE

The radiological inventory and the conditions of other disposal systems have been updated. AGE environmental evaluation and planning has also been updated to improve the underground aquifers behavior modeling. The aim is to increase quantity and quality of the data from the spreading coefficient and longitudinal dispersion of the area.

The situation of the AGE facilities by the end of 2019 in relation to the previous National Report is described in the following paragraphs.

AGE Facilities for Spent Fuel and Radioactive Waste Management

Maneuvering Yard and Stowage of Radioactive Packages (PMEB)

After some structural changes, the PMEB currently stows packages containing radioactive material such as structural solid waste, spent resins from the RA-3 and low and intermediate level liquids for their treatment in the PPCC and PTARR.

Conditioning of structural solid RW in 200 dm^3 drums was conducted, and some packages have been relocated in order to optimize radiological protection and reduce radiation fields.

A survey of structural solid RW stored in the PTARR was conducted.

Cementing and Compacting Pilot Plant (PPCC)

In March 2018 the Start-Up Licence extension was requested to ARN, and afterwards the Safety Final Report with the Operating Licence was submitted. During 2019 observations from ARN were received within the framework of the Operating Licence requirement and, continuing with the licensing of personnel, two individual Licences Level 2 were obtained.

Facility operation was continued within the framework of the Start-Up Licence, carrying out the cementing and compacting of different streams of RW, and the document corresponding to the Quality System of the Facility was updated.

Three full-scale cold cementing tests were performed, concluding in the need of improving both systems to be further implemented in the PTARR.

Treatment and Conditioning Plant of Radioactive Waste (PTARR)

The civil work for the refurbishment of the original facility of the PTARR Project started on June 15th, 2015 and finished on November 30th, 2018.

The processes to be conducted in the facility have been assessed, and a first version of the resins transference system together with the mixing system has been built.

The resins mixing system to improve homogeneity during conditioning and the structural RW cutting system have been designed and built together with the dynamic confinement system for their future implementation.

Additionally, the RA-3 spent resins collecting system (foreseen for incidental events) was designed and built on a small scale, and after assuring its feasibility for implementation, the full-scale design was produced.

Interim Storage Deposit for Spent Sources and Radioactive Waste (DAIFRR)

As a result of the routine operation of this deposit, the stored inventories of RW and disused sources have also been increased. In order to improve the operational doses and optimize storage areas, the package stowage yards have been divided into sectors.

Packages have been rearranged in order to reduce radiation fields in places with higher occupancy factor, and maintenance of the top cover, drainage, external surfaces of walls and interior lighting has been continued.

Long-Term Storage Deposit (DAP)

This Deposit, located in the Ezeiza Atomic Centre, with administrative dependence on the AGE, became operational in 2010 in order to store waste from old practices (drums containing radioactive waste removed from Trench No. 2 of the Semi-containment System for Solid Radioactive Waste).

Due to the fact that this facility created to store historic waste in transoceanic containers does not operate continuously, neither new radioactive packages have been deposited nor have any movements been produced. Monitoring to evaluate radiological condition and maintenance activities has also been carried out.

Facilities for Spent Fuel and Radioactive Waste Management next to the AGE

Radioactive Waste Characterization Lab (LABCAR)

The aim of this lab is to improve information about radionuclides present in waste stored within the AGE in the DAP, and in the newly generated waste, in order to determine the treatment and conditioning techniques, to control conditioned waste quality, and to provide a complete and updated radiological inventory of all waste, complying with ARN requirements.

This lab will also be used to control characterization performed by the NPPs to the RW arising from them.

During 2017 and 2018 cold start-up tests without radioactive material were continued; observations to the Unique Document Radiological Safety Assessment (DUESR) previously

submitted to ARN were received and adopted, and the Document was delivered again to ARN for its revision.

On May 6th 2019, ARN granted the Operating Licence of the facility, and so calibration and start-up of equipment using radioactive patterns was started.

From that moment onwards, progress have been made in the development of ion exchange resins acid digestion techniques and cementing in inactive samples and of qualitative and quantity determinations of the radionuclides content in samples of different matrixes, arising from the RA-3, FACIRI and AGE. Determinations of Tritium in environmental samples have also been conducted.

Furthermore, documentation regarding the sampling system of drums from the Semi Containment System for Solid Radioactive Waste (SSRRS) was submitted to ARN in order to obtain the authorization for Non-Routine Practice.

AGE Final Disposal Facilities

Semi Containment System for Solid Radioactive Waste (SSRRS)

In previous National Reports, it was informed that all of the final disposal systems and semi containment systems are no longer operative. Radiological surveillance of those systems has been continued.

Up to the end of 2017, Gamma spectrum from 54 drums (47 cemented, 2 compacted and 5 non compactable drums) corresponding to a lot of 114 drums from sectors S and T (uncovered) of the Trench No. 2 (See Sixth National Report, Section H.2.5), extracted during the withdrawal and encapsulation of drums carried out in 2009, have been obtained. There has been progress in the analysis of some acquired spectra, estimating the activity of gamma emitting radionuclides from 36 cemented drums, assuming some approximation in terms of homogeneity.

Semi containment System for Very Low Level and Very Short Lived Radioactive Liquid Waste

In previous National Reports, it was informed that all of the final disposal systems and semi containment systems are no longer operative. Radiological surveillance of those systems has been continued.

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

In previous National Reports, it was informed that all of the final disposal systems and semi containment systems are no longer operative. Radiological surveillance of those systems has been continued.

H.2.6 Facilities at the Ezeiza Atomic Centre

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

Due to the changes that have been implemented in the processes and in the radioactive waste management of the PPR in June 2001, the residence time in the storage decay tanks is sufficient for their subsequent discharge into the environment. For further information about the PPR, see Section H.2.6 of previous Reports.

H.2.7 Pilcaniyeu Technological Complex (CTP)

This center 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.

In recent years, the following activities have been developed in terms of waste management and storage:

- A campaign to collect and reorganize waste in non-operating plants.
- The in-site waste storage system was improved, mainly those related to cleaning and personal protection items, including segregation and minimization of new materials when entering controlled areas.
- The interim low activity waste storage area has been modified with the construction of a platform to preserve storage containers.
- Infrastructure and containers protection have been improved by implementing snow and water draining systems. Containers have also been separated, creating radiological monitoring passages.
- A drying process of the drums containing water has begun in order to improve the structural behavior of drums and avoid potential leaks.
- The licensing process of the facility has been started.

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 ARN. This waste includes mainly gloves, clothes, plastics, disposable material from laboratories, hoses, gutter cleaning and filter and prefilter dismantling.

They are consolidated inside 200 dm^3 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 section are the same as developed in Section G.3.

H.4 Design and Construction of New Facilities

H.4.1 Located at Atucha Nuclear Power Plant Unit I

During the informed 2017-2019 period, a new Interim Storage Deposit for RW (known as DATRR III) of 1500 m^2, which includes a new semiautomatic stowage system, was designed and built within the site of CNA Unit I. The building is already finished and there are only some adjustments to be made to the internal metallic structure. The deposit is expected to be operative by mid 2020.

The semiautomatic stowage system is made up of metallic racks across the width of the impassable 5 level high building, without internal passages. The installed capacity is of 2720 positions of 120 cm x 120 cm platforms, equivalent to 10880 drums of 200 liters each.

Stowage will be performed with a shuttle (mobile robot platform) that will transport the load through a rail to the next free position. The shuttle will be positioned in the desired level of the facility with an elevator, and will be transported from the front to the storage position with a remote control. In turn, the shuttle will include a remote visual system to control the condition of the stowage during periodic inspections.

Some of the benefits of this technology are the optimization of storing space, deriving in economic savings; the optimization of doses during stowage activities; the improvement in personnel safety due to the type of structure, and the improvement in the capacity of stowage periodic inspection.

Furthermore, during this period, technical specification has been developed, and the acquisition process to create a Radioactive Waste Exclusion Zone (ZERR) has begun in order to keep all waste for interim storage within a perimeter fenced confined area with a unique access control. Some progress have been done regarding the specification of the irradiator building, which will work as an entrance building, with portals and dosimetry, and will include the gamma measurement room for drums and samples.

This facility will have the following goals: maximizing the distance of non-occupationally exposed personnel and complying with the regulatory recommendation of 10 µSv/h doses for preexisting storage buildings according to ARN Guide AR 13 “Radioactive Waste Storage”; minimizing the contamination dispersion risk in incidents occurred during storage operations, by installing monitors that control people contamination at the entrance of the ZERR; and optimizing security control.

H.4.2 Located at Embalse Nuclear Power Plant

As a consequence of the activities developed during the CNE life extension, the inventory of RW stored increased substantially. This led to the need for progress in the project of building new RW storage deposits.

Due to the magnitude of this project, waste generated before the authorization is granted is the only waste considered; and as a response in the short term a deposit for interim storage of contaminated material and tools to be processed is being conditioned.

Meanwhile, the existing RW storage deposits are being enlarged in order to store waste arising from the new cycle of operation of the CNE.

Besides the deposits described in the SNR, with a capacity of about 3000 m^3 in total, increasing capacity in at least other 3000 m^3 is being developed. Initially, 4 deposits of about 400 m^2 and 5 meters tall each are being considered. The first building stage includes the whole platform and a first deposit for low level waste storage, which will be located close to an existing waste deposit of the site that already has the required necessary control system.

H.4.3. Located at the Constituyentes Atomic Centre

H.4.3.1 Nuclear Materials Chemistry Lab (LQMN)

The Nuclear Materials Chemistry Lab located at the CAC is devoted to R&D activities, education and training of young professionals on new process of SF and RW management.

There has been progress in the conditioning and start-up of the controlled ventilation system of the whole facility, and in the setting-up of the equipment by conducting trials without radioactive material.

The mandatory documentation to obtain the Operating Licence with radioactive material is being prepared in order to be later submitted to ARN.

H.4.4 CAREM-25 NPP

Section G includes the detailed features of this new facility. The main aspects associated with the safety measures of the RW 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 RW arising from the operation and maintenance of CAREM-25.

RW will be managed to ensure an acceptable level of radiological protection of workers and public, and the preservation of the environment.

RW 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 RW within the CAREM site.

RW 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, step factors) or analytical methods (calculation software).

RW shall be kept isolated, far from humans, during the necessary period of decay, using adequate multiple barriers.

H.4.5 RA-10 Reactor

This facility has been described in G.4.3. The Radioactive Waste Management System of this facility 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 in the environment.

Waste generation has been considered since the design stage by 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 level waste, and intermediate level waste. Some of the waste treated by this system will be spent ion exchange resins, used components from some of the reactor systems, and filter elements from the ventilation system, among others.

Radioactive waste will be characterized and transferred to the AGE, complying with acceptance criteria established by the PNGRR.

H.5 Mining Waste and Processing of Uranium Ores

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 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 actual impacts, the possible contamination routes, the elements present, etc. On the basis of internationally accepted techniques, the possible specific solutions to manage the tailings and the restoration of each site are developed.

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

- 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 to 1996, and some tasks to keep their radiological conditions had already been performed. Both CNEA and ARN conduct periodic environmental surveys in the areas around the industrial mining complexes that process uranium ore.

The aim is to ensure the protection of the environment, 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 was to finish the works at Malargüe site. Detail engineering for Los Gigantes Site management has been conducted, and it was submitted to the Enforcement Authorities of Córdoba Province in November 2018. Likewise, the studies necessary for environmental restitution engineering of the following sites will be continued: Córdoba, Tonco (Salta Province), Pichiñán (Chubut Province), La Estela (San Luis Province), Los Colorados (La Rioja Province) and Hüemul (Mendoza Province).

In 2017, the project activities aimed primarily at finishing the restitution works of the Former Malargüe Industrial Complex and to continue the engineering for the management projects of the Former Los Gigantes Mining and Milling Complex and El Chichón, environmental liabilities deposited in Córdoba. As mentioned before, in November 2018 detail engineering for Los Gigantes Site was submitted to the Enforcement Authorities of Córdoba Province, awaiting approval. Moreover, environmental characterization studies of environmental liabilities of the uranium mining of the other six Sites have been continued, as well as the execution of the monitoring plan and promotion of PRAMU in different areas.

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

The CMFSR began extraction activities in 1975 and production activities in 1979, and it operated until 1995, when for technical and financial reasons, it was suspended (mainly due to the international low cost of uranium). Production continued until 1997 with stockpile.

When operation was suspended, 1600 tons of uranium had been extracted, leaving around other 6000 tons to be extracted. Initially, due to the great reserves of uranium, CNEA kept the stance of a future reactivation of the site, preserving its infrastructure in excellent conditions and not including the site in the list considered by PRAMU. Since the CMFSR was suspended, the site has been devoted exclusively to environmental monitoring and remediation plans of environmental liabilities.

In June 2004, CNEA as operator submitted the Environmental Impact Assessment (EIA) document for the reactivation and synchronic remediation of the environmental liabilities of the CMFSR, complying with the Province Legislation. In response, enforcement authorities requested a new Environmental Impact Assessment related to the “Management of Waste in Interim Disposal”, taking into account firstly the treatment of quarry water and solid waste management (Phase 1), and secondly the assessment for a future restart.

In 2007, CNEA submitted a new Environmental Impact Assessment (EIA) document including only the process of remediation of environmental liabilities and leaving aside the production restart. Due to several disagreements between CNEA and Provincial authorities, this document did not progress.

Finally, in 2014, CNEA submitted the document Environmental Impact Statement (EIS) for the remediation of quarry water and solid waste, which after some changes was approved and went on to the next stage.

During January 2019, the binding Public Hearing for the approval of the “Environmental Impact Statement: San Rafael Mining and Milling Complex - Remediation Stage Phase I” was held. It entails the management activities of remediation of quarry water, solid waste and effluents from the dike for evaporation DN3B to the dikes DN8 and DN9.

Later on, due to some enquiries and doubts from participants of the Hearing, a second Public Hearing was held in April 2019.

In July 2019, by means of Resolution 259, the Secretariat of Environment and Territorial Planning (SAYOT) of the Mendoza Province granted CNEA the Environmental Impact Statement to the Remediation Project of the San Rafael Mining and Milling Complex (CMFSR) Phase I.

According to the Resolution passed on July 15th 2019 by the Province of Mendoza, CNEA shall proceed with the remediation activities of quarry water, solid waste and effluents from the dike for evaporation DN3B to the dikes DN8 and DN9.

Neutralization activities of effluents from DN3B started In November 2019.

Operating procedures for treatment processes of quarry water and solid waste are being elaborated in order to be submitted to the Provincial authorities and ARN.

Plant facilities are being conditioned and the systems of dikes DN5 (part of the conditioning treatment process) are in their final stage of construction.

In the same manner, the design of a procedure to close quarries is being developed, aimed to be applied fist at quarry “El Gaucho I and II”.

H.6 Safety Assessment of the facilities

During 2019, activities requested by ARN related to safety assessments of interim storage deposits of low, intermediate and high level RW located within NPPs sites have begun.

Criterion 40 of the ARN Standard AR 10.12.1 “Radioactive Waste Management” Rev. 3, and RQ-CNE-101 and RQ-CNAI-104 determine that RW storage deposits shall undergo a safety assessment comprising design, construction and operation stages, as appropriate, as well as a safety analysis during normal, abnormal and accidental operation.

The scope of the safety assessment includes all interim storage deposits of RW, as well as all RW management activities carried out in said deposits, located at CNA Unit I and II, and CNE respectively.

Waste deposits located outside the radiologically controlled area of the NPPs are not included. These deposits have already been considered in the Probabilistic Safety Assessment (PSA) of other radioactive sources different from the core of CNA Unit I and CNE. These assessments are expected to be finished by June 2020.

H.7 Operation of the Facilities

The considerations corresponding to this section 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.

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

SECTION I TRANSBOUNDARY MOVEMENTS

In Argentina Revision 3 of the Standard AR 10.16.1 *Transport of Radioactive Materials*, which agrees with the 2012 Edition in its Spanish version of the *IAEA Regulation for the Safe Transport of Radioactive Materials: Specific Safety Requirements No. SSR-6"* is already in force. The revision of this standard was approved by Resolution of the Directory No. 14/16 on 25 January 2016. 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
- *Law on Transport* 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),* incorporating the abovementioned *Regulation for the Safe Transport of Radioactive Materials* of the IAEA No. SSR-6.

In relation to cross-border movements, the agreements and / or conventions signed by Argentina and ratified by law are:

- 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).
- The "Agreement for the Facilitation of the Transport of Dangerous Goods" approved by Decision of the MERCOSUR Council No. 14 dated December 3, 2019.
- Convention on the Physical Protection of Nuclear Materials, in the framework of the International Atomic Energy Agency (IAEA) and its amendment approved by Law No. 26640, enacted on 13 October 2010.
- 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 this 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 has 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 the radiations emitted by them or from nuclear reactions and transmutations. This decree was replaced by the legal and regulatory framework determined by ARN and described in Section E.2.

The Standard AR 10.1.1 Rev. 4 “Basic Radiological Safety Standard” determines the basic radiological safety requirements for nuclear activities performed in the country, including sealed sources. This Standard classifies the facilities in three levels. Such classification determines the regulatory control models based on a gradual approach related to the radiological risks associated with the practices involved in such facilities.

Said Standard determines that the Licensee, holding a license or authorization, is liable for complying with regulations, requirements, licences, authorizations and permits issued by ARN. The operation licences / authorizations issued by ARN expressly include responsibilities and conditions of operation. Some of them state that the Licensee (of the operation of a facility) is responsible for the SF management and the RW generated in the facility under its responsibility (which is the case of disused sealed sources in some facilities).

Likewise, the Licensee, when applying for an authorization or presenting mandatory documentation, assumes responsibility over those radioactive sources once they have reached the end of their operating and specific life. In turn, ARN performs regulatory inspections and audits to verify that Licensee comply with their responsibilities in order to detect failures to comply with the standard and avoid situations that might derive in radiological accidents.

Furthermore, the procedure to grant licences for the management of radioactive sources, in any of the utilization cycles, allows ARN to control that the people 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 or 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 Safety and Security of Radioactive Sources* in the 2003-2004 period, the country complies with the recommendations formulated in it, reinforcing the permanent 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, ARN determines that:

- Every natural person or legal person may, among other activities, adopt, introduce, conduct, interrupt or cease a practice, extract, treat, design, manufacture, build, assemble, install, acquire, import, export, supply, provide, distribute, lend, rent, receive, site, locate, start up, own, use, exploit, maintain, repair, transfer, remove from service, dismantle, transport, store or dispose of radioactive sources provided they comply with the standards and requirements determined by ARN. Only facilities having adequate resources may handle radiation sources, and the personnel require adequate knowledge and training.
- Licensees 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 to Maintain an Adequate Control of Disused Radioactive Sources

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

- The storage of disused radioactive sources is allowed only in the facility as long as the Licensee is able to demonstrate that there is a specific program for its reuse or for its use in replacement of another source existing at the site.
- In this case, the Licensee must provide an interim storage area qualified as a deposit, over which they have adequate control to prevent non-authorized access, and appropriate security measures to avoid the theft thereof. They must also keep auditable records of the regular checks undertaken in the interim storage area.

In case the Licensee does not have a suitable place for storing radioactive sources or in case of any other situation determined by ARN, the radioactive sources must be sent to a safe storage site. ARN requires the source to be sent to CNEA in custody, so that it is safely stored in the DAIFRR located at the AGE, a facility created for this purpose. However, in extreme circumstances, in order to keep the source under control, it can also be transferred to a nearby facility licensed for this purpose, with an appropriate deposit and assuming full responsibility.

It may be underlined that during 2019 Argentina adhered voluntarily and non-bindingly to the *IAEA Guidance on the Management of Disused Radioactive Sources*, a document produced within the framework of the *Code of Conduct on the Safety and Security of Radioactive Sources*.

J.4 Special Actions for Appropriate Control of Radioactive Sources

ARN has agreements with the 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.

In this context, ARN has entered agreements with the customs authorities to ensure that:

- All imports or exports of radioactive materials should be performed with ARN's authorization.
- Industrial plants, measurement instruments and laboratory equipment that may include radioactive sources to be imported shall previously submit a declaration to ARN stating the content of such type of sources.
- In the case that radioactive sources deposited in custom premises exceed the time allowed by its internal procedures, ARN must intervene in order to arrange for the storage at CNEA's authorized facilities.

ARN pays special attention to cases where it is not possible to ensure the control of radioactive sources, as for example, when a company having radioactive sources goes bankrupt and/or when a legal action orders an attachment on their assets. In those cases, ARN and the Justice act together to confiscate the involved radioactive sources and send them to a safe storage, preventing accidental events. This safe storage may imply the definitive custody of the sealed source in disuse in the DAIFRR, becoming CNEA the new owner of such source. It should be underlined that the Licensee of the use of radioactive sources shall continue being responsible for the safety and security throughout the whole cycle of life of such sources until they are formally transferred to another Licensee.

In the case of exports of radioactive sources and before granting the authorization for the pertinent export, ARN interacts with the Regulatory Authorities of the countries involved. In the case of Type I and II radioactive sources, the procedures recommended by the IAEA *Guidelines on Imports and Exports of Radioactive Sources* are applied. In the case of other types of sources, authorization procedures used 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 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 originally by ARN in 1995 and revised in 2002, and with IAEA technical documentation (IAEA – TECDOC – 1344 and IAEA – TECDOC 1355). Said Directive was established as mandatory for all facilities conducting activities that involved the use and/or storage of radioactive sources in use or in disuse, under their responsibility.

In January 2007, ARN issued the Standard AR 10.13.2 “Security Standard for Sealed Sources”. The following measures are included in said Standard:

- In the case of a facility with high radioactive inventory (above the threshold mentioned for Type I sealed sources, 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, 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 mentioned in IAEA TECDOC-1355 *Security of Radioactive Sources*.

For the transport of sealed sources, extra security measures, equivalent to those required for transportation of nuclear materials under the Standard of Physical Protection AR 10.13.1, are applied, considering a gradual approach according to the category of material to be transported. These measures, in addition to the radiological safety measures, were specifically created to prevent fraudulent acts, and include corrective actions that should be applied in case of events involving Type I sources.

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, 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 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 ARN and other competent authorities in the matter, 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

Sections E.2.2.5 and E.2.2.6 describe the regulatory actions and the applicable penalty system regarding the use of radiation sources.

J.7 Abnormal Events and Emergencies

Argentine regulations determine that people or organizations using radioactive sources must implement emergency plans or procedures. The criteria determined by ARN in case of an emergency includes the evaluation of scenarios for specific situations such as: theft or loss of the radiation 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 radioactive sources. 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 Radiological Emergency Intervention System (SIER*)* is an emergency system for radiological emergencies occurred in facilities or in public areas where radioactive material coming from regulated companies or from orphan sources is involved. This system operates 24 hours, 365 days a year. The PNGRR, in the case of being summoned by the SIER when a radiological emergency occurs in a facility or in a public area, transports the radioactive source to the CAE and stores it in custody in the DAIFFR, the facility licensed for that purpose.

ARN has cooperation agreements with organizations that intervene in case of an emergency, such as the Argentine Army, the National Gendarmerie, the Argentine Navy, the Argentine Federal Police (PFA), the Argentine Coast Guard and the National System for Comprehensive Risk Management (SINAGIR).

J.8 Readmission of Decayed Sealed Sources to the Country

The import of decayed sealed sources, as well as the import of any other radioactive source, is authorized by 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 licence.

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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 were completed in the period between the presentation of the Sixth 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
- Regulatory inspection programs
- Emergency plans
- Education, training and re-training of operating personnel
- Quality assurance program
- Preventive, predictable and corrective maintenance programs

K.3 Management Safety Improvements

In addition to the regular activities mentioned above, other projects and modifications to improve safety were developed and put into practice. Some of them are listed below.

K.3.1 Follow-up of the Actions Taken in the Light of the Fukushima Daiichi Accident, focused on the Period 2016-2018

As a consequence of the Fukushima accident and with the purpose of applying the corresponding lessons learned, ARN requested to perform a stress test to each operating NPP in Argentina, 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 the loss of heat sinks, lines of external electricity supply and finally the simultaneous loss of both resources which could eventually lead to severe accident scenarios of core damage.

The topics included in the assessment have already been mentioned in the SNR and in the 2013 Report to the Convention on Nuclear Safety.

Reactors safety is periodically assessed, including safety of spent fuel pools. These assessments entail the operating experience as well as the event occurred in Fukushima. It should be noted that the updating of the seismic evaluation of Embalse and Atucha sites is described in the specific chapters of the Convention on Nuclear Safety. The main results

were completed in CNA Unit I and II, and the resulting modifications are being implemented. Foreseen updates were implemented during CNE refurbishment outage, and they are described in the following paragraphs.

In response to the regulatory requirement mentioned, the Licensee of CNA Unit I, and II and CNE (NA-SA) has conducted the required stress test and the reports were submitted to ARN.

Afterwards, ARN conducted an evaluation of these reports. As a result, opportunities for improvements related to the incorporation of systems and additional actions of the operator tending to prevent sequences leading to severe accident scenarios were identified.

Improvements and modifications required to the Licensee of the NPPs include an implementation schedule consisting of short, medium and long term actions, which were considered acceptable by ARN. The improvements required as a result of the stress tests focused on the period 2016-2019 are the following:

K.3.1.1 Loss of Safety 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 Unit I

Improvements mentioned in the Sixth National Report remain the same for this period.

CNA Unit II

Improvements mentioned in the Sixth National Report remain the same for this period.

CNE

During the refurbishment outage ***(2016-2018)***, required for the plant's life extension, some power supply improvements were implemented. The most important are listed below:

- **External Power Supply Protection Devices**

500 kV station protections, bars, lines and switches failure were improved.

- **Class III Diesel Generators (DGs)**

The four standby Diesel Generators (Class III) for the power supply system of the CNE were replaced by newer higher power DGs independent from the process water system (closed cooling system). All the necessary changes to the building of this system were performed,

including structural backing; and a new redundant system of fuel storage for generators was installed.

- **New Emergency Power Supply (EPS) System**

The two 50 kW (75 kVA) DGs were replaced by new higher power ones of 1.6 MW nominal power (2 MVA) and 6.6 kV nominal tension, and were installed in a brand-new seismic qualified building (outside the service building), with underground fuel storage tanks. The system is completely redundant.

- **Batteries Availability Extension**

An extra 1500 kVA/380 V Diesel Generator was installed in order to recharge 2 battery banks and to energize 3 distribution bars of each of the power systems belonging to Class I (uninterruptible 220 VDC and 48 VDC trains, respectively) in case of a complete loss of the power systems of the plant, including the EPS system.

K.3.1.1.2 Station Blackout (SBO)

As a result of the SBO studies, the NPPs Operation Licensee has decided to implement the following improvements:

CNA Unit I

- **Alternative Power Sources**

Improvements mentioned in the SNR remain the same.

- **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 one or two fuel assemblies, was assessed.

The measures necessary to ensure the integrity of the fuel located inside the refueling machine were implemented by means of a guideline within the Severe Accident Management Program (SAMP).

- **Batteries Availability Extension**
- **Instrumentation & Control (I&C)**

Improvements mentioned in the SNR remain the same.

CNA Unit II

- **Alternative Power Sources**

Since after a blackout, the plant does not have electricity feeding to supply certain key components to keep the core cooling, it is necessary to implement the modifications to the facility to feed electrically these components and, consequently, take the plant to a safe and stable condition.

Power supply for key components is achieved by means of a Mobile Auxiliary Generation System which has an only Auxiliary Diesel Generator connected to one or more 6.6 kV bars of the Emergency System (supply bars BDA, BDB, BDC and BDD).

The aim of this modification is to supply water to the steam generators and vent steam to the atmosphere. Power delivered by the Mobile Diesel Generator is also enough to feed KBA volume control system components and to inject water into the moderator primary system.

In particular, a modification was implemented to supply water to fuel elements pools by means of the system of purification of fuel elements pools by using the firefighting system. This system is supplied from the firefighting system of the building site that includes a diesel pump.

- **Fuel Assemblies Integrity Assessment**

Similar to CNA Unit I case, a detailed assessment of the evolution of the conditions in the exchange machine of CNA Unit II in case of total SBO was conducted.

The necessary measures to ensure the integrity of the fuel placed inside the refueling machine were implemented by means of a service order, until it can be incorporated to the Operations Manual.

- **Interconnection between CNA Unit I and II Diesel Generators**

A guideline within the SAMP was elaborated considering how to reestablish tension in normal and auxiliary bars of CNA Unit II from the power supplied by the normal bar of CNA Unit I through its secured bar, this being supplied by de emergency DG.

- **Batteries Availability Extension**

Through a service order, there is a possibility of extension of electricity supply time from batteries, until this can be incorporated to the Operations Manual.

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During the refurbishment outage ***(2016-2018)*** required for the plant life extension, some improvements related to the SBO scenarios were implemented. The main activities conducted were the following:

- **Abnormal Event Procedure**

An Operating Procedure for Abnormal Event (POEA) to respond to the loss of cooling and/or loss of water inventory from the spent fuel pool was elaborated. This procedure includes all 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 due to a SBO, the POEA determines suitable actions to replenish with water from alternative sources of secured supply (fire trucks) and to monitor the level and temperature of the pool from the outside of the service building.

- **Fuel Elements Integrity Assessment**

A POEA was elaborated to respond to the loss of cooling of the refueling machine with spent fuel elements that could be located inside the machine, when it is decoupled from the reactor.

- **Alternative Power Sources**

There is a 668 kVA/380 V MDG that will be used to meet a specific power demand in case of accidental situations caused by a SBO. It is an additional supply source to the existing sources to supply unspecific charges.

- **Batteries Availability Extension**

K.3.1.1.3 Loss of Heat Sinks

As a result of the assessment abovementioned, the Operation Licensee will be implementing the following:

CNA Unit I

- **Alternative Water Sources**

Alternative water sources of secured water supply (such as reservoirs, pools, tanks, etc.) will be added to the existing ones in order to deal with severe accidents caused by the loss of heat sinks. The plant must also have appropriate accessories/devices to connect these

water sources with the respective pumps and supply lines in order to ensure the cooling of the core and of the spent fuel pools in the long term by implementing the following:

- Spent fuel pools water replenishment 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.
- Installing an independent pump assigned to the aforementioned process in order to extract groundwater to fill the spent fuel pools. A secured bar and a MDG operated by a simple manual connection will supply power to the pump. Furthermore, implementing an alternative power supply system to feed the necessary I&C to monitor the relevant parameters of the spent fuel pools from outside the pools building is also planned.

In relation to the two previous points, an alternative system was implemented to supply water to the spent fuel pools consisting of a well pump and branches to each pool with the respective valves. This system enables the operation and monitoring of the water level from the outside of the building, and it is independent from the control room. Electricity supply for the submersible motor pump and the instruments is redundant from a secured bar and the MDG.

- Water inventory replenishment in the steam generators (SGs) through the second heat sink system (SHS) in case of simultaneous loss in the tank, the residual heat removal chain and the guaranteed water injection 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.
- Water replenishment in the SHS system, to ensure an independent 72-hours operation without external actions.

In relation to the two previous points, a water replenishment inventory system was installed in SGs to keep one of them as a cold source in accidents where no feedwater tank is available or where the later cooling chain and the guaranteed water injection system for SGs and their tank or supply pump are not available. It consists of supplying water with a UJ pump to UA pools and, from these pools by means of another pump, UA10 D020 and/or UA10D21 to the RX tank or independently to boost a RX feeder. Pumps can be supplied from the MDG.

CNA Unit II

❖ **Alternative Water Sources**

Alternative water sources of secured water supply (such as reservoirs, pools, tanks, etc.) will be added to the existing ones in order to deal with severe accidents caused by the loss of heat sinks. The plant must also have appropriate accessories/devices to connect these

water sources with the respective pumps and supply lines in order to ensure the cooling of the core and of the spent fuel pools in the long term by implementing the following:

- Providing an alternative water reservoir to keep water supply for removing heat through the SGs and to keep the spent fuel pool cooled in the long term.
- Implementing an additional system to replenish water in the spent fuel pools from an alternative reservoir, such as groundwater, existing tanks or other sources.

For these two points, different modifications were implemented in the facility to increase water supply sources and, in this way, to achieve the cooling of the core and fuel elements stored in pools. They are the following:

- Water supply to fuel elements pools by means of the SGA firefighting system (interconnection between the purification system of fuel assemblies pools FAL and the firefighting system SGB).
- Supply to the storage tanks of the GHC system by means of the SGA firefighting system.
- Water supply to the SGA system by means of the fire network of the building site of the Nuclear Projects Management Unit.

CNE

During refurbishment activities conducted in the facility ***(2016-2018)*** to extend its life for 24 more years in full power, some improvements related to the loss of heat sinks were implemented. The more relevant are the following:

❖ **Alternative Water Sources**

Alternative water sources of secured water supply (such as reservoirs, pools, tanks, etc.) were added to the existing ones in order to deal with severe accidents caused by the loss of heat sinks. Such sources include appropriate accessories/devices to connect those sources with the specific needs in order to ensure the cooling of the core and of the spent fuel pools in the long term. They are the following:

- Spent fuel pool water replenishment through a connection from outside the building pool, including two fire hose couplings, two isolation valves and the necessary equipment located in the respective cabinets (couplings, hoses, keys, etc.) to couple the fire extinguishing system in case of loss of coolant or loss of cooling. In turn, this connection enables water replenishment to the pool from a fire truck or tanker in case a SBO occurs. All these actions are described in the procedures of the corresponding POEA.
- Availability of two mobile cisterns of 8,000 liters each, with their respective motor pump.
- A water supply line to the calandria vault from outside the reactor building by means of a specific and seismic qualified line that enables the coupling of the firefighting system and of fire trucks. This change is part of the Severe Accident Management Program of the CNE.

- A water replenishment line to the dousing tank by means of fire trucks, using ECCS pipes. This line is already available and is also used for water replenishment to the SGs and for breaking rupture disks of the ECCS when the high pressure stage is unavailable. As it is necessary to enter the service building to use it, there was a change in the design to put it outside, in order to make connection works easier. Detail engineering is already finished.
- An additional fire truck containing 11,000 liters of water and a variable pressure pump.
- An alternative 11,000 m^3 water reservoir built in the discharge channel.

❖ **Modifications to the Emergency Water Supply (EWS) System**

Modifications were made in order to improve the general reliability of the system and increase the availability of the Emergency Core Cooling System (ECCS). In relation to reliability, water supply pneumatic valves to the dousing tank and SGs were doubled. In order to increase the ECCS availability, a seismic qualified line was added for EWS water supply towards the secondary side of the ECCS heat exchanger, with a motor operated isolation valve. This flow will return to the low pressure service water system (discharge channel). Finally, the greatest changes were the replacement of original diesel pumps for electric pumps (that can be fed from Class III or from the new EPS) and the replacement of pipes in general.

❖ **Abnormal Event Procedure**

Severe accident management and recovery was revised, but in no case weaknesses demanding immediate action were discovered.

K.3.1.2. Accident Management and Severe Accidents Management Program

CNA Unit I

❖ **Severe Accident Management Guidelines (SAMG)**

The Severe Accident Management Program (SAMP) includes the following approved guidelines to mitigate accidents exceeding design bases:

- Guideline 1-GAS-CE-01 (Rev. 3) “Evaluation of Plant Status”, Rev. 3.
- Guideline 1-GAS-SC-01 “Main Guidelines for Control Room”, Rev. 3.
- Guideline 1-GFAS-CE-01 “Long-term Monitoring”, Rev. 3.
- Guideline 1-GFAS-CE-02 “Completion of Severe accident management guidelines”, Rev. 2.
- Guideline 1-GAS-CE-04 “Power Supply”, Rev. 3.
- Guideline 1-GAS-SC-04-1 “Electrical interconnection from Unit II to Unit I”, Rev. 2.
- Guideline 1-GAS-SC-04-2 “Mobile Diesel Generator power supply” Rev. 2.
- Guideline 1-GAS-CE-05 “Feed and vent of Steam Generators”, Rev. 4.

- Guideline 1-GAS-SC-05-1 “Water Injection to the Steam Generators - High Pressure Way”, Rev. 3.
- Guideline 1-GAS-SC-05-2 “Water Injection to the Steam Generators - Low Pressure Way”, Rev. 3.
- Guideline 1-GAS-SC-05-3 “Water Injection to the Steam Generators by Pressurizing the feedwater Tank”, Rev. 1.
- Guideline 1-GAS-CE-06 “Depressurization of Primary”, Rev. 1.
- Guideline 1-GAS-CE-07 “Water Injection to the Primary”, Rev. 3.
- Guideline 1-GAS-SC-07-1 “Water Injection to the Primary (TA)”, Rev. 3.
- Guideline 1-GAS-SC-07-2 “Water Injection to the Primary (TA/TN)”, Rev. 3.
- Guideline 1-GAS-CE-08 “Water Injection to Containment Sinks”, Rev. 1.
- Guideline 1-GAS-CE-09 “Reduction in the Release of Fission Products”, Rev. 2.
- Guideline 1-GAS-SC-09-1 “Insulation of Containment vent” Rev. 1.
- Guideline 1-GAS-CE-10 “Control of Containment Conditions”, Rev. 2.
- Guideline 1-GAS-SC-10-1 “Containment Relief (TL7 system)”, Rev. 1.
- Guideline 1-GAS-SC-10-2 “Containment Relief (TL8 system)”, Rev. 1.
- Guideline 1-GAS-CE-12 “Water Injection to the Spent Fuel Elements Pools”, Rev. 5.
- Guideline 1-GAS-SC-12-1 “Water Injection to the Spent Fuel Elements Pools (UJ04)”, Rev. 3.
- Guideline 1-GAS-CE-13 “Refrigeration of Loading Machine”, Rev. 2.
- Guideline 1-GAS-SC-13-1 “Refrigeration of Loading Machine (SBO)”, Rev. 1.
- Guideline 1-GDC-CE-01 “Evaluation of Containment Challenge”, Rev. 0.
- Guideline 1-GDC-CE-02 “Reducing the Release of Fission Products”, Rev. 0.
- Guideline 1-GDC-CE-03 “Reduce the Pressure within the Containment”, Rev. 0.
- Guideline 1-GDC-CE-05 “Containment Vacuum Control”, Rev. 0.

❖ **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 pools.

❖ **Accident Management Procedures Review and Improvement**

The review of the procedures was 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 manual deactivation of the deuteroboric acid injection shutdown system.
- Inventory replenishment of the SHS with an increase in the capacity of the SHS feedwater tanks, using the two pumps of the water conditioning system, and replacing the water of those pools with groundwater using one of the pumps of the drinkable water supply.
- Low river level: systematic handling to conduct a plant outage and secure the cooling system can be performed.

The following SAMP guidelines are available:

- Guideline 1-GAS-CE-05 ““Feed and vent of Steam Generators”, Rev. 4.
- Guideline 1-GAS-SC-05-1 “Water Injection to the Steam Generators - High Pressure Way”, Rev. 3.
- Guideline 1-GAS-SC-05-2 “Water Injection to the Steam Generators - Low Pressure Way”, Rev. 3.
- Guideline 1-GAS-SC-05-3 “Water Injection to the Steam Generators by Pressurizing the Feedwater Tank”, Rev. 1.

❖ **Severe Accident Management Program**

A procedure to deal with an event of loss of cooling or water inventory of the spent fuel pools intended to monitor water level and the temperature of the pools during an emergency was implemented, as well as the possibility of recovering its water inventory even in scenarios of loss of the main control room, SBO, earthquakes, flooding or low water level.

The severe accident management program was completed, 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.

The following SAMP guidelines are available:

- Guideline 1-GAS-CE-12 “Water Injection to the Spent Fuel Elements Pools”, Rev. 5.
- Guideline 1-GAS-SC-12-1 “Water Injection to the Spent Fuel Elements Pools (UJ04)”, Rev. 3.
- Guideline 1-GAS-CE-04 “Power supply”, Rev. 3.
- Guideline 1-GAS-SC-04-1 “Electrical interconnection from Unit II to Unit I”, Rev. 2.
- Guideline 1-GAS-SC-04-2 ““Mobile Diesel Generator power supply”, Rev. 2.

❖ **Filtered Containment Venting System**
❖ **Instrumentation and Control**
❖ **Alternative Cooling Mode of the DGs (new EPS)**
❖ **Disconnection of Electrical Loads**

This item remains the same as described in the SIN.

❖ **Procedure for Passive Components Control**

This item remains the same as described in the SIN.

❖ **Safety System Trip Parameters**
❖ **Operating Procedure for Abnormal Events**
❖ **Measures for Accident Management to Deal with Loss of Cooling in the Fuel Storage Pools**

These two points are included in the Severe Accident Management Program in the Guidelines GAS-CE-12 and GAS-SC-12-1: Water Injection to the Spent Fuel Elements Pools.

It may be underlined that an alternative system was implemented to supply water to the spent fuel pools consisting of a well pump and branches to each pool with the respective valves. This system enables the operation and monitoring of the water level from the outside of the building, and it is independent from the control room. Electricity supply for the submersible motor pump and other instruments is redundant from a guaranteed bar and the MDG. It only has a level measurement in case the main control room is unavailable.

CNA II

- **Severe Accident Management Program**

The Severe Accident Management Program (SAMP) includes the following approved guidelines to mitigate accidents exceeding design bases:

- Guideline 2-GAS-CE-01 “Evaluation of Plant Status”, Rev. 4.
- Guideline 2-GAS-SC-01 “Main Guidelines for Control Room”, Rev. 3.
- Guideline 2-GFAS-CE-01 “Long-term Monitoring”, Rev. 3.
- Guideline 2-GFAS-CE-02 “Completion of Severe accident management guidelines”, Rev. 1.
- Guideline 2-GAS-CE-04 “Power Supply”, Rev. 4.
- Guideline 2-GAS-SC-04-2 “Plant Refrigeration with One Electric Train Active”, Rev. 1.
- Guideline 2-GAS-SC-04-4 “Electrical Interconnection from Unit I to Unit II”, Rev. 1.
- Guideline 2-GAS-SC-04-8 “Feeding from Emergency DG from Unit I to Unit II”, Rev. 0.
- Guideline 2-GAS-CE-05 “Feed and Vent of Steam Generators”, Rev. 2.
- Guideline 2-GAS-SC-05-1 “Water Injection to the Steam Generators (LAB/LAH)”, Rev. 2.
- Guideline 2-GAS-CE-06 “Depressurization of Primary”, Rev. 1.
- Guideline 2-GAS-CE-07 “Reduction of Release of Fission Products”, Rev. 2.
- Guideline 2-GAS-SC-07-1 “Insulation of Ventilation of Containment”, Rev. 1.
- Guideline 2-GAS-CE-09 “Water Injection to the Primary”, Rev. 1.
- Guideline 2-GAS-SC-09-1 “Water Injection to Primary (KBA)”, Rev. 2.
- Guideline 2-GAS-CE-11 “Water Injection to the Spent Fuel Pool”, Rev. 4.
- Guideline 2-GAS-SC-11-1 “Water Injection to the Spent Fuel Pool (GHC)”, Rev. 3.
- Guideline 2-GAS-SC-11-2 “Water Injection to the Spent Fuel Pool (SG)”, Rev. 0.
- Guideline 2-GAS-CE-13 “Water Injection to Containment Sinks”, Rev. 1.
- Guideline 2-GAS-SC-14 “Containment Conditions Control”, Rev. 1.
- Guideline 2-GDC-CE-01 “Evaluation of Contention Challenge”, Rev. 0.
- Guideline 2-GDC-CE-02 “Reducing the Release of Fission Products”, Rev. 0.
- Guideline 2-GDC-CE-03 “Reduce the Pressure within the Containment”, Rev. 0.

- Guideline 2-GDC-CE-05 “Containment Vacuum Control”, Rev. 0.

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❖ **Severe Accident Management Guidelines (SAMG)**

In December 2012, CANDU Energy performed at the CNE a validation exercise with participants from the plant and Canadian experts. The exercise entailed using generic documentation obtained from the COG (with some adjustments) with the aim of showing the correct performance of the decision framework and its effectiveness in the management of this type of accidents.

Revision 0 of the SAMP documentation package of the CNE was completed in January 2017. It comprised the respective guidelines and the specific documents to conduct field and control-room maneuvers in order to mitigate the accident. This program was fully adapted to the plant, and all the relevant changes performed during the CNE refurbishment outage for its life extension were considered.

The CNE general manual for severe accidents was completed in March 2018. It comprises the main objectives and scope of the SAMP, the explanation about core damage progression in CANDU reactors, the entry conditions for a severe accident, the description of all documentation on the program and the planning of the respective training and mock-ups.

Severe accidents mock-ups started in 2019 with participants from the ORE and from Operations Guards. With the results from these mock-ups and COG specific documents from the Fukushima accident, Revision 1 of the SAMP and of the general manual was conducted and completed in December 2019.

❖ **Procedure to Passive Components Control**

This item remains the same as described in the SIN.

❖ **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 was developed. This procedure includes 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 inaccessible. It includes 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 (See Section K.3.1.1.2).

- **Facility to Connect a Fire-truck from Outside the Spent Fuel Storage Pool Building**

A centre to connect a fire-truck from outside the pool building was installed in order to replenish water to the pools in the events of loss of cooling, circulation or SBO. (See Section K.3.1.1.2).

K.3.2 R&D Activity Program

In order to achieve the goals of safety, efficiency and continuous improvement, the PNGRR develops several R&D and innovation 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 *2017-2019*, in the framework of the communication policy established by CNEA in its Strategic Plan and carried out by the Social Communication Department, created to provide information and establish communication channels with CNEA personnel and the community in general, both the National Program for Radioactive Waste Management (PNGRR) and the Environmental Restoration Project of Uranium Mining (PRAMU) have implemented several communication activities.

As mentioned in Section B. 3, a broad communication program was conducted before, during and after Malargüe environmental liabilities management process. In turn, Los Gigantes site has also developed a Communication Plan to be launched once the management activities start. Accordingly, PRAMU is developing communication plans for the remaining sites for remediation, whenever the decision to manage liabilities is taken.

It is worth noticing that said activities and plans are in full compliance with Law No. 25018: CNEA has the responsibility of keeping the citizenship informed about the different aspects of radioactive waste management.

The development of communication activities is crucial, as the fulfillment of the objectives of PNGRR and PRAMU depends not only on the positions taken by the technical and political decision makers, but also on the perception of the public opinion on the nuclear activity in general.

From 2017 to 2019, the PRAMU Department conducted training activities within the institutional frame, and dissemination activities for the scientific and technical community. In this context, the “National Training Workshop on Mining Safety and Uranium Processing, including Remediation and Waste Management” was carried out with participants from organizations devoted to irrigation, environmental protection, mining, water resources, etc. from Córdoba and Mendoza provinces. In addition, a “National Training Course on Monitoring Uranium Mining Legacy Site after Remediation” was carried out in May 2019 in

San Rafael, Mendoza Province. In turn, a public lecture on “Environmental Management of Uranium Mining in Malargüe Site in Mendoza Province, Argentina” was delivered in the Faculty of Applied Sciences to the Industry of the National University of Cuyo.

In line with the activities conducted in previous years, the seminars at the “Open Constituyentes Atomic Centre (CAC)”, in which CAC opens its door to the community, and the Program “School Visits” (described in the SNR) were continued. Moreover, visits from teachers and students to the facilities related to remediation processes and waste management (in the AGE, within the Ezeiza Atomic Centre, in the province of Buenos Aires) continued being fostered.

In terms of the educational sphere, in 2018 the Social Communication Department, interacting with the National Ministry of Education started to deliver a course of lectures called “Applications of Nuclear Technology on Daily Life”, destined to high-school teachers from all over the country -giving scores to those who pass the exam. It is deployed through the website of the National Teachers Training Institute (INFoD) of the National Ministry of Education and its aim is to offer an educational proposal by using theoretical material from institutional sources, leaving teachers with the possibility of planning discussion corners and opportunities for reflection in the classroom about the several peaceful uses of nuclear power. The course of lectures lasts three months; three cohorts have already finished and more than 1800 teachers have enrolled in it. Among the topics included, there is a module devoted to spent fuel and radioactive waste management and environmental remediation, being the PNGRR involved since the beginning by elaborating and delivering educational material on the matter.

Among the dissemination and training activities, several training courses were delivered, many of them for different classes of radioactive waste generators, for example those related to diagnosis and treatment of diseases using nuclear techniques in health care centers of the Government of the Autonomous City of Buenos Aires.

As part of the regular activities carried out during this period, the PNGRR focused on updating its webpage in CNEA’s institutional website and on elaborating new content.

Within the period covered by this report, hard work was done in CNEA’s social media. A strategy to increase the number of followers and views of institutional posts was implemented in Twitter (CNEA_Arg), Facebook (CNEA.Arg), Instagram (@cnea_arg) and YouTube (CNEAArg). The strategy implied a cross-platform display, each topic being reposted in the specific format of each social networking site, and further developed in CNEA website. Consequently, the number of followers increased in different percentages.

A “disused sources pick-up service” was also included in the website argentina.gob.ar (the new website hosting all of the State agencies and organizations) and it was one of the most visited links of the wide list of services offered by CNEA, highlighting not only an increase in the number of services offered but also showing it is an issue of public interest.

As is customary, several information and outreach materials were produced, including a video on Malargüe Site remediation; an article with pictures and a video about training and

innovation on radioactive waste management –developed jointly with the IAEA in the framework of the Office of Public Information and Communication (OPIC)[1]-; a trifold and a bifold information leaflet on the Malargüe remediation project; a trifold leaflet on waste management in Argentina; and a catalogue of disused sealed sources.

Focusing on internal activities, CNEA personnel could visit, among other facilities, the different labs located in the Ezeiza Atomic Centre thanks to the "Visits to Intercenters" Program.

In terms of the activities specifically related to the Joint Convention, CNEA adopted as a common practice since the First National Report to upload on the internet (available at CNEA and IAEA websites) the content of the Reports and Q&A. This information has also been published in the Management Report CNEA 2015.

In compliance with the national legislation, the PNGRR and PRAMU annually inform the Honourable Congress of the Nation on their main management activities.

These reports are available for the public and can be accessed through CNEA website (https://www.argentina.gob.ar/cnea).

The Head of Social Communication of PNGRR participated in the Technical Meeting on Learning from Experience of Local Involvement in Radioactive Waste Management, held in IAEA Headquarters, Vienna, Austria, from 4 to 8 December 2017.

K.4. Commitments of Previous Revision Meetings

The commitments made by Argentina in previous meetings and their state of progress are the following:

1) Complete in time the dry storage facility for SF from the CNA Unit I to comply with the plant operational requirements.

The state of progress of the project by the end of 2019 was the following: 94% of the civil work, 75% of the engineering, 70% of the main components supply. Further details are described in Section G.4.1.

2) Continue developing and implementing public commitment to influence positive support of the candidate sites for future near surface repositories and deep geological repositories.

Even if public acceptance in relation to siting of repositories is a common concern for all countries, development and implementation of CNEA's plans to fulfill public commitment to

[1] Available at https://www.iaea.org/newscenter/news/seeking-a-solution-for-radioactive-waste-in-argentina (Article and video) and https://www.flickr.com/photos/iaea_imagebank/sets/72157690315095925 (Photo Gallery).

influence positive support of the candidate sites did not reach significant progress during the period 2017-2019.

For this reason, CNEA public communication activities during the period 2017-2019 were focused on establishing communication channels with both CNEA personnel and the citizenship as a whole, within the framework of the communication policies established by CNEA in its Strategic Plan and carried out by the Social Communication Department.

3) Remaining Mining Sites Remediation

As soon as Malargüe site remediation finished in June 2017, the post-closure monitoring program started (see details in Section H.5.1). The remaining mining sites remediation is an ongoing activity in CNEA through the PRAMU Project and it entails medium and long term challenges.

4) Update of the Strategic Plan for Radioactive Waste Management

As the National Executive Power sent back the second version of the PEGRR (December 2015) -approved by CNEA's Presidential Resolution on December 4th, 2012- without sending it to the National Congress to be approved by law, the third version is being prepared since 2017 and it is estimated to be finished by 2020.

K.5 IAEA Review Missions

K.5.1 ARN Preparation for Hosting an IAEA IRRS Mission

The Sixth National Report to the Joint Convention informed about the arrangement of a future IRRS mission to ARN, starting on 4 May 2020. In that context, since the preparation of the SNR to the Joint Convention (January 2017), the following activities were conducted:

- The National Workshop on IRRS mission and the IAEA Methodology and Tool for Self-Assessment of the Regulatory Infrastructure for Safety (SARIS) was held in Buenos Aires, from 25 to 27 April 2017, with the participation of more than 60 ARN´s staff, 7 members of other governmental offices and 3 IAEA´s experts.
- The SARIS methodology was implemented, completing the Respondent phase and Analysis phase, being at the time of preparing this initial NR draft, in the phase of defining the Summary Report and the Advance Reference Material for the mission (Ref: definition of phases according to the SARIS Methodology, IAEA´s SVS 37).
- Several ARNs staff members participated in some IAEA´s IRRSs missions, in various Training Courses for Reviewers in Integrated Regulatory Review Service missions, and also, ARN´s representatives took part of the Technical Meeting for the revision of the Integrated Regulatory Review Service Guidelines and the International Workshop on Lessons Learned from Integrated Regulatory Review Service (IRRS) Missions.
- The Preparatory Meeting of the IRRS mission was held in Buenos Aires, on 6-7 November 2018, with the participation of the mission leaders and IAEA´s coordinators. The preliminary results of the self-assessment were presented (8 detailed presentations).

The ARN´s staff is devoting a continuous effort to the preparatory work and completion of the self-assessment for hosting the IRRS mission.

As a conclusion, the self-assessment being conducted by ARN´s staff for the IRRS is considered by them a valuable tool that contributes to analyze the institution and its practices in a systematic way, and of course, this enhances our views on how to explore actions to improve.

K.6 Synoptic Summary

In agreement with the determinations of the document *Guidelines relative to the Form and Structure of the National Reports (INFCIRC 604/Rev. 3)*, the following synopsis of the present conditions in Argentina is included.

ARGENTINE SEVENTH NATIONAL REPORT – OVERVIEW

Type of Liability	Long Term Management Policy	Funding of Liabilities	Current Practices/ Facilities	Planned Facilities
Spent Fuel	• Reprocessing decision deferred. • Final Disposal: a tentative schedule of new dates is expected by the end of 2020.	• Argentine State[1].	• CNA I: NPP Wet Storage. • CNA II: NPP Wet Storage. • CNE: NPP 6 years Wet Storage. • CNE: NPP Dry Storage. • Research reactors and NPPs: Wet Storage facility or site (RA-6, FACIRI).	• CNA I: Dry Storage. • CNA II: Dry Storage Facility or Site. • CAREM: Wet Storage Facility or Site and Wet or Dry Storage Site. • RA-10: Wet Storage Facility and Site. • Deep Geological Repository (feasibility).
Nuclear Fuel Cycle Waste	• Final Disposal	• Argentine State[1].	• LLW: Storage + Final Disposal. • LLW: Treatment and Conditioning Facility. • ILW: Treatment, Conditioning and Storage.	▪ LLW: Near-surface Centralized. Repository (date under review). ▪ ILW: (waste from conditioning or reprocessing of SF of research and production reactors are included) and HLW (waste generated if the SF of power reactors is reprocessed): Deep Geological Repository. ▪ LLW: Treatment and Conditioning 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. • LLW: Treatment and Conditioning Facility. • ILW: Storage	• LLW: Near-surface Centralized Repository. • ILW: Deep Geological Repository. • LLW: Treatment and Conditioning Facility (PTARR).
Decommissioning	▪ Decommissioning Plan (Regulatory Requirement).	• Argentine State when the facility is state-owned • Facility operator when it is a private owner	• RA-8 in Decommissioning Process.	• LLW: Near-surface Centralized Repository. • VLLW: Near-surface Centralized Repository.
Disused Sealed Sources	▪ Reuse or Recycling ▪ Clearance ▪ Final Disposal	• Source User	• Reencapsulado: Planta de Fuente Selladas de Co-60. • Storage + Clearance (short-lived) • Storage (long-lived)	• LLW Near-surface Centralized Repository. • ILW and HLW: Deep Geological Repository (feasibility).

(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

All the articles of the National Law of Nuclear Activity are described in the SNR. It can be accessed through the following link: https://www.argentina.gob.ar/sites/default/files/6_sixth-national-report.pdf.

L.1.2 Law No. 25018/98 National Law on Radioactive Waste Management Regime

All the articles of the National Law on Radioactive Waste Management Regime are described in the SNR. It can be accessed through the following link: https://www.argentina.gob.ar/sites/default/files/6_sixth-national-report.pdf.

L.1.3 Regulations Governing the Nuclear Industry of the Argentine Republic: Organizational Structure (1950-2019)

- Creation of the Argentine Atomic Energy Commission
  Decree No. 10936/50, 31 May 1950
  Published: Argentine Republic Official Gazette, 7 June 1950
  (Derogated by Decree Law No. 22498/56)
- Organization of the Argentine Atomic Energy Commission
  Decree Law No. 22498/56, 19 December 1956
  Published: Argentine Republic Official Gazette, 28 December 1956 (Ratified by Law No. 14467)
  (Partially derogated by Law No. 24804; Articles. 2, 5, 9, 11, 16 and 17 are derogated pursuant to Article 33)
- Ratification of Decrees Laws of the Provisional Government
  (Issued between 23 September 1955 and 30 April 1958)
  Law No. 14467 Sanctioned: 5 September 1958
  Enacted: 23 September 1958
  Published: Argentine Republic Official Gazette, 29 September 1958
- Reorganization of Activities and Modification of Competences of the Argentine Atomic Energy Commission
  Creation of the National Nuclear Regulatory Entity
  Establishment of the Corporation Nucleoeléctrica Argentina S.A.
  Decree No. 1540/94
  30 August 1994
  Published: Argentine Republic Official Gazette, 2 September 1994
- National Law of Nuclear Activity No. 24804
  Sanctioned: 2 April 1997
  Partially enacted: 23 April 1997
  Published: Argentine Republic Official Gazette, 25 April 1997
- Regulation of the National Law of Nuclear Activity No. 24804

Decree No. 1390/98, 27 November 1998
Published: Argentine Republic Official Gazette, 4 December 1998

- Radioactive Waste Management Regime
  Law No. 25018 Sanctioned: 23 September 1998
  Enacted: 19 October 1998
  Published: Argentine Republic Official Gazette, 23 October 1998

- The amendments to the Nucleoléctrica Argentina Sociedad Anónima by laws are ratified. Nucleoeléctrica S.A. is required to conduct the activities necessary to establish CNA II NPP Management Unit. The corporation's purpose is to undertake the acts required to start up CNA II NPP and to make the Argentine Atomic Energy Commission participate in it.
  Decree No. 981/05, 18 August 2005
  Published: Argentine Republic Official Gazette, 22 August 2005

- The regime to conduct works for CNA II NPP is fully binding. It has been granted to the Argentine Atomic Energy Commission and it engulfs to the CNA II Management Unit of the corporation Nucleoeléctrica Argentina Sociedad Anónima.
  Decree No. 1085/06, 23 August 2006
  Published: Argentine Republic Official Gazette, 25 August 2006

- The Assignment of Stock Agreement subscribed by Nucleoeléctrica Sociedad Anónima and the Argentine Atomic Energy Commission was ratified on 22 June 2006.
  Decree No. 1760/09
  16 November 2009
  Published: Argentine Republic Official Gazette, 19 November 2009

- The following activities are declared to be of national interest: those to conclude a fourth NPP, Embalse NPP life extension and CAREM Prototype Reactor.
  Law No. 26566 Sanctioned: 25 November 2009
  Enacted: 17 December 2009
  Published: Argentine Republic Official Gazette, 24 December 2009

L.1.4 Main International Treaties on Nuclear Energy Subscribed by the Argentine Republic (1966-2019)

- Vienna Convention on Civil Liability for Nuclear Damage. Approved by the International Conference on Civil Liability for Nuclear Damage, held in Vienna, Republic of Austria, in 1963. (This Convention was modified and complemented by a Protocol and a Supplementary Convention approved by Law No. 25313)
  Law No. 17048 Sanctioned and enacted: 2 December 1966
  Published: Argentine Republic Official Gazette, 16 December 1966

- Convention on Prevention of Marine Pollution by Dumping of Wastes and Other Matter, open for signature on 29 December 1972 in London, Mexico, Moscow and Washington.
  Ley No. 21947 Sanctioned and enacted: 6 March 1979
  Published: Argentine Republic Official Gazette, 9 March 1979

- Convention Relating to Civil Liability in the Field of Maritime Carriage of Nuclear Material, subscribed in Brussels, Belgium, on 17 December 1971.
  Law No. 22455 Sanctioned and enacted: 27 March 1981
  Published: Argentine Republic Official Gazette, 6 April 1981

- Treaty on the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Sea-Bed and the Ocean Floor and in the Subsoil Thereof, subscribed in London, Moscow and Washington on 11 February 1971.
  Law No. 22507 Sanctioned and enacted: 7 October 1981
  Published: Argentine Republic Official Gazette, 13 October 1981

- Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and under Water (PTBT), concluded in the city of Moscow on 5 August 1963.
  Law No. 23340 Sanctioned: 30 July 1986
  Enacted: 19 August 1986
  Published: Argentine Republic Official Gazette, 25 February 1987

- Convention on the Physical Protection of Nuclear Material (CPPNM), subscribed in Vienna, Republic of Austria, on 3 March 1980.
  Law No. 23620 Sanctioned: 28 September 1988
  Enacted: 20 October 1988. Published: Argentine Republic Official Gazette, 2 November 1988

- Convention on Early Notification of a Nuclear Accident and Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, approved by the General Conference of the International Atomic Energy Agency in Vienna, Republic of Austria, on 26 September 1986.
  Law No. 23731 Sanctioned: 13 September 1989
  Enacted: 6 October 1989
  Published: Argentine Republic Official Gazette, 13 October 1989

- Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (Tlatelolco Treaty), adopted in México on 14 February 1967, with the amendments introduced on 3 July 1990, on 10 May 1991 and on 26 August 1992.
  Law No. 24272 Sanctioned: 10 de November de 1993
  Enacted: 7 December 1993 (Application Art. 70, National Constitution)
  Published: Argentine Republic Official Gazette, 14 December 1993

- Treaty on the Non-Proliferation of Nuclear Weapons (NPT), open for signature in London, Washington and Moscow on 1 July 1968.
  Law No. 24448 Sanctioned: 23 December 1994
  Enacted: 13 January 1995
  Published: Argentine Republic Official Gazette, 20 January 1995

- Convention on Nuclear Safety, adopted in Vienna, Republic of Austria, on 20 September 1994.
  Law No. 24776 Sanctioned: 19 February 1997
  Enacted: 4 April 1997 (Application Art. 80, National Constitution)
  Published: Argentine Republic Official Gazette, 11 April 1997

- Comprehensive Nuclear-Test-Ban Treaty (CTBT), adopted by the General Assembly of the United Nations in New York, United States of America, on 10 September 1996.
  Law No. 25022 Sanctioned: 23 September 1998

Enacted: 20 October 1998
Published: Argentine Republic Official Gazette, 28 October 1998

- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, adopted in Vienna, Republic of Austria, on 5 September 1997.
  Law No. 25279 Sanctioned: 6 July 2000
  Enacted: 31 July 2000 (Application Art. 80, National Constitution)
  Published: Argentine Republic Official Gazette, 4 August 2000

- Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage and the Convention on Supplementary Compensation for Nuclear Damage, adopted in Vienna, Republic of Austria, on 12 September 1997 (amending and supplementing the Vienna Convention approved by Law No. 17048).
  Law No. 25313 Sanctioned: 7 September 2000
  Enacted: 6 October 2000 (Application Art. 80, National Constitution)
  Published: Argentine Republic Official Gazette, 18 October 2000

- Agreement on Activities Related to Facilities of International Surveillance at the Service of the Comprehensive Nuclear-Test-Ban Treaty (CTBT), subscribed together with the Provisional Technical Secretariat of the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) in Vienna, Republic of Austria, on 9 December 1999.
  Law No. 25837 Sanctioned: 26 November 2003
  Enacted: 19 February 2004
  Published: Argentine Republic Official Gazette, 20 February 2004

- Co-operation Agreement for the Promotion of Nuclear Science and Technology in Latin America and the Caribbean, adopted by the IAEA Board of Governors in Vienna, Republic of Austria, on 25 September 1998.
  Law No. 25842 Sanctioned: 26 November 2003
  Enacted: 9 January 2004
  Published: Argentine Republic Official Gazette, 15 January 2004

- Amendment to the Convention on the Physical Protection of Nuclear Material
  Law No. 26640 Sanctioned: 13 October 2010
  Enacted: 13 November 2010
  Published: Argentine Republic Official Gazette, 17 November 2010

- International Convention for the Suppression of Acts of Nuclear Terrorism
  Law No. 26976 Sanctioned: 27 August 2014
  Enacted: 17 September 2014
  Published: Argentine Republic Official Gazette, 24 September 2014

- Convention on the Privileges and Immunities of the Agency for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (OPANAL)
  Law No. 27186 Sanctioned: 23 September 2015
  Enacted: 13 October 2015
  Published: Argentine Republic Official Gazette, 28 October 2015
  Entered into force: 24 June 2016 (Argentine Republic Official Gazette: 24 August 2016).

L.2 PNGRR R&D Program

L.2.1 R&D&I Activities

The R&D Program was created in order to comply with the PNGRR objectives. It includes activities and lines of action regarding disposal and final disposal of spent fuel and radioactive waste. Listed below are all R&D&I activities conducted during the period 2017-2019:

- Study of formulation for cementation of liquid radioactive waste and spent ion-exchange resins from research reactors.
- Development of inorganic adsorbents for the selective extraction of Cs-137 of aqueous effluents coming from Mo-99 production process.
- Development of low temperature thermal processes for treatment of spent ion-exchange resins from NPPs.
- Study of the plasma processing of gaseous effluents coming from thermal treatments of polymeric spent ion-exchange resins.
- Study of the immobilization of thermally treated resins incorporated in phenolic resins.
- Development of new materials to efficiently catch radioactive gases generated during the application of thermal processes to the treatment of spent ion-exchange resins.
- Development of ceramic and glass-ceramic matrices for the conditioning of spent fuels from Argentine research reactors.
- Development of ceramic matrices for the pretreatment of liquid streams.
- Development of new Zirconium (IV) ATMP type coordination polymers for the selective extraction of lanthanides and actinides.
- Development of new inorganic polymers compounds for the immobilization of thermally treated spent ion- exchange resins.
- Study of new processes for Mo-99 production that eliminate or significantly reduce radioactive waste generation in comparison with conventional processes.
- Studies on radiation response of ceramics and coordination polymers.
- Hydrogeological, hydro-geochemical and geophysical prospecting studies in Areco river basin (Buenos Aires Province).
- Development of equipment and software for radiological and nuclear measurements.
- Study of the phreatic aquifer and soil of the Ezeiza Radioactive Waste Management Area (AGE).
- Studies of mechanisms of Aluminum alloy AA6061 aqueous corrosion in highly purified and semi-purified water.
- Study on the degradation of high level radioactive waste containers.
- Study on the degradation of spent fuel from CNA Unit I during long interim dry storage.
- Assessment of stainless steel welding corrosion in new dry storage silos for spent fuel from CNA Unit I.
- Assessment of corrosion of storage baskets for spent fuel in CNE dry silos.
- Study of the underground hydrology with isotopic tracers in underground and superficial waters of Los Gigantes site.

- Hydrology study of fractured media from Los Gigantes site.
- Microbiological monitoring of waters, biocide treatments analysis and biofouling and microbiological corrosion studies in the FACIRI and RA-6.
- Basic and applied studies on the degradation of reinforced concrete structures destined to the construction of radioactive waste repositories.
- Studies on the plasma torch method for the treatment of very low and low level radioactive waste.
- Studies on vitrification as a method for the immobilization of intermediate and high level radioactive waste.
- Development of a method for obtaining ash nanoparticles from actinide oxides, lanthanides, metals and nonmetals coming from a nitrate solution or nitrate, oxide, metal and nonmetal suspension. Application for an INPI[1] Patent 20190101580 (10 June 2019) in process.
- Study of corrosion in metallic containers of liquid radioactive waste coming from processes related to Mo-99 production.
- Study of aqueous corrosion mechanisms of Aluminum alloys in spent fuel pools (FACIRI) and in the research reactor RA-6.
- Study on the possibility of the development of microbiological corrosion of Aluminum alloys in the FACIRI.

L.2.2 Joint Activities with the International Atomic Energy Agency

In the frame of the IAEA Technical Cooperation and Research Program, Argentina participated and participates in the following projects and activities for the period 2017-2019:

- Networks launched by the IAEA on the matter: IAEA “Network of Environmental Management and Remediation (ENVIRONET)” and “International Low Level Waste Disposal Network (DISPONET)”.
- “Le Trench” Project (Remediation of Legacy Trenches Containing Radioactive Waste), created in the frame of the ENVIRONET.
- IAEA International Radioactive Waste Technical Committee (WATEC).
- Coordinated Research Project (CRP): “Options and Technologies for Managing the Back End of the Research Reactor Nuclear Fuel Cycle (T33001)”, Research Contract: “Storage and Conditioning Options for the Argentine al based-Research Reactor Spent Fuel”.
- Coordinated Research Project (CRP): “Ageing Management Program for Spent Fuel Dry Storage Systems (T21028)”, Research contract: “Durability of Structural Components of Dry Storage Systems”.
- National Technical Cooperation Project ARG/9/013: “Treating Radioactive Waste by Thermal Processes”.
- National Technical Cooperation Project ARG/9/014: “Developing National Capacities in Vitrification of Nuclear Waste”.

[1] National Institute of Industrial Property (Instituto Nacional de la Propiedad Industrial)

- National Technical Cooperation Project ARG/7/008: “Improving Management and Evaluation of Quality and Availability of Water Resources in certain Regions through the Use of Isotopic Techniques”.
- National Technical Cooperation Project ARG/9/016: “Building Capacities for Selecting and Characterizing Potentially Suitable Sites for the Geological Disposal of Radioactive Waste and Spent Nuclear Fuel”.
- Interregional Technical Cooperation Project INT/9/182: “Sustaining Cradle-to-Grave Control of Radioactive Sources”.
- Interregional Technical Cooperation Project INT/9/186: “Sustaining Cradle-to-Grave Control of Radioactive Sources – Phase II”.
- Significant events on the matter, organized by the IAEA: “Technical Meeting on Old Facilities for Final Disposal” (May 2017, Ukraine); “Technical Meeting on Funding Plans for Radioactive Waste Final Disposal Program” (May 2017, Austria); “International Workshop on Management of Decommissioning and Conditioning/Remediation of Damaged and Old Nuclear Facilities” (October 2017, United Kingdom); “Annual Meeting on the Status and Trends Project on Spent Fuel and Radioactive Waste” (July 2018, Luxembourg, and July 2019, Austria); “Training Workshop on Technical Options for Management Prior to Final Disposal of Radioactive Waste” (July 2018, Uruguay); “Technical Meeting on Funding for Waste Management and Decommissioning” (July 2018, Austria); “Technical Meeting on the Spent Fuel and Radioactive Waste Information System” (June 2019, Austria).
- IAEA Mission comprising two experts in the matter: “Decontamination and Management of Metal Elements and Low-level Waste of a Uranium Ore Processing Plant”, October 2018, Malargüe, Mendoza.

End of the

Seventh National Report

of the

Argentine Republic

in furtherance of the

Joint Convention

on the

Spent Fuel Safety

and on the

Radioactive Waste Management Safety