Regulatory Standards established to control Radioactive Facilities and Nuclear Fuel Cycle Facilities

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The nuclear activity regulation and control is based on four main topics: radiological protection, nuclear safety, safeguards and physical protection. In Argentina, the Nuclear Activity National Law assigns these functions to the Nuclear Regulatory Authority (ARN).
Nuclear regulation issues in Argentina were developed since the beginnings of activities devoted to research, development and production belonging to the National Commission of Atomic Energy (CNEA) in the frame of international regulations.
Sixteen years ago the regulation and control of all nuclear activities were separated from research, development and production through the creation of the Regulatory Body, nowadays the ARN.
In accordance with the provisions of the National Nuclear Law, the ARN establish regulations relating to radiological and nuclear safety, physical protection and control of the use of nuclear materials, the licensing and control of nuclear facilities, international safeguards and transport of nuclear materials. Is this framework, ARN has established Regulatory Standards to regulate all the activities in order to control the facilities and personnel licensing.
The purpose of this paper is to present the regulatory standards evolution regarding to the control radiological protection and nuclear safety in radioactive and nuclear facilities, with particular reference to nuclear fuel cycle facilities, particle accelerators, radioactive sources production plants, irradiation facilities, radioactive waste management facilities and mining and milling activities.
Finally it will be presented a resume of the current situation in the areas mentioned and discuss future prospects in this field.

Key Words
Regulatory standards, Basic Standards on Radiological and Nuclear Safety, Regulatory body, Class I facilities

Antecedents

The backgrounds in regulatory standards related to the licensing and control of the radioactive and nuclear facilities in Argentina go back to the beginnings of this activity during the 50's and 60's.

In Argentina, as well as in other countries, the radiological and nuclear safety was originally included in the activities of only one organization which joint research, development and production. In our country this organization was the National Commission of Nuclear Energy (CNEA).

The first Basic Standards on Radiological and Nuclear Safety, known as "Normas Rosas", were established on December 1966 in order to preserve safety and protection of the CNEA's health staff and members of the public who may be affected by the radiation fields due to the activities performed. The set of regulatory standards was created not only following a performance criteria as a general philosophy but also including guides of different topics.

The mainly activities considered were:

- The production, treatment, manipulation, use, store and transport of special fissile materials and naturals and artificial radioactive sources.
- The use of ionizing radiations generator equipment´s.

- The radioactive wastes disposal.

The standards mentioned aimed to cover the radiological and the nuclear safety issues throughout the control of the facilities and operations, the definitions of controlled areas, the criteria for dose evaluation of the staff's workers and public's, the medical radio sanitary surveillance, the personal records, criteria for inspections and interventions.

The standards detailed in two annex different topics related to radiation protection of workers and publics and nuclear safety.

The annex 1 refers to the Basic Standards on Radiological Safety outreach to the workers and members of the public with the objective of keeping under control the hazards due to ionizing radiation. In this annex were shown the maximal dose allowed to controlled sources for occupational exposition (external and internal irradiation) and the exposition to members of the public. Also deals with the expositions in case of abnormal situations.

The annex 2 refers to the Basic Standards on Nuclear Safety at the work with special fissionable materials (SFM) with the objective of avoiding criticality accidents. In the annex are not included the activities in nuclear and research reactors.
The annex defined safety parameters to operate with SFM, such as size of individual units, safe isolation of groups of units, impact of moderation and special reflectors. Furthermore the concepts for storage of homogenous mixtures, the application of correction and grant factors, the disposition of low enriched uranium rods in heterogeneous arrangements, general limits of mass and volume and limits to groups of units were also considered. Finally, the standard included the requirements for the SFM transport.

These standards were applied up to 1994, when the national government decided to create an independent body from CNEA for the regulation and control of all nuclear activities. By Decree 1540/94, the National Nuclear Regulatory Body (ENREN) was created as an autonomous Organization depending directly from the President's Office.

Later, in 1997, Law 24804, called the National Law of Nuclear Activity, provides that the functions of regulation and supervision would be assigned to the Nuclear Regulatory Authority (ARN) as the successor of ENREN.

This body with new and specific functions will be in charged to develop a regulatory framework applicable to all nuclear activities carried out in Argentina.

Current Status

The ARN is the Regulatory Body of Argentina devoted to the control and regulation of all nuclear activities, it does not cover equipment specifically designed to generate x-rays, but does include linear accelerators for medical use that as a result of their operation, generate or produce ionizing radiation in addition to x rays.

The ARN is an autonomous entity, with federal jurisdiction, depending directly from the Presidency of the Nation with the following responsibilities:

- To provide an appropriate standards for protection of individuals against the harmful effects of ionizing radiation.

- Ensure a reasonable degree of radiological and nuclear safety in all nuclear activities performed in Argentina.

- Ensure that nuclear activities are not performed with purposes not authorized by this Law, by the standards issued in pursuance thereof, by international commitments and nuclear non-proliferation policy undertaken by Argentina, and

- Prevent the commission of intentional actions which may either have severe radiological consequences or lead to the un-authorized removal of nuclear materials or other strategic materials and equipment subject to safeguards control.

The following attributions of the ARN, as provided by the law, are worth noting:

- To establish regulatory standards relating to nuclear and radiological safety, physical protection and control of use of nuclear materials, licensing and inspection of nuclear facilities under international safeguards, and nuclear and radiological safety and physical protection aspects of the transport of nuclear material;
- Establish, in accordance with international standards, safety standards on radio-logical and nuclear protection for the personnel working in controlled facilities;
- Grant, suspend and / or revoke licenses, permits or authorizations;
- Perform regulatory inspections and evaluations at facilities subject to monitoring and control by the Nuclear Regulatory Authority, where nuclear or radioactive materials is used, handled, produced, stored, etc.;
- Apply sanctions in cases of non-compliance with standards and / or regulatory li-censes, and
- Evaluate the environmental impact of any practice that is licensed, these activities include monitoring activities, analysis and follow-up actions of the incidence, evolution and possible environmental damage derived from the licensed nuclear activities.

In compliance with the attributions to establish regulatory standards, since 1994 the standards related with the radiation protection and nuclear safety are being reviewed and updated and others new standards are issued.

The Argentine regulatory standards are performance oriented: they are not prescriptive but define compliance with security objectives. The "how" these goals are achieved is based on appropriate decision making by the organization that deals with the design, construction, commissioning, operation and decommissioning of the facility in question. The organization must demonstrate to the Regulatory Authority that the technical means employed meet the objectives proposed by the standards.

The current set of regulatory standards is integrated by 62 documents that embrace subjects of radiological security, nuclear security, physical security and safeguards. There are also 9 regulatory guidelines, without mandatory character, in order to facilitate the demonstration of compliance with the regulatory standards.

The Basic Standards on Radiological Safety, AR.10.1.1 is the main reference related with the radiological safety. It applies to all facilities, practices and interventions regulated by ARN.

The first version of AR10.1.1 published in 1994, included the new legal framework, facility classification based on a radioactive inventory index and the ICPR 60 recommendations.

At present AR.10.1.1 revision 3, dated on 20/11/2001, includes general criteria about classification of nuclear and radioactive facilities, responsibilities for radiologic security, radiological safety principles, potential exposure's, radioactive waste management, operational requirements, emergency plans, procedures, interventions, communication and radioactive material transport.

Regulatory Standards related with Class I Facilities

Based on AR.10.1.1 revision 3, the facilities are classified in three categories depending on the radiological risk. The Class I facilities include facilities or practices that require more than one step for licensing (design, construction, commissioning, operation and decommissioning). The Class II facilities include the facilities or practices that require only operation license and the Class III facilities require just a record.

Besides nuclear power reactors, research reactors and critical assemblies, the Class I Facilities include the following sub-classes:

- Nuclear facilities with potential occurrence of a criticality accident
- Particle Accelerators with E >1 MeV (except medical accelerators)
- Fixed or mobile Irradiation Facilities
- Production facilities of open or sealed radioactive sources
- Radioactive Waste Manager
- Mining and Process Facilities including the final site of disposal of radioactive waste generated in their operation.

The regulatory framework based on the AR 10.1.1 includes specific regulatory standards for Class I Facilities, as follow:

- **AR 0.0.1. Licensing of Class I facilities**
  Objective: Establish general conditions to be settled during building, commissioning, operation and decommissioning. Define the responsibilities of the Responsible Facility (RF) and the relationship between RF and ARN.

- **AR 0.11.1. Licensing of Personnel of Class I facilities**
  Objective: Establish the requirements to be fulfilled by a person to apply for an Individual License or a Specific Authorization (SA).

- **AR 0.11.2. Requirements of psychological and medical conditions for SA**
  Objective: Establish the requirements to be fulfilled by a person to apply SA.

- **AR 0.11.3. Permanent Training of Personnel of Class I facilities**
  Objective: Establish the requirements to be fulfilled by the Responsible Entity to maintain an adequate level of personnel trainee.

- **AR 6.1.1. Occupational radiation exposition in Class I facilities**

Objective: Establish the radiological occupational protection requirements to be considered during the design stage.

- **AR 6.1.2. Radioactive effluents limits in Class I facilities**
  Objective: Establish the radiological protection criteria to be considered in the facility design to limit the future radioactive discharges to the environment.

- **AR 10.12.1. Radioactive waste management**
  Objective: Establish general requirements for radioactive waste management in order to provide an adequate level of radioactive protection to the people and the environment preservation for current and future time.

Moreover the previous described standards, some facilities have to observer specific regulations, like the irradiation facilities and the particle accelerators.

As an example, the **AR 6.2.1** and **AR 6.9.1** are the standards for design and for operation of fix irradiated facility with mobile underwater sources, describing the safety criteria that have to be fulfilled in both cases. The **AR 6.7.1** establishes the chronogram of mandatory documentation that have to be presented by the Responsible Entity before the operation of an irradiation industrial facility in order to request the construction, commissioning and operation license.

There are also other regulatory standards that some types of facilities have to fulfill. In the case of facilities handling nuclear material, the **AR 10.14.1**, related to safeguards applications. According to the inventories of nuclear material or radioactive sources involved, the **AR 10.13.1**, related to Physical Protection and the **AR 10.13.2**, related to Radiological Security, have to be considered.

The regulatory framework is complemented by the Fees Regime and Penalty Regime. The ARN establishes the corresponding fees regime of licensing and inspection and the procedures for applying sanctions due to non-fulfill the mandatory regulations.

At present, without include nuclear power and research reactors, Argentina has more than 40 Class I facilities distributed in all subclasses defined by AR10.1.1. These facilities are in different stage of their life with licenses in force or in progress.

Final comments

During the last 16 years, since the ARN was created, the regulatory standards system has strengthen and broaden based on the practical experience on licensing and control of the nuclear and radioactive facilities and following the international recommendations.

The “performance criteria” in the regulatory standards was maintained with successful results and the regulatory guidelines are good complementary documents that need to be expanded in order to consider particular topics.

The Radiological Basic Safety Standard AR 10.1.1 provides a wide insure of all regulatory aspects however it should be reviewed to reconsider the classification facility criteria and nuclear safety aspects related with the prevention of criticality accidents.

Finally, ARN are working in the process of updating the standards to incorporate the new recommendations of the ICRP 103.

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References

- Basic Standards on Radiological and Nuclear Safety (Normas Rosas) (1966)
- National Law of Nuclear Activity - Law N° 24.804 – (1997)
- Basic Standards on Radiological Safety AR.10.1.1 vs.1 (1994) and vs. 3 (2001)
- ARN Regulatory Standards
- ICRP 60
- ICRP 103