Regulatory Framework for the Management of Radioactive Wastes in Argentina

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ABSTRACT

The legal and regulatory framework within which the radioactive waste management is carried out in Argentina are exposed. The activities of the Nuclear Regulatory Authority (ARN) in relation to facility inspections, safety assessments and collaboration with international agencies in the matter are also presented. Further, the regulatory criteria applied to waste management are reported.

1. INTRODUCTION

There are two nuclear power plants in operation in Argentina, Atucha I (KWU, PHWR, 340 MWe) since 1974 and Embalse (CANDU, 600 MWe) since 1984. A third one, Atucha II (PHWR, 600 MWe) is in an advanced stage of construction. Three research reactors and three critical assemblies are also in operation. There are several facilities related to the front-end of the nuclear power and research reactor fuel cycle, including chemical and physical uranium concentrate production and fuel element assembling. Three Atomic Centres are devoted mainly to research and development in the nuclear field and about 1400 users around the country involve radioactive materials in their activities, mainly related to the medical and industrial area. A waste management facility for the final disposal of LLRW, located at the Ezeiza Atomic Centre, is in operation. The spent fuel elements from the nuclear power plants are temporarily stored on site in decay pools and dry storage silos until a decision on their future treatment is taken. The National Atomic Energy Commission (CNEA) is the governmental organisation responsible for the radioactive waste management. The Nuclear Regulatory Authority, at present in charge of nuclear activity regulations and control concerning radiological and nuclear safety, regulates and controls such practice.

2. LEGAL FRAMEWORK

During the period 1950 to 1994 the National Atomic Energy Commission (CNEA) had, among other areas of competence, the regulatory function in the field of radiological and nuclear safety, particularly on those aspects concerning the human health protection against the harmful effects of ionising radiation, the nuclear installations safety and the control of nuclear material use. In 1994 the Government transferred the Authority for regulation of nuclear activities from the Regulatory Branch of CNEA to the National Board on Nuclear Regulation (ENREN) through the Decree No. 1540, 1994.

In April 1997, Act No. 24804; “National Law of Nuclear Activity” [1] was passed, proclaiming (in its Article 7) the creation of the Nuclear Regulatory Authority (ARN). This authority is in charge of nuclear activity regulations and control concerning radiological and nuclear safety, safeguards and physical protection, giving, in addition, advice to the Executive Power on subjects of its competence. The Nuclear Regulatory Authority, as an autarchic entity within the jurisdiction of the Presidency of the Nation, has full legal power to act in the fields of public and private rights, being the successor of the ENREN.
The “National Law of Nuclear Activity” establishes, also, that CNEA is the governmental organization responsible for radioactive waste management. In this sense, the Act establishes that for the definition of repository sites for high, medium and low-level radioactive wastes, CNEA, as Responsible Entity, shall propose a place. The site shall be approved by the ARN in relation to radiological and nuclear safety, and, shall also be approved by an Act of the Provincial State where is proposed to install the repository.

In September 1998, Act No. 25018, “Radioactive Waste Management Regime” [2] was passed, establishing responsibilities concerning the National Atomic Energy Commission (CNEA), as the Responsible Organization for waste management. In addition, it sets the “National Program of Radioactive Waste Management” within the CNEA, that shall:

- design the strategy for RWM, which requires the approval of the National Congress
- propose, plan, co-ordinate, execute, assign funds and control research and development projects on RWM technologies and methods
- project, construct and operate systems, equipments, facilities and repositories for High, Medium and Low Level RW.
- conduct the management of RW generated in nuclear activities, including decommissioning and mining activities, establishing acceptance criteria and management procedures
- perform any other activity required to fulfil the RWM objectives

This Law also establishes that this Program of the CNEA shall comply with the regulatory standards issued by the Nuclear Regulatory Authority (ARN) and other relevant regulations of national or provincial level. The Act sets a “Fund for Radioactive Waste Management and Disposal” to finance the above mentioned Program as well.

3. REGULATORY FRAMEWORK

Act No. 24804 empowers the Regulatory Body to establish standards, which regulate and control nuclear activities, of application along the whole national territory. The first regulatory standards were initially produced some 20 years ago. In the course of time a normative system was established comprising subjects such as radiological and nuclear safety, safeguard of nuclear materials and physical protection. The system, known as “AR Standards” (AR meaning “Autoridad Regulatoria” - Regulatory Authority), has at present 51 standards.

The regulatory standards are based on a set of fundamental concepts, which are part of the philosophy sustained by the regulatory system concerning radiological and nuclear safety, safeguard and physical protection. Such concepts, are the following:

**Basic criteria of radiological and nuclear safety:** The basic criteria in which radiological and nuclear safety is supported are being applied since long time ago and they are in agreement with the ICRP recommendations (in its publications No. 26 and No. 60). On the other hand the Regulatory Body has contributed to formulate recommendations issued by international bodies (such as IAEA, ICRP and UNSCEAR), so that it is usual to find, in its own standards, concepts dealing with radiological and nuclear safety that appear in such recommendations. Further, nowadays, ARN is taking part of the IAEA’s Waste Safety Standards Advisory Committee (WASSAC), the Transport Safety Standards Advisory Committee (TRANSSAC), the Radiation Safety Standards Advisory Committee (RASAC), and the Nuclear Safety Standards Advisory Committee (NUSAC).

**Responsibility for safety:** The regulatory system considers that the owner and operating organisation, known as Responsible Organisation is responsible for the radiological and nuclear safety of the installation as well as for the physical protection and safeguards of nuclear material in the facility. The mere compliance with the regulatory standards does not exempt the organisation from the mentioned responsibility. For this reason the regulatory standards are not
prescriptive but, on the contrary, they are “performance-based” standards, that is to say, they establish the fulfilment of safety objectives. The way of reaching these objectives is based on engineering experience, on the qualification of designers, constructors and operators and on suitable decisions taken by the Responsible Organisation itself. Therefore, the Responsible Organisation must demonstrate and convince the Regulatory Body that the installation is safe.

As for every practice involving radioactive material, the standard AR 10.1.1 - “Basic Standard of Radiological Safety” [3] is the fundamental one the operators involved in waste management activities shall comply with. Nevertheless, since some time ago, a specific standard applicable to waste management activities is under discussion. Such standard is intended to complement the standard AR 10.1.1 for which it includes a criterion set, fully in accordance with internationally agreed principles, to be applied in the field of waste management.

4. LICENSING SYSTEM AND REGULATORY ACTIVITIES

A basic aspect of the regulatory system is the approach adopted, in which the Responsible Organisation dealing with the design, construction, commissioning, operation and decommissioning stages of the significant nuclear installations, is completely responsible for their nuclear and radiological safety as well as physical protection and safeguards.

The regulatory standards establish that the construction, commissioning, operation or decommissioning of a significant nuclear installation shall not start without the corresponding licence, required by the Responsible Organisation and issued by the Regulatory Body. The validity of such licences is subordinated to the compliance with their stipulated conditions, and to standards and requirements issued by the Regulatory Body. The non-compliance with any of these requirements may be enough reason for the Regulatory Body to suspend or cancel the corresponding licence validity, according to the sanction regime in force.

Since the early days of the nuclear activities in the country, the Regulatory Body has performed assessments as well as multiple and different regulatory inspections and audits as frequently as considered necessary, with the purpose of verifying that nuclear installations satisfy the standards, licences and requirements in force.

Act No. 24804, “National Law of Nuclear Activity”, authorizes the Regulatory Body to continue with such inspections and regulatory assessments and audits, performed by its personnel.

Concerning waste management in particular, ARN performs assessments of radiation and waste safety to practices and systems of radioactive waste management. The main aim of such assessments is to verify fulfilment of the criteria in force and the regulatory requirements put to the Responsible Organization, applying in both cases, the regulatory tools presented in the previous paragraph. All phases of waste management are controlled in the installations under regulatory control: from waste generation to its disposal, through predisposal activities. In the NPP there are resident inspectors, performing routinely inspections of nuclear, radiation and waste safety. Other installations are regularly controlled by the inspectors, with a variable frequency, according the installation characteristics.

In the case of safety assessment of radioactive waste disposal, ARN has developed some computational tools. These tools are models to compute source term releases from near surface disposal facilities, radionuclide transport in three dimensions and doses due to several scenarios (normal and intruder, including various exposure paths). These codes participated in the NSARS inter-comparison exercise of the International Atomic Energy Agency. The developed codes can also be used to aid in making regulatory decisions. At the moment, ARN is taking part of the IAEA’s Co-ordinated Research Programs “Improving Safety Assessment Methodologies” (ISAM) and “BIOsphere Modelling and ASSessment methods” (BIOMASS).

Decree No. 1390 (1998) [4], that dictates rules for the execution of Act No. 24804, added to the current activities of the Regulatory Body those related to the revision of the annual contribution made by waste generators to the Fund for Radioactive Waste Management.
5. REGULATORY CRITERIA APPLIED TO WASTE MANAGEMENT

ARN has developed some basic regulatory criteria applicable to the radioactive waste management with the aim of providing assessment targets on radiological and waste safety for the demonstration period, and other regulatory requirements.

5.1. Risk Limits: The radiological protection criteria applied by ARN to the final disposal of radioactive wastes establishes that no individual of the critical group shall be exposed to a risk higher than $10^{-5}$ y$^{-1}$ with optimization of the protection systems, and if the risk is not higher than $10^{-6}$ y$^{-1}$, the optimization requirement is not considered necessary, taking into account that further reduction in the detriment could only be achieved with a deployment of resources not balanced with the dose abatement.

5.2. Optimization of protection systems: The radiological protection systems used for waste management shall be optimized taking into account the reduction of the effective doses, the cost of several options, the uncertainties associated to the long term and, as a boundary condition, the dose/risk constraints.

5.3. Responsibilities: The waste generators (namely the operators of nuclear installations, or other users of radioactive material) shall be responsible for ensuring the wastes they generate are managed with an adequate level of protection of workers and public. These operators could delegate the management of the wastes, without transferring their responsibilities. The criteria for the final waste disposal are based on the fact that once the decision to proceed is taken, such waste will not be subject to further treatment or other use not foreseen. The final disposal of radioactive wastes shall be previously and explicitly authorized by the Regulatory Authority in the licence or operation authorization. Additionally, to dispose of materials subject to safeguards as waste a previous specific authorization of the Regulatory Authority is required.

5.4. Liquid and Gaseous Wastes: To comply with the radioactive effluent discharge limits set by the regulation in force, gaseous and liquid radioactive wastes shall be either treated by radioactive decay or retention, if necessary. Finally, wastes not fulfilling the previous criteria shall be solidified or immobilized.

5.5. Solid Wastes: The final disposal of solid wastes shall be performed through multiple barrier systems. These barriers shall be the appropriate for the required confinement time, and composed by barriers of geologic nature and others with engineering features, with independent, and redundant character. The final closure of a waste disposal facility, or a particular system within this facility, shall previously be authorized by the Regulatory Authority. The operator of the facility shall extend its responsibilities to the phase between operation ending and the closure, the closeout stage and the following institutional control period established by the Regulatory Authority.

When applying for the construction and operation licence, the Responsible Organization shall demonstrate the system can be closed adequately and that after closure it will meet the safety goals.

5.6. Safety Assessment of disposal systems: The safety assessments of waste final disposal systems shall cover design, construction and operational stages, as well as their state after closure and their future evolution. Several type of scenarios shall be taken into account, among them: "normal evolution" (considering average degradation of the system) and "incidental or accidental scenarios" (resulting from possible disruptive events). The Safety Assessment shall be reported in terms of doses for normal scenarios, in terms of risk for probabilistic events, or by any other safety indicator considered as appropriate to the required confinement period, to the satisfaction of the Regulatory Authority. In the case of "normal scenarios", the estimated doses to future generations shall not exceed the dose constraint established at the time of disposal. For disruptive events, risk limits as defined above should be used.

5.7. Reporting to Regulatory Authority: The Responsible Organization of a waste generator facility or a waste disposal facility shall maintain an updated inventory of the wastes disposed of, during its operative phase, on their own third parties. The disposed inventory shall be informed...
annually to the Regulatory Authority. The inventory records shall be sent to the Regulatory Authority after ceasing activities.

6. REFERENCES


