Regulatory Control on Decommissioning of Research Reactors

Perrin, C.D.

REGULATORY CONTROL ON DECOMMISSIONING
OF RESEARCH REACTORS IN ARGENTINA

CARLOS D. PERRIN
Nuclear Regulatory Authority
Argentina

ABSTRACT

The NUCLEAR REGULATORY AUTHORITY (ARN) was established as an autonomous body reporting to the President of Argentina by Act 24,804 known as the Nuclear Activity National Act, which came into force on April 25, 1997, and is empowered to regulate and control the nuclear activity with regard to radiation and nuclear safety, physical protection and nuclear non-proliferation issues. It must also advise the Executive on issues under its purview.

The objective of the Nuclear Regulatory Authority is to establish, develop and enforce a regulatory system applicable to all nuclear activities carried out in Argentina.

The construction, commissioning, operation and decommissioning of a significant nuclear installation shall be previously authorized and licensed by the Regulatory Authority.

In the field of Research Reactors, the ARN controls six installations: three Research Reactors and three Critical Facilities (one in extended shutdown).

This paper describes the legal and regulatory framework, as well as the regulatory activities that ARN applies to the decommissioning of Research Reactors and Critical Assemblies in Argentina.

1. INTRODUCTION

In Argentina there are two nuclear power plants in operation, a third one in delayed construction, three critical assemblies, three research and isotope production reactors, one ? dismantled critical assembly, 25 major radioactive facilities and approximately 1,500 facilities for medical, industrial, research, education and training purposes which use radioactive materials or sources.

The regulatory responsibilities and tasks in the nuclear field cover radiological protection and nuclear safety, safeguards and physical protection.

Regarding radiological and nuclear safety in research reactors and critical assemblies, the regulatory activities are directed at controlling the aforementioned six facilities, analyzing safety-related documents, assessing safety during operation, and verifying by means of regulatory inspections and audits the compliance with the provisions of the pertinent licenses, the applicable regulatory standards and other requirements.

The principal characteristics of the Argentinean RRs and CAs are:
### RESEARCH REACTORS AND CRITICAL ASSEMBLIES IN ARGENTINA

<table>
<thead>
<tr>
<th>CRITICAL ASSEMBLIES</th>
<th>RA-0</th>
<th>RA-2</th>
<th>RA-4</th>
<th>RA-8</th>
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<tbody>
<tr>
<td>Power (w)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>10</td>
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<tr>
<td>Type</td>
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<td>Tank</td>
<td>Homogeneous</td>
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<tr>
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<td>Education and training</td>
<td>RA-3 critical facility???</td>
<td>Teaching and training</td>
<td>CAREMfuel test</td>
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<tr>
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<td>Uo2</td>
<td>Ual</td>
<td>Uo2</td>
<td>Uo2</td>
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<tr>
<td>Fuel element</td>
<td>Rods</td>
<td>Mtr</td>
<td>Polyethylene plates</td>
<td>Rods</td>
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<tr>
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<td>90</td>
<td>20</td>
<td>1.8 AND 3.4</td>
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<tr>
<td>Status</td>
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<td>Dismantled</td>
<td>Operational</td>
<td>Extended shutdown</td>
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<tr>
<td>Place</td>
<td>University - Córdoba</td>
<td>Constituyentes atomic centre</td>
<td>University-Rosario</td>
<td>Pilcaniyeu</td>
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<table>
<thead>
<tr>
<th>RESEARCH REACTORS</th>
<th>RA-1</th>
<th>RA-3</th>
<th>RA6 (1)</th>
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<tbody>
<tr>
<td>Power (kW)</td>
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<td>10000</td>
<td>500</td>
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<tr>
<td>Type</td>
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<td>Tank</td>
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<tr>
<td>Utilization</td>
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<td>Radiois. Production, research, axa</td>
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<tr>
<td>Fuel</td>
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<td>UO₂, usi³</td>
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<td>Rods</td>
<td>MTR</td>
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<tr>
<td>Enrichment</td>
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<td>20</td>
<td>90</td>
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<tr>
<td>Status</td>
<td>Operational</td>
<td>Operational</td>
<td>Operational</td>
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<tr>
<td>Place</td>
<td>Constituyentes atomic centre</td>
<td>Ezeiza atomic centre</td>
<td>Bariloche atomic centre</td>
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<tr>
<td>First Criticality</td>
<td>1958</td>
<td>1967</td>
<td>1982</td>
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</table>

(1) RA-6 is projecting to increase power up to 3 MW and to replace HEU to LEU (from 90% to 20%).

### 2. LEGAL FRAMEWORK

From 1950 to 1994 the National Atomic Energy Commission (CNEA) was the only state institution in the nuclear field and had, among other areas of competence, the responsibility for the regulatory control in the field of radiological and nuclear safety, safeguards and physical protection.

In 1994 the Government created a new and independent institution through the Decree No 1540/94, the National Board of Nuclear Regulation (ENREN), and transferred to it the authority, the personnel and infrastructure for regulating nuclear activities in the country. The Nuclear Regulatory Authority (ARN) was established as an autonomous body reporting to the Presidency of Argentina by Act 24,804 known as the Nuclear Activity National Act, which came into force on April 25, 1997, and is empowered to regulate and control the nuclear activity with regard to radiation and nuclear safety, physical protection and nuclear non-proliferation issues. It must also advise the Executive on issues under its purview.
The objective of the ARN is to establish, develop and enforce a regulatory system applicable to all nuclear activities carried out in Argentina. The goals of this regulatory system are:

- To provide an appropriate standard of protection for individuals against the harmful effects of ionizing radiation.
- To maintain a reasonable degree of radiological and nuclear safety in the nuclear activities performed in Argentina.
- To ensure that nuclear activities are not developed with purposes un-authorized by the law and regulations resulting there from, as well as by the international agreements and the non-proliferation policies adopted by Argentina.
- To prevent the commission of intentional actions which may either have severe radiological consequences or lead to the unauthorized removal of nuclear materials or other materials or equipment subject to control.

The Act N° 24804 establishes also that CNEA is the institution responsible for determining the decommissioning of nuclear power plants and any significative radioactive facility.

REGULATORY FRAMEWORK

With the purpose of fulfilling the objectives before mentioned, the ARN has developed and has been provided with:

Legal competence: it is an organism established by means of a law, with missions and functions clearly established and legally recognized.

a. Technical competence: it has an staff of personnel suitably trained, with a high percentage of professionals, in its majority posgraduated.

b. Operational capability: it has adequate infrastructure, equipments and budget for the fulfillment of his functions.

Act No 24804 (it should be noted that initially ENREN was empowered to this role by means of Decree 506/95) empowers the Regulatory Body to issue and enforce its own standards, with the aim to regulate and to control nuclear activities along the whole national territory.

The regulatory standards are based on criteria, which are part of the performance-based philosophy sustained by the regulatory system, concerning radiological and nuclear safety, safeguards and physical protection. Such criteria are in agreement with the recommendations issued by international scientific bodies (mainly IAEA, ICRP, UNSCEAR, WHO). Therefore the regulatory standards are mainly based on the performance approach, that is to say, they establish the fulfillment of safety objectives. The Responsible Organization must demonstrate, at the satisfaction of the Regulatory Authority, that such objectives are fulfilled; ‘how’ to comply with is one of the responsibilities of the Organization.

The regulatory standards establish that for starting the construction, commissioning, operation and decommissioning stages of a nuclear facility the Responsible Organization

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1 The regulatory system and activities were established and implemented log time ago, but as branch within the National Atomic Commission
must previously possess the corresponding licence, requested by the Responsible Organization and issued by the Regulatory Authority. The licences’ validity are subordinated to the compliance with stipulated conditions and with the applicable standards and requirements.

Four main regulatory standards are applicable to the decommissioning stage of nuclear installations in Argentina. One of them is specific and the other three have general requirements for the licensing of nuclear installations and for radiological and waste safety. They are:

1. *Licensing of class I installations*, AR 0.0.1, Rev.2 (2002)

The basic concepts of this standard are:
A licence issued by the Regulatory Authority is required for the construction, commissioning, operation and decommissioning stages of an installation life-cycle.
A Responsible Organization must be identified for each stage.
This Responsible Organization is responsible for the nuclear and radiological safety of the installation in each of its stages: construction, commissioning, operation and decommissioning.
For each facility the Responsible Organization must identify a qualified staff member, called the Primary Responsible, who is assigned with the direct responsibility for the nuclear and radiological safety of the installation.
The Responsible Organization shall submit in due time to the Regulatory Authority the technical documents required for the safety assessment of the installation stage whose licence is requested.


This standard provides the radiological criteria to be applied to all installations and tasks in all stages of their life: construction, commissioning, operation and decommissioning. It is coherent with ICRP 60 recommendations and related IAEA Safety Standards.


This standard establishes the general requirements for the decommissioning stage. The main requirements are:
The Responsible Organization, holder of the Decommissioning Licence, is responsible for the planning and provision of the necessary resources for the safe decommissioning of the nuclear power plant.
A previous approval by the Regulatory Authority is required for implementing the Programme.
The Decommissioning Programme shall include all the necessary steps for ensuring the adequate radiological protection with a minimal ad hoc surveillance after decommissioning.

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2 For the Regulatory Authority the licence for construction include siting and design safety-related aspects.
The Responsible Organization may delegate tasks for performing decommissioning, either totally or partially, to third parties, but keeping all responsibilities. During the decommissioning process, the Responsible Organization (or Operating Organization in accordance with IAEA terminology) shall contemplate and put under Regulatory Authority consideration, the following:

a. Management of the project  
b. Site management  
c. Role and responsibilities of the organizations involved  
d. Radiation protection  
e. Quality systems  
f. Waste segregation, conditioning, transport and, if it’s the case, disposal  
g. Surveillance after completion of partial stages of decommissioning  
h. Physical protection  
i. Safeguards and non-proliferation commitments

If the dismantling is deferred for a significant period of time after the final shutdown decision, the Responsible Organization shall provide the adequate storage for drawings, reports, data and all the relevant documents for the decommissioning. In this case, the Responsible Organization shall keep its responsibilities during this period, maintaining in operation all the safety systems required to keep the facility on safe conditions.


This is the specific standard for waste safety issued by ARN. It complements the standard AR 10.1.1 in radioactive waste management aspects, and includes a set of criteria that are coherent with internationally recommendations and principles to be applied in this field.

Other applicable regulatory standards are: AR 0.11.1 *Licensing of personnel*, AR 3.1.1 *Occupational Exposure*, AR 3.1.2 *Limitation of Radioactive Effluents* and AR 3.6.1 *Quality system for nuclear power reactors*. In the last standard emphasis is given to grading, so the standard can be applied to all nuclear facilities on a case-by-case basis using the graded-approach.

**REGULATORY ACTIVITIES**

Today there aren’t any decommissioning project for research reactors in the near future, so the regulatory action is focused to the control of reports and other documents which will be necessary and applicable in due time.

In addition to requirements established in the regulatory standards previously mentioned, there is a specific one included in the Operation Licences: the Preliminary Decommissioning Plan.

This mandatory document, the Preliminary Decommissioning Plan, include topics related to documents management, record-keeping and special tasks oriented to decommissioning The Operating Organization must collect and archive the following documentation during the operation stage.
Documents
- Safety analysis report
- Technical manuals
- Technical specifications (limits and conditions)
- Complete drawings, photographs and technical descriptions of building, systems, experimental facilities and components
- Design change reports and updated drawings
- Modifications to the original design
- Quality records (such as deficiencies, corrective actions, etc.)

Records
- Effluents management records and locations
- Waste management records and locations
- Radiation sources management records and locations
- Records of neutron flux and distribution
- Radioisotopes management and locations
- Radioprotection records (doses rates, contamination levels, radiation and contamination survey data, etc.)
- Samples of irradiated materials and probes
- Operation and maintenance reports
- Hazardous material inventories
- Abnormal events reports (fuel failures; incidents leading to spillage or inadvertent release of radioactive material)
- Staff records

On the other hand in the Operation Licence are established that at least one year before the date of the planned decommissioning, the Decommissioning Plan must be submitted to the Regulatory Body. The content of this plan must be coherent with IAEA SRS N° 45 Standard format and content for safety related decommissioning documents and Safety Guide WS-G-2.1 Decommissioning of nuclear power plants and research reactors.

REFERENCES