

REGULATORY AUTHORITY

The Nuclear Regulatory Authority (in Spanish, ARN) was created as an autarchic entity under Act 24,804 known as Nuclear Activity National Act, which came into force on April 25th, 1997, to succeed the National Nuclear Regulatory Board. The Nuclear Regulatory Authority reports directly to the Argentine Presidency and is empowered to regulate and control the nuclear activity with regard to radiological and nuclear safety, physical protection and nuclear non-proliferation aspects.

The objective of the Nuclear Regulatory Authority is to establish, develop and enforce a regulatory system applicable to all nuclear activities within Argentina, as well as, to advise the Executive on issues under its purview. The goals of these regulatory system are:

- ✓ To provide members of the public with an appropriate level of protection against harmful effects of ionizing radiations.
- ✓ To ensure a reasonable degree of radiological and nuclear safety for nuclear activities performed in Argentina.
- ✓ To ensure that nuclear activities are not diverted for unauthorized purposes and are performed in accordance with international agreements to which the Nation is a signatory.
- ✓ To establish criteria and standards in order to prevent deliberate actions from being committed which may either have severe radiological consequences or lead to the unauthorized removal of nuclear materials or other materials or equipment of nuclear interest.

Articles 1, 7, 14, 15, 16, 18, 25 and 26 of Act 24,804 explain in detail the functions, powers and duties vested in the Nuclear Regulatory Authority. Decree 1390/98 enforcing said Act defines its scope and procedures facilitating its enforcement.

The effective direction and management of the Nuclear Regulatory Authority is carried out by the Board of Directors. The Board of Directors is composed of six members appointed by the Executive, two of which shall be nominated respectively by the Senate and the House of Representatives. The term of office of each Director shall be six years, with one third of them being chosen every second year. Technical and professional qualifications in the specific field are selection criteria for the Director's office.

The ARN organizational structure has been approved by a Board resolution in accordance with the provisions of Act 24,804. The relevant organization chart is shown in Chapter 1 of the Main Report (The Main Report is only available in Spanish).

THE ARGENTINE REGULATORY SYSTEM

In its capacity as the national authority on radiological and nuclear safety, non-proliferation assurances and physical protection issues, the ARN grants authorizations, licenses or permissions, as appropriate, in connection with practices associated with radiation sources. In addition, the ARN performs control activities to ensure that persons responsible for each practice comply with the provi-

2 - SYNTHESIS

sions set forth in the standards and other regulatory documents. From the beginning of the regulatory activities in the country it was recognized that to efficiently play this role an appropriate scientific and technological expertise was needed to assess, based upon an independent criterion, the design, construction, operation and decommissioning of the facilities subject to control. Within this framework, the global strategy contained in the Argentine regulatory system has focussed in the following basic principles:

- ✓ Adopting specific standards on radiological and nuclear safety, safeguards and physical protection.
- ✓ Conducting regulatory inspections and audits to verify compliance with licenses and authorizations granted.
- ✓ Carrying out studies and assessments on radiological and nuclear safety, safeguards and physical protection, for the purposes of the licensing process.
- ✓ Promoting scientific and technological development regarding radiological and nuclear safety, safeguards and physical protection.
- ✓ Providing personnel training in connection with radiological and nuclear safety, safeguards and physical protection, directed at both personnel responsible for the safety of the facilities and performing regulatory activities.

The ARN has the power to adopt regulatory standards related to radiological and nuclear safety, safeguards, physical protection and transport of nuclear materials, in accordance with the provisions of Act 28,804. All of 51 regulatory standards currently in force, applicable to major and minor facilities existing in the country, are set out in Chapter 2 of the Main Report.

The ARN laboratory building at Ezeiza Atomic Center



Radiological and Nuclear Safety

According to the Argentine regulatory system the organization (owner or operator) dealing with the design, construction, commissioning, operation and decommissioning stages of a nuclear facility shall take full responsibility for the radiological and nuclear safety of the facility in question. No event affecting radiological and nuclear safety shall relieve said organization, referred to as Responsible Entity, from its responsibility in each stage of the project. The compliance with the regulatory standards and requirements is to be considered as a minimum requirement which does not relieve said organization from its obligation to take any action necessary to ensure the radiological and nuclear safety of the facility.

From the licensing process standpoint, facilities are divided into two groups: major and minor facilities, according to the associated radiological risk involved. For major facilities the ARN grants operating licenses while for minor facilities it grants operating authorizations. An application for a license or authorization will be accepted for examination provided that it is accompanied by an appropriate preliminary nuclear safety assessment, the depth of which shall be in accordance with the radiological risk associated with the facilities concerned.

Major facilities require three types of licenses: construction, operating and decommissioning licenses. Licenses shall be granted to the Responsible Entity, that is, the organization liable for the safety of such facilities. The construction license for a given facility shall be granted upon compliance with standards and requirements applicable to location, basic design and expected safety level for future operation.

In order to be issued an operating license, the Responsible Entity shall prove compliance with applicable specific conditions, standards and requirements.

As for the ARN, it performs an independent evaluation of the technical documents and detailed studies filed, the reports in connection with inspections conducted during construction, the results of preliminary operation activities, etc.

It should be particularly noted that since the beginning of the construction stage the ARN evaluates the ability of the Responsible Entity to take its responsibilities. Argentina has adopted performance-based nuclear safety regulations. This requires both the Responsible Entity, as regards its proposals, and the ARN, in connection with its independent evaluation, to make a remarkable effort such that a final satisfactory result is attained. Accordingly, the interaction between the Responsible Entity and the ARN shall be carried out on a permanent basis throughout the licensing process.

The evaluations prior to issuance of a license for the operation of a major facility include matters such as quality assurance, methods of construction, provisions for inspections during operation, methods of operation, etc. In addition, if a facility has a potential for accidents which may affect members of the public, it is required that emergency plans be implemented in coordination with the relevant federal, provincial and local organizations.

According to the ARN requirements, the whole staff of the Responsible Entity shall be properly trained and qualified and demonstrate an aptitude in accordance with their duties in a major facility. The Responsible Entity must also apply to the ARN for individual licenses for personnel whose activities could substantially affect safety. Applicants for an individual license are nominated by the Responsible Entity and separately subjected to the independent evaluation of the ARN. Training and qualification requirements for staff members generally cover four areas: basic training, specialized training,

4 - SYNTHESIS

ning, in-job training and physicophysical fitness. Every function within the organization chart shall be fulfilled by staff members whose background meets the relevant requirements. Such required qualifications will include, if appropriate, basic university education in accordance with the nature of the responsibility to be taken. Both the specialized and in-job training shall be duly certified. Applicants shall be examined by ad-hoc examination boards.

Two types of regulatory documents are issued for the purpose of certifying the skills of the staff concerned. The first one consists in an individual license certifying that the applicant possesses the basic and specialized training suitable to take up a certain duty in a given type of facility. This document is issued at the applicant's request and has no expiry date. It is not, however, enough to certify the ability of an applicant to take up a given duty in a facility. Accordingly, to be accepted for performing a key safety-related responsibility in a given facility, the applicant needs in addition to the individual license a specific authorization which has to be requested to the ARN by the Responsible Entity. For this purpose, the applicant shall prove a specific knowledge of the facility in question, as well as a suitable in-job training and an adequate psychophysical fitness. This specific authorization is valid for a period that shall not exceed two years.

As indicated above, for the operation of minor facilities the organization liable for any practice involving radioactive material or ionizing radiations is required to apply for an operating authorization.

For the operation of minor facilities the ARN has the authority to require that the organization liable for any practice involving material or ionizing radiations applies for an operating authorization. This document shall be issued by the ARN in favour of that organization upon assessment of the documents filed and the results of the preliminary operation-related inspections, provided that all applicable standards and prerequisites are met and qualified staff is brought in. Additionally, for the operation of a minor facility, individuals involved are required to hold a specific individual permission applicable to a given practice. In order to be granted such a permission, the applicant shall meet several requirements, namely to possess a suitable basic training, an appropriate specialized training and enough in-job training, in accordance with the provisions of the relevant specific standards. The minimum requirements to be met in order to be granted an operating authorization and an individual permission for the different minor facilities existing in the country are set out in Chapter 2 of the Main Report.

All individuals and legal entities desiring to apply to the ARN for licenses, operating authorizations, specific authorizations and individual permissions or radioactive material transport certificates shall pay a licensing or inspection fee in accordance with the provisions of article 26 of Act 24,804. Furthermore, Article 16 of the same Act empowers the ARN to impose sanctions and/or fines in the event of non-compliance with the radiological safety standards regarding medical and industrial applications, as well as with ionizing radiation research and teaching regulations. The corresponding regulations have been established under Decrees 256/96 and 236/98.

Safeguards and Physical Protection

Safeguards and nuclear non-proliferation assurances are an essential aspect in the Argentine regulatory system. They are a group of requirements and procedures applicable to both the nuclear materials and other materials, equipment and information of nuclear interest, aimed at ensuring, with a reasonable degree of certainty, that such elements are not intended for an unauthorized use, and that the international agreements signed in this matter are appropriately respected.

The safeguards may be national or international in nature, with the international safeguards being divided into regional and global. National safeguards are defined by the provisions set forth in the regulatory framework adopted by each State. In the case of Argentina, the ARN has established the guidelines of the Argentine Accountancy and Control System for nuclear materials and other materials, equipment and facilities of nuclear interest. As far as the international safeguards and non-proliferation assurances are concerned, their application proceeds in accordance with the provisions of the agreements on non-proliferation of nuclear weapons ratified by Argentina. In this case, the safeguards may be applied by regional or global international organizations and are aimed at detecting within reasonable time and a reasonable degree of certainty the diversion of "significant amounts" of nuclear materials for purposes banned by the agreements by virtue of which those safeguards are applied.

In this regard, it is worth mentioning the "Bilateral Agreement between the Argentine Republic and the Federative Republic of Brazil for the exclusively peaceful use of nuclear energy" signed in the city of Guadalajara in 1991. By virtue of this agreement an agency was created, designated as "Brazilian-Argentine Agency for Nuclear Material Accountancy and Control" (ABACC) the essential objective of which is the implementation of the "Common System for Accountancy and Control of Nuclear Materials" aimed at ensuring that said materials are not diverted for the manufacturing of nuclear weapons or other nuclear explosive devices.

Immediately after the bilateral agreement came into force, a multilateral agreement was concluded by Argentina, Brazil, the ABACC and the International Atomic Energy Agency (IAEA) for the application of safeguards (referred to as Quadripartite Agreement). This agreement commits the IAEA to applying safeguards in both countries for nuclear materials in connection with all nuclear activities in Argentina and Brazil, based upon the "Common System for Accountancy and Control of Nuclear Materials".

The Argentine regulatory system also contemplates, with special attention focussed on the national regulatory function, the physical protection against robbery, removal or unauthorized use of nuclear materials, and sabotage against nuclear facilities. In this respect, the ARN takes full responsibility for requiring the Responsible Entity to implement a complete physical protection system applicable to nuclear facilities and materials in accordance with the regulatory requirements set forth by the ARN. In particular, the "Convention on Physical Protection of Nuclear Material", regarding international transport of these materials, was opened to signature on March 3, 1980, in the IAEA's Vienna headquarters and the United Nations's New York headquarters; Argentina adopted this Convention under Act 23,620 and then ratified it.

Transport of Radioactive Material

The transport of nuclear material within Argentina shall be carried out in accordance with the provisions of the IAEA's "Regulations for the Safe Transport of Radioactive Material" which 1985 edition (amended in 1990) came into force on December 11, 1993.

All international, regional and national organizations responsible for regulation of land, air, river and sea transport of hazardous materials have endorsed the safety criteria contained in regulation AR 10.16.1. related to "Radioactive Material Transport", literally in accordance with the afore-said IAEA Regulations. Regulation AR 10.16.1. provides persons, goods and environment with a suitable safety level during normal transport of radioactive material, as well as in the event of any acci-

dent. In order to protect workers and members of the public under normal transport conditions, this regulation sets forth prerequisites which essentially limit the dose rate in the environment of the packages to be transported and the non-fixed contamination in their external surface.

Type B (U) packages for cobalt 60 transport



The annual average of total shipments of radioactive material within Argentina is estimated at 10,000, 5% of which is associated with the nuclear fuel cycle and 95% corresponds to radioactive materials used for research, industry and medicine. The ARN verifies compliance with the provisions of Regulation AR 10.16.1. A so-called "Approval Certificate issued by the Competent Authority" shall be delivered by the ARN to certify approval of type-B packages, packages containing fissionable substances, specially-packaged radioactive materials (sealed sources), certain shipments and specially-arranged shipments.

The importation of radioactive sources is a practice under regulatory control. All importers must possess operating and specific import authorizations issued for each particular shipment.

Regulatory documents issued

During 1998 the ARN issued the following licenses, authorizations and other documents:

Type of document	Number
Individual licenses	24
Individual specific authorizations	189
Operating authorizations	260
Individual permissions	370
Transport certificates	11
Radioactive material import authorizations	1230

INSTITUTIONAL RELATIONS

Within the context of its regulatory function, the ARN maintains a close and varied interaction with domestic and foreign, governmental and non-governmental organizations, as well as with international agencies. Such an interaction has the following objectives:

- ✓ To facilitate the exchange of experiences and information and the participation in developing international recommendations to address issues related to radiological and nuclear safety, nuclear non-proliferation assurances and physical protection.
- ✓ To establish and develop technical co-operation agreements.
- ✓ To promote cooperation in order to improve effectiveness and efficiency of the international safeguards system through the participation of experts and the development of specific techniques in the country.

Furthermore, the ARN is actively involved in negotiating international instruments in connection with the nuclear regulatory function and also in their subsequent implementation. In addition, the ARN contributes to the definition of Argentine regulatory policies upheld in different international fora.

Conference of the IAEA Director General
at the Argentine Council for International Relations (CARI)



From left to right: Dr. Eduardo D'Amato, President of the ARN Board; Dr. Oscar Fernández, President of the CARI; Dr. Mohamed ElBaradei, IAEA Director General and Dr. Dan J. Beninson, President of National Atomic Energy Commission (CNEA) Board.

The negotiation of national and international agreements has always been one of the most important tasks within the framework of the institutional relations. The ARN maintains currently valid agreements with national and foreign universities, public hospitals, the Federal Police and the Coast

Guard, as well as with American, Canadian, Spanish and Swiss regulatory authorities, among other countries. During 1998, international agreements were concluded with Germany's "Gesellschaft für Anlagen und Reaktorsicherheit (GRS) mbH" and France's "Institut de Protection et de Sûreté Nucléaire" (IPSN). In the national sphere, agreements have been signed with the Argentine Border Guard, the University of Buenos Aires' Faculty of Engineering and "Otto Krause" Technical Education School N° 1.

The ARN attaches great importance to the link with the International Atomic Energy Agency (IAEA). This link can be defined as having three key principles:

- ✓ Attending the regular meetings of the so-called IAEA's "policy-making" organs;
- ✓ Participating in meetings of high-level expert committees advising the IAEA Director-General on issues in connection with nuclear safety and safeguards, as well as in activities related to negotiation or implementation of international agreements significant for nuclear safety; and
- ✓ Contributing experts for taking part in technical assistance missions in various countries, preparing safety-related publications and training foreign trainees.

The ARN participates in the National Commission for the Control of Sensitive and War Material Exports to provide advice in cases related to nuclear exports. During 1998, it prepared and issued judgements on the export applications filed, then granting the relevant export authorizations.

The Comprehensive Nuclear Test Ban Treaty (CTBT) adopted by the United Nations General Assembly in September, 1996, is a matter of permanent work for different sectors in the ARN. In fact, with the purpose of verifying compliance with the essential obligation set forth in the Treaty, an International Surveillance System was established envisaging the intensive use of detection techniques. In the case of radionuclide and infrasound technique, the ARN is the responsible organization.

Visiting missions and international meetings attended by ARN officials during the year are listed in detail at the end of Chapter 3 of the Main Report.

REGULATORY INSPECTIONS

In Argentina, there are two nuclear power plants in operation, one under construction, six research and radioisotope production reactors, 24 major radioactive facilities and more than 1500 facilities (for medical, industrial, research and teaching purposes) which utilize radioactive materials or sources and radiation-generating systems. Those facilities are devoted to various purposes such as electric power generation, basic and applied research, or the use of ionizing radiations in the field of medicine and industry. Such various facilities are located all around the country and their complexity varies in a very wide range.

The ARN's regulatory functions aimed at controlling those facilities include analyzing design and operation-related documents, permanently assessing safety during operation, and verifying by means of regulatory inspections and audits the compliance with the provisions of the license concerned. The analysis and assessment functions are discharged by staff members skilled in the field of radiological and nuclear safety who use modern information technology for data management and are acquainted with the use of calculation codes, in order to validate documents supplied by the licensee based upon their own independent criteria.

The ARN's regulatory control action aimed at controlling the facilities also includes a program of routine and non-scheduled inspections for the follow-up of activities related to safety and verification of compliance with the provisions of the relevant license.

Routine inspections are aimed at a) supervising the facility's regular activities, b) process monitoring and c) verification of compliance with the provisions of mandatory documents. As far as nuclear power plants are concerned, inspections are basically conducted by ARN's resident inspectors relying on the technical support provided by the ARN analysis and assessment groups or by groups working for the ARN under agreements or contracts.

Non-scheduled inspections are carried out either in the event of specific circumstances or when the need arises to increase the inspection effort. In these cases inspections are conducted by experts in a variety of disciplines, either from the ARN or other ARN-related institutions.

Facilities subject to regulatory control are listed in the following table:

Facilities under regulatory control	Number
Nuclear power plants (one under construction)	3
Research reactors and critical assemblies	6
Particle accelerators	4
Radioisotope or radioactive sources production plants	5
High-dose irradiation plants	2
Fuel cycle facilities	13
CNEA's waste management area	1
CNEA's minor facilities	26
Teletherapy centers	108
Brachytherapy centers	81
Nuclear medicine and radioimmunoassay centers	605
Gammagraphy	48
Nuclear gauges	266
Research and teaching centers and other applications	433

The distribution of the inspections carried out by the ARN in 1998 by area under regulatory control, as measured in man-days, is showed below.

Area under regulatory control	man days
Radiological and nuclear safety	2866
Safeguards	484
Physical protection	174

The total number of major facilities subject to safeguard and physical protection control is 36.

Radiological and nuclear safety inspections

Type of facility	man days
Nuclear reactors	1370
Major radioactive facilities	114
Medical applications	922
Industrial applications	300
Research and teaching and others	160

Safeguards inspections

Type of facility	man days
Nuclear reactors	356
Major radioactive facilities	86
Research and development facilities	42

Physical protection inspections

Type of facility	man days
Nuclear reactors	60
Major radioactive facilities	65
Research and development facilities	49

With regard to the implementation of the “Common System for Accountancy and Control of Nuclear Materials” the ARN performed in 1998 its obligation to co-operate with the ABACC by contributing 24 inspectors who carried out a 242 man days inspection work in Brazilian facilities.

OCCUPATIONAL SURVEILLANCE

Basic criteria supporting radiological safety establish that: all practices involving the use of ionizing radiations shall be adequately justified, radiological protection shall be optimized, dose limits and constraints shall be complied with, and the likelihood of accidents (potential exposure) shall be kept at a minimum level.

The ARN performs assessment of information related to occupational exposure in the most important major and minor facilities. This work allows the ARN to define behaviour indicators for radiological protection systems, to identify tendencies, to verify compliance with dose limits, and to compare different practices to each other. In 1998, the total number of workers subjected to control in the different major facilities reached 1943, 80% of which pertaining to the nuclear power plants.

The resulting collective dose to nuclear power plant workers was 9.1 man Sv. For Embalse nuclear power plant (CNE) the dose to workers in any case exceeded 20 mSv for 1998, while for Atucha I nuclear power plant (CNA I) 89% workers received individual doses of less than 20 mSv. No dose to workers in the latter power plant exceeded 50 mSv during the year.

The total number of workers in research reactors and critical assemblies reached 130. The annual collective dose to workers involved in the operation of these facilities was 0.04 man Sv. No worker received doses of greater than 3 mSv in the course of the year.

Atucha I Nuclear Power Plant



Embalse Nuclear Power Plant



For radioisotope production plants no dose to workers exceeded 20 mSv for the year. In the remaining major facilities, workers received doses which did not exceed 6 mSv during 1998.

According to the aforesaid results, it is to be concluded that in 1998 doses to major facility workers subjected to control did not exceed the dose limits established by the regulations currently in force; in particular, 55% of those workers received doses lower than a tenth of said limit.

ENVIRONMENTAL SURVEILLANCE

The ARN performs environmental monitoring in the surroundings of the different nuclear facilities in a manner fully independent from monitoring carried out by the facilities themselves. In 1998, such a monitoring was carried out in Atucha I and Embalse nuclear power plants, Ezeiza Atomic Center, San Rafael uranium ore mining plant, Cordoba uranium ore milling plant and the following decommissioned plants for mining and milling uranium ores: Malargüe, Pichiñán, Los Gigantes, La Estela, Los Colorados and Tonco.

In the surroundings of Atucha I and Embalse nuclear power plants, representative samples were taken of the different compartments within the radionuclide transfer environmental matrix. In order to assess the environmental impact of the liquid discharges, samples of river and lake water, sediments and fish were collected and analyzed. To assess the environmental impact of the gaseous effluents released into the atmosphere, samples of locally produced food, such as milk and vegetables, were taken and analyzed. Grass was analyzed as an indicator of radioactive material deposition. On account of their importance from the radiological point of view, radionuclides analyzed were mainly the radioactive fission products (cesium 137, strontium 90, iodine 131) and neutron activation products (tritium and cobalt 60).

No environmental contamination was detected attributable to nuclear power plant operation, except for very low activity levels in some sediment samples.

Environmental monitoring was also carried out for CNEA's Ezeiza Atomic Center. As with the nuclear power plants, representative samples of the different compartments of the environmental matrix were collected in the surroundings of the Atomic Center and then analyzed. No radionuclides were detected in the environment attributable to the operation of said atomic center, except for some sediment samples.

The ARN has continued to perform regular environmental monitoring in the surroundings of operating and decommissioned facilities for the mining and milling of uranium ores. Monitoring was conducted at currently operating Cordoba plant, as well as the following decommissioned plants: Malargüe, Pichiñán, Los Gigantes, La Estela, Tonco and Los Colorados. To assess the radiological environmental impact of the operation of the various facilities, surface water, sediment and ground water were sampled. Natural uranium concentration and radium 226 activity were determined, as was radon gas emission rate from uranium mill tailings, on account that uranium, radium 226 and radon carry with them the highest potential to produce radiological exposure. The results obtained show that no environmental contamination exists attributable to the monitored facilities.

In the course of 1998, the ARN continued to carry out the radon concentration measurement program directed to monitor households in different cities of Argentina, so that exposure incurred by

members of the public could be estimated. For 1780 households monitored from 1983 to 1998 all around the country, the radon concentration mean value was estimated at 34.6 Bq/m^3 . Studies undertaken show that in Argentina, radon levels in households are well within the permissible values.

Public Exposure

In 1998 the radioactive effluent release during operation of CNA I and CNE nuclear power plants accounted respectively for 10% and 8% of the annual dose constraints.

The resulting doses to individuals of the critical group for Atucha I and Embalse nuclear power plants reached respectively 0.004 and 0.005 mSv. These doses accounted for 3% of the annual dose constraints for a particular facility as established by the ARN at 0.3 mSv. The resulting dose to the individuals of the critical group delivered by the research reactors was less than 0.001 mSv, which accounts for approximately 0.3% of the dose constraints value. The resulting doses delivered to the individuals of the critical group at CNEA production plants were 0.005 mSv for the radioisotope production plant and less than 0.001 mSv for both the molybdenum 99 fission-production plant and the sealed sources production plant. Those doses were one order of magnitude lower than the annual dose constraints value.

The resulting doses to individuals of the critical group in the nuclear fuel elements production plant and the remaining major facilities authorized to release radioactive effluents to the environment were lower than 0.001 mSv, which accounts for less than 1% of the annual dose constraints value.

SCIENTIFIC AND TECHNOLOGICAL ACTIVITIES

The ARN carries out various kinds of scientific and technological functions to support its regulatory activity. For this purpose, the ARN relies on appropriate laboratories, equipment and skilled personnel whose tasks consist in implementing and validating the corresponding methodologies within different working sectors.

The ARN possesses various laboratories within the Ezeiza Atomic Center, located in Ezeiza, province of Buenos Aires. These laboratories cover an area of 2000 m^2 and are devoted to physical dosimetry, radiopathology and biological dosimetry, radiochemical analyses, uranium particle detection, iodine 129 detection, radon measurement, environmental sample processing, and internal contamination assessment. Those facilities also include measurement laboratories (whole body counter, gamma and alpha spectrometry laboratory, gross alpha and beta activity measurement laboratory, and low background activity counter), and electronical support laboratories.

In 1998, supporting activities related to regulatory and development control functions were performed within the following specific areas:

- ✓ Physical dosimetry.
- ✓ Internal contamination.
- ✓ Biological dosimetry.

- ✓ Program of medical assistance on radiological protection.
- ✓ Diagnostic and prognostic indicators applicable to accidental overexposure.
- ✓ Prenatal irradiation effects on developing central nervous system.
- ✓ Nuclear tests detection.
- ✓ Use of thermohydraulic codes for assessment of nuclear power plant safety.
- ✓ Electronic developments applied to regulatory activities.
- ✓ Computer model development for assessment of nuclear power plant safety.
- ✓ Study on core material behavior in nuclear power plants during severe accidents.
- ✓ Development of techniques aimed at detecting undeclared nuclear activities.

Radiation induced chromosomal aberration analysis



Within the framework of the Comprehensive Nuclear Test Ban Treaty, a gamma spectrometry laboratory was in operation and served as a primary laboratory within the international network set forth in this Treaty.

With regard to the tandem electrostatic generator pertaining to the Accelerator Mass Spectrometry facility, which will be commissioned in Ezeiza Atomic Center, the following components were installed: accelerator tank, internal columns, accelerating tubes, terminal, resistor chain and load system.

The radiochemical laboratories processed samples obtained from environmental monitoring and inspections. Different types of samples were analyzed including waters, soils, sediments, vegetables, filters and biological samples such as urine, feces and nasal wipes, in order to determine different alpha and beta emitter radionuclides.

In the radiation measuring laboratories routine and special measurement

in thyroid, lungs and the whole body were performed. Measurements associated with environmental studies, inspections and audits were also conducted.

In the field of physical dosimetry, routine measurements of personnel dosimetry and special measurements in reactors, critical assemblies, and accelerators for medical use and research accelerators were carried out.

These laboratories are regularly involved in international quality assessment programs aimed at keeping up the required operating standards.

RADIOLOGICAL EMERGENCIES

The ARN evaluates the radiological and nuclear emergency procedures in case of accidents developed by facilities under control. Which actions are to be taken, who will take them and how they will be taken are the highlights of the emergency plan on which intervention is based. This plan contains all procedures to be followed in the event of an accident condition. For major facilities, the licensee shall take full responsibility for implementing an emergency plan; for minor practices, emergency procedures are required to contain accidents and minimize their consequences.

In accordance with its duties, the ARN will take steps in a subsequent stage to minimize injury and damage which may result from any incident, accident or radiological emergency, through its own Radiological Emergency Intervention System (SIER). The SIER is intended to:

- ✓ Advise both users and public authorities involved in radiological emergency control.
- ✓ To play a part as an intervening organization in the event of emergencies which may arise in minor facilities and practices where accidents can not be provided with adequate containment or affect members of the public, as well as in the event of radiological emergencies in public areas.

The SIER consists of two groups: the Primary Intervention Group and the Support Group. The Primary Intervention Group is on duty in weekly shifts all year round. The Support Group is made up of the rest of the ARN technical staff members who do not work in shifts but may be summoned when necessary. The SIER has the specific equipment and necessary logistic infrastructure to ensure a prompt and efficient intervention in the event of a nuclear accident or a radiological emergency. It works in close relationship and has reached co-operation agreements with other organizations such as federal and provincial Civil Defence Services, the Federal Police, the Coast Guard, the Armed Forces and the Internal Security Department.

In the course of the year, the SIER has taken part in 11 incidents involving radioactive material occurred in medical centers and industrial facilities.

TRAINING AND TECHNICAL INFORMATION

The ARN undertakes as a permanent activity the training of specialists in radiological and nuclear safety, safeguards and physical protection, by means of training courses and the participation in national and international congresses and expert meetings.

The training activity is carried out through the Training Department in charge of defining, organizing and co-ordinating courses, workshops and updating seminars.

The Postgraduate Course on Radiological Safety and Nuclear Safety organized in accordance with the provisions of an agreement with the University of Buenos Aires and the Ministry of Health and Social Welfare under the auspices of the IAEA, has been uninterruptedly given on a yearly basis since its inauguration in 1980. Since then, a total number of 539 professionals have taken a degree, roughly a half of them being foreigners. The course consists of two modules respectively devoted to radiological protection and nuclear safety and running for 20 and 10 weeks. Both modules run on a daily seven-hour basis. In 1998, 23 participants attended the course. Nine out of them were from Argentina while 14 came from the rest of Latin America.

A course on radiological protection is offered to train technicians from public and private institutions. This course runs for eight weeks on a daily seven-hour basis. In 1998, 17 students attended this course. Among the participants were members of the ARN, the CNEA, the National Border Guard and the Ministry of Health of the Republic of Nicaragua.

In 1998, 29 specialized Workshops on various issues in connection with nuclear safety, radiological protection, safeguards and physical protection were held as forming part of a training and accreditation system for ARN inspectors.

The ARN possesses an Information Center consisting of two functional unities where the public can have access to specialized literature on radiological and nuclear safety, safeguards and physical protection through either the ARN's own databases and remote data banks, or by means of periodicals and specific textbooks.

Training courses attended by ARN personnel in the country or abroad, their scientific visits made abroad, trainees received during the year and all publications and papers submitted at specific congresses and simposia are detailed in Chapter 10 of the Main Report.

HUMAN AND ECONOMIC RESOURCES

The organizational structure of the ARN is made up of 215 established posts and 6 posts pertaining to the Board of Directors. In the course of 1998 four specialized contract workers were engaged. At the end of the year, the ARN had 12 research trainees.

Out of the total regular staff, 67% are university-degree holders. Out of the total regular staff, 85% is devoted to specialized scientific and technical functions within the ARN's sphere of activities, while the remaining 15% is devoted to support and clerical jobs.

The total budget allocation approved by Administrative Decision 6/98 for the year 1998 for the ARN was \$ 18,622,065, funded by the Treasury Department contributions, Specific Resources and Specific-Allocation Resources. This initial budget was first reduced by Administrative Decision

361/98 and then reinforced by means of external loans. Therefore, the ultimate budget allocation for the year 1998 was \$ 18,638,445.

Personnel expenditures accounted for 64.6% of the total current expenditure, including contributions from the employer, and social security allowances. Consumption expenditure and non-personnel services accounted for 16.9% of the total current expenditure.

The expenditure breakdown and the ARN consolidated balance sheet at December 31, 1998 is shown in Chapter 11 of the Main Report.