

NATIONAL REPORT FROM PERU

The logo of the International Panel of Experts (IPEN) is a large, light gray watermark in the background. It features a central circular emblem with concentric rings and a stylized figure. The text 'SEVENTH REPORT PREPARED IN THE FRAMEWORK OF CONVENTION ON NUCLEAR SAFETY' is overlaid on this emblem.

**SEVENTH REPORT PREPARED IN THE FRAMEWORK
OF
CONVENTION ON NUCLEAR SAFETY**

IPEN

August 2016

INTRODUCTION

This report updates the last one presented for the Sixth Meeting held in April 2014. At present the Republic of Peru do not have any nuclear installation as defined by the Convention and there is no plan for embarking the country in a nuclear power program as the power demands will be covered by hydroelectric and gas resources as well as non-renewable sources.

The only nuclear activities carried out in the country are those related to the use of ionizing radiation sources in medicine, industry and other fields which are out of the Convention scope. The registered radiation sources are nearly 10000 being most of them medical diagnostic X-ray machines. The existing nuclear material in the country is used as nuclear fuel in two nuclear research reactors which are operated by Peruvian Institute for Nuclear Energy (IPEN) for research and radioisotopes production purposes. The information about these research reactors have been provided in previous reports in a voluntary basis and, basically, remains unchanged.

In despite of not having nuclear installations, the country is strongly committed with the Convention on Nuclear Safety and willingly to accomplish with obligations which applies as a contracting part without nuclear installations and which are addressed in this National Report, as the regulatory framework, emergency preparation and radiation protection. It is also remarked that Convention is deemed to be very important as it provides a good support to the legal framework on safety and protection and promoting the awareness on them.

The National Report follows the INFCIRC/575/Rev.5 recommendations for countries without nuclear installations and its preparation has been made by reviewing the last report and comparing with the current situation of each issue then updating them as applicable. The structure of report remains the same as previous report and it provides enough information as to be self-sufficient and give a good picture of current status.

Finally, as many aspects of situation remain the same, the report has taken information from sections of previous report directly and in some cases these have been copied from previous report, included Appendixes.

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SUMMARY

The report includes the information applicable to countries without nuclear installations as recommended in INFCIRC/575/Rev.5. Peru has no nuclear power plants and there is no intention of embarking in a nuclear power program. Nuclear activities in the country just involve radiation sources that are used in industry, medicine and others, as well as the two research reactors.

The regulatory framework remains as previously reported but it has been reinforced by the approval for Peru of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, and also of the Amendment to the Convention on the Physical Protection of Nuclear Material which raises the need for revision of regulation in physical protection.

The projects of law on Nuclear Safety and for Radioactive Waste Safety did not have success and were returned to IPEN with recommendations of Ministry of Energy and Mines for improving them. Also a program is going on addressed to review and updating the radiation safety regulation to keep it in line with the new IAEA International Safety Basic Standards.

In the field of emergencies, there has not been significant progress on preparation of the National Integrated Plan with the National Institute responsible for emergencies however, on other side a plan for radiological emergency response to big magnitude emergencies was provided to Ministry of Energy and Mines to integrate it in the Sectorial Plan for Responding to a Category 5 of Disaster, which is under approval. The National Radiological Emergency Plan in charge of IPEN was tested on notification reception. The emergency plan was applied in two minor events with radioactive sources however updating of the threat assessment remains as a challenge.

Regard to regulatory body it is noticed its limitations on budget and resources which impacted on its activities and resulting in an increasing stress for prioritization of activities and appraising for first time the need and possibility of being independent.

Arrangements have been made for returning the spent fuel of research reactor RP10 to United States of America in the frame of the Global Threat Reduction Initiative (GTRI) project, expecting this will occur in 2017.

REPORTING ARTICLE BY ARTICLE

A. CHAPTER 2. OBLIGATIONS

a. *General provisions*

ARTICLE 4. IMPLEMENTING MEASURES

Each Contracting Party shall take, within the framework of its national law, the legislative, regulatory and administrative measures and other steps necessary for implementing its obligations under this Convention.

The Law 28028, Law of Regulation on the Use of Ionizing Radiation Sources, approved in July 2003, is the highest legal document which establishes the general provisions for safety of practices using ionizing radiation sources and the obligations to users and also empowering the Nuclear Institute for Nuclear Energy (IPEN) as regulatory body. The Law includes to the nuclear reactors as specified in their definitions as a complex ionizing radiation source. The Law is also supported by other regulations establishing the regimes for authorization, enforcement and technical requirements on nuclear safety and radiation protection. The framework remains the same as specified in the last report. A listing of Laws and Regulations in Nuclear and Radiological Safety Matters are shown in the Appendix.

ARTICLE 6. EXISTING NUCLEAR INSTALLATIONS

Each Contracting Party shall take the appropriate steps to ensure that the safety of nuclear installations existing at the time the Convention enters into force for that Contracting Party is reviewed as soon as possible. When necessary in the context of this Convention, the Contracting Party shall ensure that all reasonable practicable improvements are made as a matter of urgency to upgrade the safety of the nuclear installations. If such upgrading cannot be achieved, plans should be implemented to shut down the nuclear installations as soon as practicable possible. The timing of the shut-down may take into account the whole energy context and possible alternatives as well as the social, environmental and economic impact.

The country does not have nuclear installations as defined in the Convention. The National Energy Policy for Peru 2010 – 2040 has considered the nuclear power as part of the energy matrix, however, currently any activity or action has been initiated for embarking the country in a nuclear program. Currently the perspective for the country is to base the production of energy by hydropower and electricity by thermic central gas stations, besides other non-renewable sources.

The only reactors in the country are a critical assembly of zero power (RP0) and one research reactor of 10 Mw of thermal power (RP10). The characteristics of these installations were described in previous reports and any change has occurred on them. The RP10 is operational while the RP0 remains in extended shutdown four years ago. These facilities are described in the Appendix IV.

Currently preparations are under way as the nuclear fuel of reactor RP10 will be exchanged from uranium oxide to uranium silicide type fuel. It is expected that the exchange will occur by 2018. It has been established that reviewing and updating of some chapters of SAR will be mandatory.

The safety status of research reactors has been described in previous report in a voluntary basis and it is recalled in present report.

The 2009 IRRS Mission recommendations were implemented with regard to human-machine interface based on procedural means, improvements on quality assurance program, the maintenance program, protection of interlocks, procedures for abnormal situations, establishment of a safety culture program, waste storage measures, fire hazard assessment and remote reactor surveillance.

The maintenance of containment building seals was not still performed neither the formal and systematic collection of operational experience and periodic reviews. Regulatory body is requesting their compliance in a mid-term.

The re-assessment of safety for seismic events was not undertaken as regulatory body considered to extend the time frame for performing that study. The review of seismic study of site, the reviewing of design requirements for safety systems and components (SSC) and reviewing of external and internal events were not performed.

All of these subjects remain as a challenge to accomplish in a reasonable time frame.

b. Legislation and regulation

ARTICLE 7. LEGISLATIVE AND REGULATORY FRAMEWORK

- 1. Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of nuclear installations.***
- 2. The legislative and regulatory framework shall provide for:***
 - i. the establishment of applicable national safety requirements and regulations;***
 - ii. a system of licensing with regard to nuclear installations and the prohibition of the operation of nuclear installations without a license;***
 - iii. a system of regulatory inspection and assessment of nuclear installations to ascertain compliance with applicable regulations and the terms of licences;***
 - iv. the enforcement of applicable regulations and of the terms of licences, including suspension, modification or revocation.***

Article 7 (1). Establishing and maintaining a legislative and regulatory framework

The legislative and regulatory framework is grounded on the Law 28028 – Law for Regulation of Ionizing Radiation Sources and it is the highest legal document for governing the safety of nuclear and radioactive installations. The purpose of the Law is for regulating the practices causing exposure or potential exposure to ionizing radiation with the goal of preventing and protecting the health of people, the environment and property against its harmful effects. The scope of Law involves also nuclear reactors as its defined as a complex radiation source. The Law designates to IPEN as regulatory body and establishes obligations related to authorizations, inspection, enforcement and empowering the regulatory body to apply the safety and protection provisions.

The Decree Law 21875 is other main regulation where responsibilities and duties of IPEN are established as regulatory body on nuclear energy issues.

Peru has approved the Convention on Physical Protection of Nuclear Material, the Convention on Early Notification of a Nuclear Accident, the Convention on Assistance in the case of Nuclear and Radiological Accident or Radiological Emergency.

The last international legal instruments which has approved Peru is the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, and the Amendment to the Convention on the Physical Protection of Nuclear Material

The projects of law on Nuclear Safety and for Radioactive Waste Safety were returned to IPEN with recommendations of Ministry of Energy and Mines for improving them and recommending also the mechanism for including the provisions into the Law 28028, meaning that this Law should be reviewed.

Article 7 (2) (i). National safety requirements and regulations

The requirements are contained in the second level regulations approved by Supreme Decrees, as may be seen in Appendix III. Any change has occurred in these regulations during the period 2013 – 2015.

- a) The ***Rule of Law 28028, Law for Regulation of the Use of Ionizing Radiation Sources*** approved by Supreme Decree N° 039-2008-EM. It provides the regime for authorizations, inspections and enforcement. The licensing regime for nuclear installations is contained in a dedicated section of the regulation. The classification of nuclear installations involves nuclear power plants, nuclear reactors, facilities for treatment of nuclear materials, facilities for storage of nuclear materials. The licenses for nuclear installations are established for siting, commissioning, construction, operation, modification and closure. Specific authorizations are required for temporary storage of fresh nuclear fuel and for pre-nuclear and nuclear testing of the facility. Also, individual licenses are required for personnel which perform duties as supervisor, operator, radiation protection officer, chief of radiation protection and for maintenance. Updating of Safety Analysis Report of nuclear installations are required to be performed every ten years. The reviewing of SAR is made by all staff of

regulatory body who take charge of a chapter according their specialty and using standard references.

- b) The ***Regulation for the Physical Security of Nuclear Material and Nuclear Installations*** approved by Supreme Decree N°. 014-2002-EM. In this regulation requisites and requirements for physical protection of nuclear installations are provided. The goal of regulation is assuring an appropriate protection to the nuclear facilities and material during its use, storage and/or transportation as well as to the facilities in order to prevent and minimizing the unauthorized removal of nuclear material and/or sabotage. The provisions of this regulation rest on the Convention on Physical Protection of Nuclear Material (CPPNM) and INFCIRC/224/Rev. 2. As Peru has approved the Amendment of CPPNM a need for revision of this regulation has raised.
- c) The ***Radiological Safety Regulation***, approved by Supreme Decree N° 007-97-EM. This regulation contains the technical requisites and requirements for radiation protection. Provisions are established for controlling the worker, medical and public exposures, as well as for transport, radioactive waste management and chronic exposures, amongst others. As regulation was prepared following recommendations of the 1995 IAEA Basic Safety Standards a program has been elaborated to update it accordingly the new IAEA International Safety Basic Standards (IAEA Safety Standard n.º GSR Part 3).

There are other specific rules issued for radiation safety on nuclear medicine, teletherapy, industrial radiography, X-ray diagnostic, personnel dosimetry services and for radioactive sources security.

The process to review and approve regulations is conducted by the Regulatory Body which issues the project of rule and then sending to other interested parties in governmental and private organizations in order to request the comments and suggestions. All comments are reviewed and included, if reasonably, into the final version. Before approval, regulation project is published in the web page of IPEN for additional comments, if any, and then approved and published in the official gazette.

Article 7 (2) (ii). System of licensing

As established in regulations, the use and activities involving exposure to ionizing radiation sources are requested to obtain an authorization before starting the operation. The practices which offer most relevant risk, as high activity radioactive sources or research reactors, are requested to obtain a license for performing their activities.

In the case of nuclear research reactors (NRR), licenses are granted for siting, construction, commissioning, operation, modification and decommissioning. The application for a license shall be requested by submission of a Safety Analysis Report, Operating procedures, emergency plans, quality assurance program, radiation protection program, radioactive waste

management program, and other specific accordingly to the stage. The application is evaluated and assessed by the Regulatory Body. License is granted only when the applicant met all criteria and regulation on nuclear and radiation safety, as well as the nuclear security regulations.

At the beginning of a nuclear reactor project (site licensing) a period of public hearing is open by 30 days for collecting observations and concerns raised by public or organizations which may deemed affected by the project, and regulatory body should process all observations for providing appropriate answer and consideration.

Licenses are linked to specific limits and conditions and being issued for a period of validity then they should be renewed. The validity periods of licenses are set as: one year for nuclear power plants, and two years for research reactors.

The revalidation process is carried out by submitting a report of the reactor operation and an operational safety and physical protection assessment. These reports are reviewed by Regulatory Body to verify that all license conditions were fulfilled before issuing the renewed license.

The reactor staff is also required to obtain an individual license as for operators, supervisors, safety officers and maintenance personnel. The validity of individual licenses is for three years. The applicants should fulfill requisites on professional background, specialized studies and training in nuclear energy and safety, knowledge and experience in reactor operation, and also a health psycho-physic aptitude. As part of licensing process, the applicants should pass theoretical and practical examinations requiring that 75% of test should be correctly answered.

The revalidation process requires the applicant to be re-trained following an approved training program under licensee responsibility and regulatory supervision. It is required a written declaration of licensee about the performance of applicant and also updating the psycho-physic aptitude.

The Regulation of Law 28028 establishes that all practices involving ionizing radiation sources, including nuclear reactors, should apply and obtaining an authorization before starting the operation. This provision prevents the operation of a nuclear installation without an authorization. It is established that siting, construction, design, testing, operation or closure of a nuclear installation without an authorization is a serious violation which is administratively sanctioned.

Article 7 (2) (iii) System of regulatory inspection and assessment

The IPEN performs inspections on all practices and radiation sources according to a program established in the Annual Plan. The planning of inspections takes into account the risk posed by the installation and radiation source. The radioactive installations classified as Category A –

the most risk relevant – are inspected at least once a year. The research reactors are inspected in a monthly frequency because one inspection does not cover all the issues as only one inspector is assigned to this task and more visits are needed to cover subjects as radiation protection, maintenance program or quality assurance. Other reason is that some observations found in inspection need to be followed closely enough until solution. The inspection includes the review of operational records, radiation protection measurements and maintenance records, amongst others, as well as the compliance verification of license conditions and limits.

The scope of inspections is just addressed to nuclear safety and radiation protection, and also security.

The results of inspection are assessed and requirements are issued when observations are found. The inspections are performed using sometimes checklists previously prepared.

Article 7 (2) (iv) Enforcement of applicable regulations and terms of licenses

The IPEN, as regulatory body empowered by Law 28028, may apply administrative sanctions to licensees by breaches or violations to the safety regulations. The sanctions include the admonition, seizure of radiation sources, suspension of licenses, closure of facilities and revoking of licenses.

The enforcement procedure begins with a direct requirement in the inspection to correct findings and then with a written request for making correction in a given time frame. When finding is not corrected in a due time as required, then a notification is sent to licensee requiring it making their disclaimers in a given time frame. The regulatory body assess the disclaimer and documents of case and determine the sanction to be applied. The sanction is applied taking into account the kind and seriousness of violation, the intention and circumstances of commission of offense, the actual or potential existence of damage resulting from the situation and the severity of damage because the offense.

When a radiation source is seized by regulatory body following a legal action the radiation source is transported and stored under owner's responsibility. The seized sources are sent to Centralized National Storage for Disused Sources in the Radioactive Waste Plant.

The sanctions may be challenged in two administrative instances, one solved by Technical Office and other by the President as last administrative solution. After these administrative levels, the sanction may be also challenged in a civil court as an administrative litigious process.

When violation or offenses have produced damage or injure to persons or environment the licensee may be also prosecuted in a court of justice. In that case IPEN should make the demand before the Justice Court and attaching all of the evidences. The civil and penal punishment applied to offender is specified in the Civil and Penal Code of the country.

ARTICLE 8. REGULATORY BODY

- 1. Each Contracting Party shall establish or designate a Regulatory Body entrusted with the implementation of legislative and regulatory framework referred to in Article 7 and provided with adequate authority, competence and financial and human resources to fulfill its assigned responsibilities.**
- 2. Each Contracting Party shall take the appropriate steps to ensure an effective separation between the functions of the Regulatory Body and those of any other body or organization concerned with the promotion or utilization of nuclear energy.**

Article 8 (1) Establishment of the Regulatory Body

In the 3rd. article of the Law 28028 has been established that the Peruvian Institute for Nuclear Energy (IPEN) is the competent authority to apply the provisions of the law and it is designated as Regulatory Body (Regulatory Body). The IPEN was created by Law Decree N° 21875 and their duties and responsibilities are ruled by the Organization and Function Provisions established in the Supreme Decree N° 062-2005-EM issued in 2005.

According its creation Law Decree N° 21875, IPEN is a public decentralized organization from energy and mines sector. It has administrative and budgetary independence and reporting their activities to the Ministry of Energy and Mines.

The IPEN duties are those for promotion, advising, coordination, controlling, representing and organizing the actions for developing of nuclear energy and its application in the country, according to the sector policy. In that way, IPEN keeps duties both for promotion and development of nuclear energy and also for control.

The specific legal duties for regulatory control are those for regulation, authorization, control and enforcing on nuclear and radiation safety, physical protection, safeguards and transport of ionizing radiation sources.

The legal authorities for regulatory matters are the President who is the top authority and the Director of Technical Office for Regulatory Body which is the executive branch of Regulatory Body and dependent from President. The President is responsible for approving the policy for IPEN activities including regulatory matters, approving the planning and programs of IPEN, acting as the last administrative instance for license claims and also approving the specific rules. The Director of Technical Office is responsible for approval the licenses and issuing the sanctions being the first instance for license claims amongst other duties.

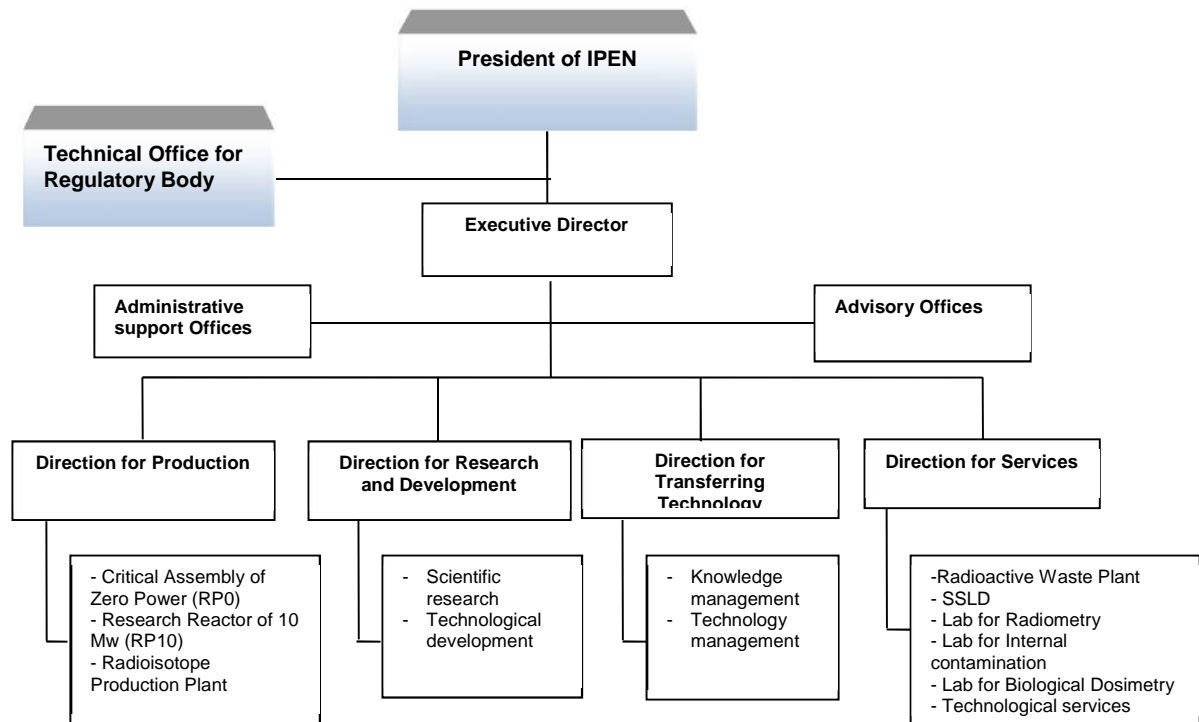
The Technical Office for Regulatory Body is the IPEN technical branch for regulatory matters as established by regulation. Their duties are:

- a. Granting of authorizations and licenses for practices and facilities using with ionizing radiation sources, including nuclear reactors.
- b. Enforcing and inspection of all practices and facilities using involving ionizing radiation sources for verifying the compliance of radiation and nuclear safety, transport, physical protection and safeguard regulations.
- c. Acting as coordinator for preparing and response to radiation and nuclear emergencies in the country.
- d. Preparing and reviewing regulations on nuclear safety and radiation protection, nuclear security, safeguards and transport.
- e. Applying sanctions to offenders of regulations on radiation and nuclear safety, transport, physical protection and safeguards.
- f. Settling as first instance the administrative claims against the decisions on sanctions issued by the Office.
- g. Keeping the national inventory of radiation sources and the ionizing radiation source users updated.

The organization of IPEN and the structure of Technical Office for Regulatory Body are shown in Figs. 1 and 2. The promotion directorates are under the charge of a Director who depends from the Executive Director. The Executive Director depends also from the President of IPEN. The main duties of promotion directorates remain the same as the last National Report of 2013 and they perform the operation of the research reactors RP10 and RP0 and the Radioisotope Production Plant, promotion and conducting research projects on nuclear energy and other fields, management for transferring of nuclear technologies, operation of the Radioactive Waste Plant and the calibration laboratories, radiometric laboratories, internal contamination and biologic dosimetry labs.

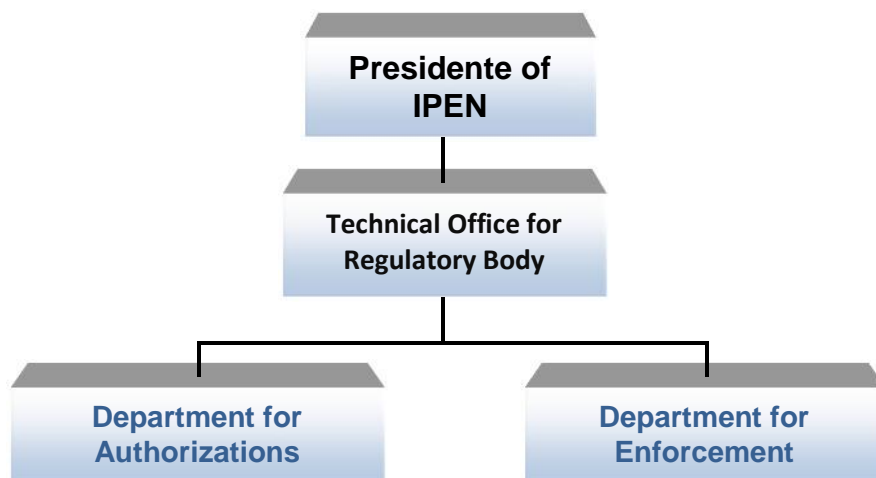
The regulatory Body has a competent staff for safety of radiation sources and nuclear safety issues. The regulatory body has recruited two more radiation specialists in 2014 and also one other specialist was re-assigned to the Technical Office which has increased the staff of regulatory body. However, in despite of these enough human resources still continue being a lack, as radiation activities and users steadily increase yearly. IPEN regulates and control all ionizing radiation sources in the country which include not only research reactors but also radioactive sources and including X ray machines in medicine. The resources are always prioritized toward most dangerous sources (research reactors, industrial irradiators, radiotherapy machines, industrial radiography, etc.) while others sources are under a less frequent control. The staffing plan has not yet been prepared and it remains a challenge to be undertaken. The competence of staff continues being kept through IAEA regional courses and attendance to some regional meetings. Also, self-training is used to keep the competence.

Fig.1. Organizational Chart of IPEN



The budget assigned to IPEN remains shared between promotional and regulatory activities with nearly 10% of budget assigned to regulatory activities. The IPEN's budget is yearly provided by national budget which continues keeping almost the same in the last five years with some special extra budgetary funds which is devoted to promotion activities. Part of the budget is covered by funds coming from authorization taxes and fees as established by Law 28028. At this time the budget is not enough to perform suitably the duties and tasks or for undertaking improvements. The increase of budget is currently a concern and it is appraised that regulatory body would need at least three times the current budget.

Fig. 2. Structure of Technical Office for Regulatory Body



The management system continues not being yet in place, as new directives were issued by central government on this subject. Following this directives IPEN has started a program to prepare Manuals and Procedures and the Technical Office, in coordination with IPEN planning office, has developed the flow chart of their procedures and the first version of Manual of Procedures which involves all processes performed in the regulatory duties. Currently this process is going on.

The transparency and openness of Regulatory Body is based in general laws of the country. In this way, information is available to any person of the public as requested with exception of classified information. The IPEN website contains information on regulations and rules and also on the requisites for licensing. It is expected to design a special website for regulatory matters where more information will be available.

Regarding external consultancy, the Decree Law 21875 allows IPEN setup Consultant Councils but any external technical support neither advisory committee on nuclear or radiation safety have been commonly used. This type of support is not at all available in the country but if case IPEN may get assistance from another regional countries having research reactors.

Article 8 (2) Status and separation of the Regulatory Body

The IPEN is a specialized organization from the mines and energy sector having its own budget and programs. The activities are reported yearly to the Ministry of Energy and Mines.

The development of nuclear technology in the country remains small but radiation users are steadily increasing and needs for controlling too. At this time, the limitations on budget and resources for regulatory body have influenced on their activities forcing to a greater prioritization toward most relevant tasks. Because of this situation, the possibility for regulatory body independence is becoming to be considered.

In despite of this situation the technical independence is deemed appropriate as legally provided by the regulation (Supreme Decree n.º 062-2005-EM and Supreme Decree n.º 039-2008-EM). These provisions establish that Technical Office for National Authority is the only branch commissioned for performing regulatory duties and they are developed without any external or internal pressures and their nuclear and radiation safety decisions are not challenged.

ARTICLE 9. RESPONSIBILITY OF THE LICENCE HOLDER

Each Contracting Party shall ensure that the prime responsibility for the safety of a nuclear installation rest with the holder of the relevant license and shall take the appropriate steps to ensure that each such license holder meets its responsibility.

The regulatory provisions assign the licensee with the responsibility for fulfilling the limits and conditions of the license and also for complying with radiation and nuclear safety, physical protection and safeguards regulations:

- i) In the article 8 of Law 28028 is established that: *Responsibility of Authorization Owner. Every Authorization owner is responsible for the safety of radiation sources and shall establish the appropriate measures in order that occupational exposure, the medical exposures, the public exposures, the nuclear and radiation safety of the sources, as applicable, accomplishes the regulations approved by the Regulatory Body.*
- ii) In the Regulation of Law 28028 is established that “*The license owner is responsible for fulfilling the license conditions and limits and the regulation on nuclear and radiation safety, physical protection and safeguards, as applicable. Also the licensee is compelled to provide suitable information on radiation risk and protection measures for persons under its charge*”.

The licensee is committed to provide all of necessary means to fulfill the safety requirements and taking charges of all safety issues. The obligations of licensee include providing means for protection of workers, preparing and approving working procedures, training of staff, testing and calibration of nuclear and radiation protection instruments, safety report preparation, safety assessments, planning of emergencies and nuclear security planning, amongst others.

In case of research reactors, the licensee is committed to prepare annual reports about the safety of research reactors for compliance of license obligations.

The Regulatory Body assures the fulfilling of licensees' responsibilities through inspection to radioactive and nuclear facilities and evaluating the operational performance and applying the enforcement.

c. General Safety Considerations

Although Peru does not have nuclear power plants and neither intents embarking in a nuclear power program, information was provided for research reactor on the articles 10 to 14 in previous reports. This report includes also this information, although the current situation remains basically unchanged.

ARTICLE 10. PRIORITY TO SAFETY

Each Contracting Party shall take the appropriate steps to ensure that all organizations engaged in activities directly related to nuclear installations shall establish policies that give due priority to nuclear safety

The safety prioritization is reflected in the main legislation as the primal objective which is “to prevent and protect people, environment and property from harmful effects of ionizing

radiation”. The safety policy is also provided in the Radiological Safety Regulation as that “all facilities and organizations will implement and keeping a safety culture with principles prioritizing the safety and protection”. These statements apply to all radiation sources and including nuclear reactors and it is deemed appropriate for current situation.

Currently some intents were made addressed to deal with the safety culture but the advance is negligible. Arrangements are in place for safety management and safety monitoring in the research reactors, but it is still missing self-assessments and independent assessments.

The regulatory oversight is performed by inspections and assessment of operational performance. The results of inspections are assessed and a following is made to assure that findings and requirements are fulfilled.

The regulatory activities have been prioritized according the importance of risks caused by radiation sources following the regulatory classification of practices. The control of highly risk practices are prioritized by licensing and inspection as well as by enforcement processes.

ARTICLE 11. FINANCIAL AND HUMAN RESOURCES

- 1. Each Contracting Party shall take the appropriate steps to ensure that adequate financial resources are available to support the safety of each nuclear installation throughout its life.**
- 2. Each Contracting Party shall take the appropriate steps to ensure that sufficient numbers of qualified staff with appropriate education, training and retraining are available for all safety-related activities in or for each nuclear installation throughout its life.**

Article 11 (1) Financial resources

The budget to operate the nuclear reactor is provided by a yearly budget coming from the National General Budget which covers the annual expenses for operation and maintenance of the reactor. In order to improve the operation and safety of reactor extra-budgetary funds have been provided yearly, however the organization continues making efforts to increase the regular budget. The spent fuel management expenses are still not included and neither the options for spent fuel disposal have been assessed and there is no approved policy on this matter. Currently, through the Global Threat Reduction Initiative (GTRI) project with United States of America (USA), arrangements have been made for returning a certain number of the spent fuel to USA, which is expected to occur in 2017.

Article 11 (2) Human resources

The operating personal involves those performing the operation, evaluation, safety and maintenance of the nuclear reactor. The staffing is established in the conditions and limits of

license. The personal has been trained since the beginning of the reactor operation through theoretical and practical courses and also by in-job training. Also the licensee prepares and implements training and re-training programs for its staff.

The competence of personnel is tested in the individual license process and then by oversight of training program. The initial training and re-training is requested as a requisite to obtain and keeping updated the individual licenses to perform duties for supervision, operating, radiation protection and maintenance of nuclear reactor. As mentioned in Article 7.2 (ii) of report, the Regulatory Body applies theoretic and practical examination to applicants for individual licenses.

The competence is kept by re-training programs for operators which are performed by the licensee and it includes the operating procedures, emergency plans, operational experience and other experiences. The licensee also applies a test to their staff for assuring that the training was well delivered and the staff is well prepared. The training programs are developed by experts in several fields.

The training program and its implementation are reviewed and inspected by Regulatory Body to verify that it is appropriately fulfilled.

ARTICLE 12. HUMAN FACTORS

Each Contracting Party shall take the appropriate steps to ensure that the capabilities and limitations of human performance are taken into account throughout the life of a nuclear installation.

The regulatory requirements to take into account human factors and organizational issues are stressed in the Radiological Safety Regulation for all practices including research reactors.

The responsibility for implementing measures on this subject rests in the licensee.

The reduction of errors caused by human factors and organizational was taken into account in the approved procedures which are followed in the operation and only by well qualified and trained personnel.

The consideration of human factors in the design is not directly specified in the regulation but it is generally stressed that safety related systems and components should be designed taking into consideration the Regulatory Body requirements for preventing accidents and decrease the magnitude and probability of exposures.

The influence of human factors on safety is oversight during inspections and witnessing the execution of operating procedures.

ARTICLE 13. QUALITY ASSURANCE

Each Contracting Party shall take the appropriate steps to ensure that quality assurance programs are established and implemented with a view to providing confidence that specified requirements for all activities important to nuclear safety are satisfied throughout the life of a nuclear installation.

Radiation Safety Regulation for the construction, operation and closure of nuclear reactors. In the research reactor the QA program cover the operation, maintenance, assay and inspection, nuclear fuel management, modification of the installation, supply of materials and parts. Currently a program is going on for adjusting the QA program and fulfill it completely.

There are not specific regulatory requirements on management system for research reactors even a INSARR Mission recommended its implementation. Some steps for this purpose were started but without advance at the moment. The regulatory body is requesting to implement this management system but any legal basis support this request and it needs to be regulated. Regulatory body verifies sporadically the QA implementation by reviewing the program and resulting records.

ARTICLE 14. ASSESSMENT AND VERIFICATION OF SAFETY

Each Contracting Party shall take the appropriate steps to ensure that:

- i. comprehensive and systematic safety assessment are carried out before the construction and commissioning of a nuclear installation and throughout its life. Such assessment shall be well documented, subsequently updated in light of opening experience and significant new safety information, and reviewed under the authority of Regulatory Body.***
- ii. verification by analysis, surveillance, testing and inspection is carried out that the physical state and the operation of a nuclear installation continue to be in accordance with its design, applicable national safety requirements, and operational limits and conditions.***

Article 14 (1) Assessment of safety

The safety assessment is required for all the stages of siting, design, construction, assembly, commissioning, operation, maintenance and closure of research reactors.

The licensees performed assessments in every stage for the research reactors as part of the Safety Analysis Report submitted for applying a license. The initial assessment was performed using the probabilistic method and using the concept of Maximum Credible Accident (MCA). A safety evaluation is also performed as some condition or new experiment could affect the reactor safety. The regulatory body has not requested to update the probabilistic assessment and remaining as a challenge.

The Regulatory Body performs the reviewing of the assessment reports and, at this time, results indicated that the reactor safety is keeping good enough.

Article 14 (2) Verification of safety

The verification on safety of research reactors is established as a general obligation in the Radiological Safety Regulation where provisions for keeping the safety of systems and components of a radiation source through suitable maintenance have been established.

The preventive and corrective maintenance is carried out according to an annual program which intent cover 100% of the safety systems by surveillance and functional testing. The provisions for ageing safety analysis are included in Safety Analysis Report but currently any progress has been made. The program of maintenance was reviewed for improving the tracking of systems and components performance because data are not well organized and making no easy analyzing the ageing effects on components and systems.

The safety cases are reviewed by the Reactor Safety Committee for approval the measures to implement. The Regulatory Body reviews the reports on safety cases and verifies that the operation and maintenance are being performed as foreseen in the procedures and programs.

ARTICLE 15. RADIATION PROTECTION

Each Contracting Party shall take the appropriate steps to ensure that in all operational states the radiation exposure to the workers and the public caused by a nuclear installation shall be kept as low as reasonably achievable and that no individual shall be exposed to radiation doses which exceed prescribed national dose limits.

The radiation protection is regulated by the Radiological Safety Regulation and it is applicable to all radiation sources including nuclear reactors. Limits of dose have been set for workers – 20 mSv average in a year, and allowing it up to 50 mSv in one single year but not exceeding 100 mSv in 5 consecutive years – and for the public, 1 mSv per year. There are also dose limits for trainees, students and pregnant women.

The research reactor has a radiation protection program with procedures and instructions intended to control the staff exposures for all activities carried out in the installation. The optimization process is not formally developed however the application of radiation protection procedures helps to keep the occupational doses reasonably low. The annual average dose recorded for workers is 0,25 mSv with a maximum dose of 0,5 mSv. These values come from personnel dosimetry records of exposed workers using OSL dosimeters.

The Regulatory Body requests the submission of annual reports of operational safety of the reactor including the environmental surveillance in order to confirm that authorized dose to

public – 0,25 mSv per year for all pathways – is being met. There is not an independent verification of these results.

The environmental discharges from the research reactor remain negligible as well as the doses.

ARTICLE 16. EMERGENCY PREPAREDNESS

1. Each Contracting Party shall take the appropriate steps to ensure that there are on-site and off-site emergency plans that are routinely tested for nuclear installations and cover the activities to be carried out in the event of an emergency.

For any new nuclear installation, such plans shall be prepared and tested before it commences operation above a low power level agreed by the Regulatory Body.

2. Each Contracting Party shall take the appropriate steps to ensure that, insofar as they are likely to be affected by a radiological emergency, its own population and the competent authorities of the States in the vicinity of the nuclear installation are provided with appropriate information for emergency planning and response.

3. Contracting Parties which do not have a nuclear installation in their territory, insofar as they are likely to be affected in the event of a radiological emergency at a nuclear installation in the vicinity, shall take the appropriate steps for their preparation and testing of emergency plans for their territory that cover the activities to be carried out in the event of such an emergency.

Article 16 (1) Emergency plans and programmes

The legislative and statutory framework dealing with all emergencies in the country underlies on the Law n.º 29664 Law for Creation of the National System of Disaster and Risk Management, issued in 2011. This legislation setup the identification and reduction of associated risks coming from dangers and preparing and response to disasters events regardless of their origin. A program between IPEN National Institute for Civil Defense (INDECI) was initiated but it has not yet concluded. The organization which leads this process is the National Institute for Civil Defense (INDECI) and IPEN is the coordinating organization accordingly the Law 28028 which assigns IPEN the role of coordinator for preparedness and response in nuclear and radiation emergencies. The Radiological Safety Regulation also makes specific provisions for preparing and response to radiological emergencies. In 2015 the Ministry of Energy and Mines led a sectorial program addressed to prepare the Sectorial Plan for Responding a Category 5 of Disaster – defined as a Big Magnitude emergency which overcome capability of country response warranting the Emergency Declaration State and receiving international assistance. IPEN, as part of Energy and Mines sector, provided the radiological emergency plan for big disasters to integrate it. Currently this sectorial plan has not still approved

The current National Radiation Emergency Plan of IPEN, approved by Presidential Resolution n.º 163-09-IPEN/OTAN in 2009, establishes the requisites and actions to be carried out by IPEN as for responding to radiation emergencies in the national territory. This institutional plan needs to be integrated to an integrated plan for radiation emergencies for local, national and international response. The institutional plan has been prepared on the basis of IAEA's categorization as follows:

- Category II. Emergency caused by small nuclear power reactors (nuclear submarines or nuclear ships that periodically visit Peru) and by research reactors.
- Category III. Emergency caused by radiation sources of high magnitude (industrial irradiators, radiotherapy, industrial radiography, nuclear gauges with activity higher than 1 TBq)
- Category IV. Emergencies caused by lost or stolen radiation sources or some dirty bombs (orphan sources, transport accidents, and re-entry of satellites, radioactive dirty devices, etc.)
- Category V. Transboundary accidents (dispersion of radioactive contamination, food trading, contaminated scrap)

The plan structure includes the organization, resources, operation concepts for attending emergencies according its category, as well as the notification, activation, deployment, mitigation actions, protective urgent measures, public information, evaluation and protection of workers, and preparedness process and keeping of plan updated, amongst others. This plan was just tested once on notification receptions detecting a minor problem about misinterpretation of messages which was corrected by instruction. In despite of this other minor incidents of theft or loss of radioactive sources were responded suitably applying this plan. The updating of threat assessment has not been performed and it remains as a challenge.

The Regulation of Law 28028 establishes that facilities in Category A, B and C in Regulation of Law 2802 as well as nuclear installations should prepare and submitting an emergency plan to operate these facilities. In that way, the critical assembly and the nuclear reactor RP10 have an emergency plan.

The classification of accidents for the Research Reactor of 10 Mw are:

- Personnel emergencies.- It includes accidents or events within the operational boundaries, without any damage to the installation but requiring urgent assistance to persons which were injured by ionizing radiation.
- Alert situations.- Accidents or events within the operational boundary, which may cause a degradation of reactor safety but enough time is available to adopt corrective measures to avoid or mitigate their consequences on the nuclear reactor.
- On-site emergency. - Events where releases of significant quantities of radioactive material are not expected as to warrant response actions outside the site.

- Off-site emergency.- Accidental event with radiological impact beyond the site boundaries and which, according to projections, it probably will demand to adopt protective actions outside the site. The Maximum Credible Accident was postulated as being the melting of 16 plates from one fuel element with 50% of its radioactive material released which could have an impact up to 1500 meters from the reactor. The exclusion zone is just 1500 meters from the reactor.

The personnel of research reactor are trained in the application of the plan and procedures. The Emergency Plans for Research Reactors are also routinely exercised as requested in the license limits and conditions. The emergency plan for the research reactor of 10 Mw was last tested in 2014 for a general emergency category but restricted to an on-site response. The exercises as well as resources and facilities for emergencies and training of personnel are verified by Regulatory Body in a routine schedule.

The coordination with external authorities for emergency exercise has been performed but it still needs to be more frequent for information exchange and participation.

Article 16 (2) Information of the public and neighboring States.

A communication program is implemented for the population located beyond 1500 meters (exclusion zone) from research reactor RP10, for providing them with appropriate information to increase the transparency on the reactor safety and on the emergency plans.

There is no provision for information of neighboring States as the impact of an accident in the research reactors will be restricted to the exclusion zone. It is deemed that the notification system provided by the Convention of Early Notification will be enough to cover this issue if needed. Peru is part of the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the case of Nuclear and Radiological Accident or Radiological Emergency since 1995.

As result of Fukushima accident IPEN is committed for issuing right and on-time communications to the media when an accident happens in order to set the real magnitude of event on Peru and on the concerns about possible affected people or environment.

Article 16 (3) Emergency preparedness for Contracting Parties without nuclear installations

The National Radiation Emergency Plan of IPEN has considered that an accident in other country could affect its territory and some measures are foreseen for controlling food and other goods coming from abroad. These restrictions were tested when accident of Fukushima happened and temporary restrictions were imposed to importation of foods coming from this zone in coordination with Custom Organization.

d. Safety of Installations

ARTICLE 17. SITING

Each Contracting Party shall take the appropriate steps to ensure that appropriate procedures are established and implemented:

- i. for evaluating all relevant site-related factors likely to affect the safety of a nuclear installations for its projected lifetime;*
- ii. for evaluating the likely safety impact of a proposed nuclear installation on individuals, society and environment;*
- iii. for re-evaluating as necessary all relevant factors referred to in sub-paragraphs (i) and (ii) so as to ensure the continued safety acceptability of the nuclear installation;*
- iv. for consulting Contracting Parties in the vicinity of a proposed nuclear installation, insofar as they are likely to be affected by that installation and, upon request providing the necessary information to such Contracting Parties, in order to enable them to evaluate and make their own assessment of the likely safety impact on their own territory of the nuclear installation.*

The situation on this issue remains the same since the last report. The Regulation of Law 28028 and Radiological Safety Regulation has set requisites for the siting of nuclear reactors however the siting of the current research reactors were carried out 30 years ago, under criteria of ANSI rules. The **Regulation of Law 28028** requests the application for a license to site the nuclear reactors by submitting technical reports on:

- Justification of selected site and on the installation to be located there
- Description of the proposed installation
- Preliminary plan with stages and schedule of activities as well as the economic study and foreseen investment.
- Description of site and influence zone characterization including data on parameters which may affect the safety of the installation and installation features which may affect the site, which includes human made events and external events.
- Organizational previsions to supervise the project and assuring the construction quality.
- Preliminary works and activities to be done.

The regulatory body requested the research reactor licensee to perform a re-evaluation of site factors however it has not been performed because economic restrictions so this demand will be deferred. Anyway, the evaluation requested should update the external events and IAEA recommendations will be used as criteria to re-evaluate the site factors.

The preparation of technical requisites for nuclear reactors has not been still performed at present. This task is delayed due to lack of time of regulatory body personnel but still remain in the program.

The consultation with other Contracting Parties likely to be affected by any nuclear installation is not considered in the regulation and it is still not foreseen in the near future.

ARTICLE 18. DESIGN AND CONSTRUCTION

Each Contracting Party shall take the appropriate steps to ensure that:

- i. the design and construction of a nuclear installation provides for several reliable levels and methods of protection (defense in depth) against the release of radioactive materials, with a view to preventing the occurrence of accidents and to mitigating their radiological consequences should they occur;***
- ii. the technologies incorporated in the design and construction of a nuclear installation are proven by experience or qualified by testing or analysis;***
- iii. the design of a nuclear installation allows for reliable, stable and easily manageable operation, with specific consideration of human factors and the man-machine interface.***

The **Regulation of Law 28028** has general provisions concerning the design and construction of nuclear reactors which are reflected in the requisites about the information to be submitted for requesting the license for construction. Also the Radiological Safety Regulation establishes provisions for applying to the radiation sources – as nuclear reactors – a system of multiple safety layers in order that the failure of one are compensated and corrected by another.

The construction of the building and the reactor's core, as well as the nuclear fuel design and other items and components safety-related have taken into account the criteria of defense in-deep by multiple safety barriers for preventing or reducing the probability of radioactive material releases against internal and external events.

Also, the criteria of redundancy and diversity were taken into account in both research reactors by diversified and independent instrumentation which was installed to control and extinguish safely the reactor in normal and abnormal situations.

The research reactors include most of these criteria and allowing a safe and manageable operation with an adequate consideration of human factor and interface human-machine.

ARTICLE 19. OPERATION

Each Contracting Party shall take the appropriate steps to ensure that:

- i. the initial authorization to operate a nuclear installation is based upon an appropriate safety analysis and a commissioning program demonstrating that the installation, as constructed, is consistent with design and safety requirements;***
- ii. operational limits and conditions derived from the safety analysis, tests and operational experience are defined and revised as necessary for identifying safe boundaries for operation;***
- iii. operation, maintenance, inspection and testing of a nuclear installation are conducted in accordance with approved procedures;***
- iv. procedures are established for responding to anticipated operational occurrences and to accidents;***
- v. necessary engineering and technical support in all safety-related fields is available throughout the lifetime of a nuclear installation;***
- vi. incidents significant to safety are reported in a timely manner by the holder of the relevant license to the Regulatory Body;***
- vii. programs to collect and analyze operating experience are established, the results obtained and the conclusions drawn are acted upon and that existing mechanisms are used to share important experience with international bodies and with other operating organizations and regulatory bodies;***
- viii. the generation of radioactive waste resulting from the operation of a nuclear installation is kept to the minimum practicable for the process concerned, both in activity and in volume, and any necessary treatment and storage of spent fuel and waste directly related to the operation and on the same site as that of the nuclear installation take into consideration conditioning and disposal.***

The **Regulation of Law 28028** establishes that operation of nuclear reactors has carried out with a license. The applicant should submit technical information which include the Safety Analysis Report of the research reactor, operating rules, emergency plan, commissioning program, the quality assurance program, the radiation protection manual, the waste management plan, the physical protection plan, the final economy study and the provisions for dismantling and closure.

The program for commissioning is specifically approved by Regulatory Body and then verified during the facility testing.

The Safety Report of research reactor, submitted for initial operation, has been updated twice during its life. The Regulatory Body has reviewed the S.A.R. concluding that it is enough suitable to fit the current regulations although some improvements are needed. Some chapters of S.A.R. will need to be reviewed and updated when the new type of nuclear fuel replaces the current one.

The technical specifications are also reviewed and updated every time that core configuration changes as established in the license conditions. The modification of core configuration requires preparing and sending safety reports on specific critical safety parameters.

The technical documents submitted to Regulatory Body are assessed and then the license conditions and limits are setup.

The operation, maintenance, radiation protection and other tasks are performed under approved procedures including those aimed to respond to anticipated occurrences. These procedures are available to operational staff of research reactor and they are periodically reviewed taking into account the operational experience. The preparation of procedures is made with involvement of the reactor staff in accordance to their field of expertise or job.

The support for engineering and technical issues in this operational stage is provided by the same reactor staff and other from technical areas from IPEN. There are not external consultants or contractors which support the nuclear installation.

The licensee of nuclear research reactors is required reporting to Regulatory Body all the significant incidents for safety. The INES scale is applicable to all the incidents or accidents with radiation sources and also include to research reactors. In this period any significant incident was reported.

The collection of operational experience and periodic reviews is not systematic performed however the country is participating in the International Reporting System for Research Reactors (IRSRR) to share experiences with other operating organizations.

The radioactive waste production remains negligible both in quantity and level. Some of solid wastes containing activated material have been sent to radioactive waste plant following the recommendation of a INSARR Mission and some minor volume remains safely stored in the reactor building. The radioactive waste plant is prepared to treat low level radioactive wastes. Some policies on radioactive wastes are included in the Radiological Safety Regulation as the prohibition for discharging radioactive wastes to environment without an authorization by Regulatory Body. The radioactive wastes may be discharged only if were specifically cleared. The licensee is required to take appropriate measures to minimize the production of radioactive wastes.

The Regulatory Body through inspection and evaluation oversight and verifies that the operation is carried out fulfilling the regulations and regulatory requirements.

Appendix I

Acronyms in the Report

| | |
|--|--------|
| 1. Global Threat Reduction Initiative | GTRI |
| 2. International Atomic Energy Agency | IAEA |
| 3. International Nuclear Event Scale | INES |
| 4. Instituto Nacional de Defensa Civil | INDECI |
| 5. Peruvian Institute for Nuclear Energy (Instituto Peruano de Energía Nuclear) | IPEN |
| 6. Integrated Safety Assessment for Research Reactors | INSARR |
| 7. Integrated Regulatory Review Service | IRRS |
| 8. International Reporting System for Research Reactors | IRSRR |
| 9. Reactor de Potencia Cero | RP0 |
| 10. Reactor de Potencia Diez | RP10 |
| 11. Safety Analysis Report | SAR |

Appendix II

Law No. 28028
Law of Regulation on the Use of Ionizing Radiation Sources

CHAPTER I

General Provisions

Article 1. Purpose of the Law

The present Law regulates the practices causing exposure or potential exposure to ionizing radiation in order to prevent and protect the health of people, the environment and property against its harmful effects.

Article 2. Scope of application

The present Law comprises the practices causing exposure or potential exposure to ionizing radiation as well as the sources involved in those practices.

The competent authority will determine specifically and progressively the practices and the ionizing radiation sources excluded from the control.

Article 3. Competent authority and duties

The competent authority to apply the provisions of this Law is the Instituto Peruano de Energía Nuclear, from now on Regulatory Body; and, in accordance with its Organic Law approved by Decree Law No. 21875, modified by Decree Legislative No. 158, will be in charge of duties for regulation, authorization, control and enforcement on the uses of ionizing radiation sources related to radiation and nuclear safety, physical protection and safeguard of nuclear material on the national territory.

CHAPTER II

Authorizations

Article 4. Authorizations

The juridical or individual persons which carry out practices that causes exposure or potential exposure to ionizing radiation or uses radiation sources shall have the corresponding authorization granted by the Regulatory Body, before starting the activities.

The authorization shall be granted within a maximum term of 60 useful days, after the Regulatory Body has verified that provisions on radiation safety for protection of people, safety of radiation sources, protection of environment, physical protection and safeguards has been met as applicable.

Article 5. Obligation for accomplishment of International Agreements

The juridical or individual persons which use nuclear materials or related elements or which may be involved with their use on the national territory, shall additional comply the provisions

on physical protection and safeguards, in agreement with the International Treaties on nuclear materials which are signed and approved by Perú.

Article 6. Indemnification and coverage for damage.

In order to obtain an authorization, besides the provisions indicated in articles 4 and 5 of present Law, the applicant shall demonstrate that have the needed financial resources and the contingency arrangements to meet the protection and safety rules; as well as having insurance policy as applicable according the type of use and source, and consistent with the legal provisions in force to the payment of indemnifications and insurances in case of nuclear and radiological damage. This condition shall remain during the term of authorized practice, including the closure and abandon of it, under the responsibility of the owner of authorization.

CHAPTER III

Inspections

Article 7. Inspection

The inspectors and representatives of the Regulatory Body will be able to enter at any installation or site where radiation sources, nuclear material or related equipment are or is expected to locate in order to obtain information and perform inspections on the state of radiation safety, physical protection and safeguards, as applicable, and verifying the fulfillment of regulations about these subjects.

The inspections will be performed with a frequency which will be established according to the type of radiation source and its use. The licensee will be obliged to facilitate its work as required by the inspectors of National.

CHAPTER IV

About the Sanction Regime

Sub-Chapter I

General Provisions

Article 8. Responsibility of Authorization Owner.

Every Authorization owner is responsible for the safety of radiation sources and shall establish the appropriate measures in order that occupational exposure, the medical exposures, the public exposures, the nuclear and radiation safety of the sources, as applicable, accomplishes the regulations approved by the Regulatory Body.

Article 9. Violations and sanctions

Any violation of legal provisions in the present Law and its rules will be administratively sanctioned by the Regulatory Body which will impose the appropriate sanctions taking into account the nature of violation.

Article 10. Repeat of violations

The repeat of violations of a light grade will be considered as a serious violation. The individual or juridical person repeating a violation of serious grade will commit a very serious violation. The repeating of a violation will be considered after a resolution has been first issued imposing the appropriate sanction.

Sub-Chapter II

About violations

Article 11. Qualification of violations

The commitment of violations against provisions of present Law and its rules will be qualified accordingly the seriousness of caused damages to the people health, the environment and the property.

Article 12. Category of violations

The violations are categorized as:

- a) Light, when actions or omissions cause risks or damages of minor importance to the people health, environment or property.*
- b) Serious, when actions or omissions cause or lead to important risks or damages for the people health, environment or property, or if they hinder the provisions of article 7 of present Law.*
- c) Very serious, when actions or omissions have caused extremely serious nuclear or radiological damage to the people health, environment or property.*

Sub-Chapter III

Sanctions

Article 13. Type of sanctions

The sanctions imposed by Regulatory Body because violations to the provisions of present Law, as well as to other rules on safety and environmental protection will be the following:

- a) Admonish*
- b) Fine*
- c) Suspension of authorizations*
- d) Revoking of authorizations*
- e) Confiscation of radioactive or nuclear material, or disabling of radiation source.*
- f) Closure of installations*

Article 14. Scale of fines

The fines will be applied according the following scale:

- a) The light violation will be fined with 0,5 to 2 Imposition Tributary Units (ITU)^(*).*
- b) The serious violation will be fined with more than 2 ITU to 5 ITU.*
- c) The very serious violation will be fined with more than 5 ITU up to 100 ITU.*

() 1 ITU equals nearly to \$ U.S. 970,00*

Article 15. Applying sanctions.

Additionally to the fine, the individual or juridical persons will be applied with any sanction established in article 13, paragraphs c), d), e) or f), depending on seriousness of violation and its consequences.

Sub-Chapter IV

Procedure for applying sanctions

Article 16. Procedure for sanctions

The qualification of violations and the procedure for applying sanctions will be established by specific rules of the Law which will be in accordance with other current legal provisions that are applicable to sanction regime.

CHAPTER V

Resources and incomes

Article 17. Taxes

The persons which request authorizations from Regulatory Body shall pay the corresponding taxes according to those established in the Text for Administrative Procedures of Regulatory Body.

Article 18. Economy resources for Regulatory Body

The resources to perform the necessary activities for accomplishment the present Law, besides to that established in the article 24 of Decree Law No. 21875, will be:

- a) Those indicated in the articles 14 and 17 from the present Law; and,*
- b) Other funds, possessions or resources which may be assigned according to other juridical regulations.*

COMPLEMENTARY PROVISIONS

First.- Glossary of terms

For a better understanding and accomplishment of present Law the following Glossary of terms are applied:

- a) *Radiological or nuclear accident.- Every involuntary event, included operation mishaps, equipment fails or other incidents that happen in the practices or with radiation sources, whose real or potential consequences to the health of persons and to environment can not be ignored.*
- b) *Authorization.- Written permission granted by the Regulatory Body to a juridical or individual person for carrying out practices which causes exposure to ionizing radiations.*
- c) *Radiological or nuclear damage.- Lost of human life, corporal injure, material damage or to environment, which is produced as a result of the dangerous properties of ionizing radiation.*
- d) *Radiological or nuclear emergency.- Condition caused as a result of a nuclear or radiological accident which involves preparation and response for controlling and mitigate its consequences.*
- e) *Related equipment.- Equipment, items or components which may be used in conversion process, enrichment or recovery of nuclear material or in nuclear reactors.*
- f) *Exclusion.- Determination of the Regulatory Body about that a practice or radiation source does not require to be under regulatory control.*
- g) *Exposure.- Exposure of persons to radiation or radioactive sources which may be: external, when caused by radiation sources out of human body; or internal, when caused by radiation sources inside the human body.*
- h) *Public exposure.- Exposure received by public individuals caused by authorized practices and sources and by emergency events, excluded medical exposures, occupational or those caused by radiation from natural background.*
- i) *Medical exposure.- Exposure received by patients during its medical diagnostic or treatment, or that received by people non exposed as workers which give voluntary help to patients for relief and welfare, and also that exposure received by voluntary people during a biomedic research program which involves exposure.*
- j) *Occupational exposure.- Exposure received by workers during its work, with exception of medical, excluded or exempted exposures.*
- k) *Potential exposures.- Exposure which can not be expected certainly to occur but may be a result of an accident with a radiation source or may be due to an event o probable events sequence, including equipment failures or operation mishaps.*
- l) *Radiation source.- Physic entity which may cause exposure to ionizing radiation, either emitting ionizing radiation or releasing radioactive material, such as are X ray equipment or other type of ionizing radiation generators, the radioactive sources, the nuclear materials or complex installations using them.*
- m) *Inspection.- Verification, in situ where practice is performed or radiation sources are used, of accomplishment of the legal and technical provisions on radiation safety, contingency, physical protection and safeguards, as applicable.*

- n) *Nuclear material.- Plutonium, excepted that whose content of plutonium–238 exceeds 80%; uranium – 233, enriched uranium in isotopes 235 or 233: uranium containing mixed isotopes as in natural state, but not as ore or ore residues; and any material containing one or several of isotopes mentioned as well as thorium.*
- o) *Practice.- Any human activity which introduces exposure sources or additional exposure paths or spreading the exposure to other persons or modifying the exposure paths due existing sources, in such a way that the exposure or probability of exposure to people or the number of people exposed increases.*
- p) *Physical protection.- Designed measures to protect the nuclear material or the authorized installations in order to prevent the unauthorized access or removal of nuclear material or sabotage of installations or operations with these materials.*
- q) *Ionizing radiation.- Radiation that pose capability to produce ion pairs in materials or biologic materials. Because its energy level this radiation can take out electrons and modify the atomic structure, as example: X rays and gamma rays.*
- r) *Risk.- Danger, threat or likelihood of harmful effects linked with a current or potential exposure to radiations.*
- s) *Safeguards.- Verification methods applied to the nuclear material and related equipment in order to insure that non declared uses are not occurring.*
- t) *Nuclear safety.- All of those appropriate conditions for operation, prevention of accidents and mitigation of consequences, which result in protection of workers, public and environment against undue dangers of the radiation.*
- u) *Radiological safety.- Applying of procedures and measures to protect people against effects from radiation.*

Second.- Regulation by rule of the Law

The regulation by rule and other complementary rules of the Law will be approved through a Supreme Decree signed by Ministry of Energy and Mines as necessary to a better application of the Law.

Third.- Coordination of radiological emergencies

The Regulatory Body will act as coordinator on matters of preparedness and response in radiological and nuclear emergency.

Fourth.- Control to imports of radiation sources and nuclear material.

The Regulatory Body, as to accomplish with provisions in articles 1 and 2 of Law No. 27575, shall establish the appropriate measures to make sure a suitable control of ionizing radiation sources, nuclear material and nuclear equipment being imported to the country as well as the appropriate identification of importer persons or organizations. These actions will be coordinated with the National Superintendence for Tributary Administration.

Fifth.- Empower to establish Agreements.

The Regulatory Body will be able to establish agreements with other private or governmental organizations as necessary in order to a better accomplishment of its duties.

FINAL PROVISIONS

First.- Deadline to became adapted to the Law.

The juridical or individual persons performing practices under scope of article 2 of the present Law at the moment of its approval will have deadlines for adapting to the provisions of the Law as established in the corresponding regulation.

Second.- Revoking of rules.

The rules and regulations which are opposed to provisions of present Law will be revoked, as applicable.

Lima, July 21th , 2003.

Appendix III

Listing of Laws and Regulations in Nuclear and Radiological Safety Matters

- A. Decree Law No. 21875 – Organizational Law of Instituto Peruano de Energía Nuclear. July 1977.
- B. Law No. 27757 – Law for Prohibition of Imports of Second-hand Goods, Machinery and Equipment which uses radioactive sources. May 2002.
- C. Law No. 28028 – Law for Regulating the Uses of Ionizing Radiation Sources, July 2003.
- D. Supreme Decree No. 009-97-EM – Radiological Safety Regulations. May 1997.
- E. Supreme Decree No. 014-2002-EM – Regulation for Physical Protection of Nuclear Material and Nuclear Installations. April 2002.
- F. Supreme Decree No. 001-2004-EM – Regulation of Law No. 27757 for Prohibition of Imports of Second-hand Goods, Machinery and Equipment which uses radioactive sources. January 2004.
- G. Supreme Decree No. 039-2008-EM – Regulation of Law 28028, Law of Regulation for Uses of Ionizing Radiation Sources. July 2008.
- H. Supreme Decree N° 062-2005-EM – IPEN Organization and Functions. December 2005.

Conventions and others on Nuclear and Radiation approved by Peru

- | | |
|---|---------------------------|
| 1. Vienna Convention on Liability for Nuclear Damage, | in force since 1980-11-26 |
| 2. Convention on the Physical Protection of Nuclear Material | in force since 1995-02-10 |
| 3. Convention on Early Notification of a Nuclear Accident | in force since 1995-08-17 |
| 4. Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency | in force since 1995-08-17 |
| 5. Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management | in force since 2015-12-17 |
| 6. Amendment to the Convention on the Physical Protection of Nuclear Material | in force since 2016-05-08 |

Peru has also expressed formally support for the Code of Conduct on the Safety and Security of Radioactive Sources and the Supplementary Guidance on the Import and Export of Radioactive Sources.

Appendix IV

SUMMARY DESCRIPTION ABOUT RESEARCH REACTORS

A. RESEARCH REACTOR OF 10 Mw (RP10)

This facility is located in the Nuclear Center RACSO at 48 km to the north from Lima. The site has a low density population. The nearest population is 1500 meters from the reactor.

The RP10 is a pool type reactor (open pool) which operates with MTR fuel elements containing ^{235}U enriched at 20%. It is cooled and moderated by light water and the nominal power rate is 10 Mw thermal. The reactor is utilized for research and testing activities as well as for radioisotope production as ^{131}I , $^{99\text{m}}\text{Tc}$, ^{153}Sm and ^{192}Ir .

The working core is arranged with 24 normal fuels and 5 control and safety bars. The core is surrounded by graphite and beryllium reflectors. The safety system is provided through 3 safety bars which fall into the core to shut down if deviations from normal setup conditions happen.

The main pool is a block of concrete and iron, inside lined with stainless steel, of a shape of cylinder with 11 meters height and 4 meters of diameter. This block is inside a building of reinforced concrete of $2,4 \text{ g/cm}^3$ density having 32 meters height and 27 meters of diameter.

The reactor is provided with a ventilation system for air injection, exhaustion (passing through HEPA and activated charcoal filters), re-circulation and homogenization.

The core cooling system is provided by two circuits, each one having three parallel pumps providing $1650 \text{ m}^3/\text{h}$ water flow when working at full rate. In order to prevent a loss flow accident (LOFA) the pumps are provided with flying wheels which allows the water flows by 10 seconds after a blackout. Likewise to prevent a loss coolant accident a break flow is provided in the pipes inside the reactor tank for avoiding the drainage of water after breaking in the primary cooling pipes.

The reactor is commanded from a control room aside the reactor building where operating parameters are displayed and controlled.

B. EXPERIMENTAL CRITICAL FACILITY OF ZERO POWER (RP0)

This experimental facility is located in the Headquarter of IPEN in Lima within a densely populated area.

The reactor RP0 is tank type which operates with MTR fuel elements having 20% of ^{235}U . It is cooled and moderated by light water and may be operated until 10 W thermal. This facility is used on experimentation, research, and teaching activities.

The core of reactor has 9 normal fuel elements and 3 control and safety bars as well as graphite reflectors.

The main tank is a cylinder shape of 1,51 meters height and 2 meters diameter which is inside a reinforced concrete building with density of $2,4 \text{ gr/cm}^3$ having 7,3 meters height, 25,3 meters long and 7 meters wide.

The core cooling system is by natural convection after tank is filled with light water to operate. When a blackout happens or when some abnormal event is in progress (for example an earthquake) the safety rods fall into the core and the water is completely exhausted from the tank then shutting down the reactor.

The reactor is commanded from a control room aside the reactor room.

Currently this reactor is not operating.