# NATIONAL REPORT FROM PERU

# NINETH REPORT PREPARED IN THE FRAMEWORK OF CONVENTION ON NUCLEAR SAFETY



**July 2022**

## INTRODUCTION

This report is presented for the Nineth Meeting and it updates the report for the Eighth Meeting although this was not effectively held due to the global pandemic situation by the Covid-19 which prevented all kind of meetings.

As stated in previous national reports, the Republic of Peru do not have any nuclear installation in the frame of the Convention and there are no governmental plans for embarking the country in a nuclear power program. It must be pointed out that some intentions have been not officially expressed by a private organization for commercially investing and operating a nuclear power reactor and currently it is inquiring about the national regulations and requirements.

The nuclear activities continue restricted to the use of ionizing radiation sources in medicine, industry and other fields. The inventory of radiation sources in the country reach approximately 13000 sources and including radioactive material and ionizing radiation generators, being X-ray machines the biggest contributors. The nuclear material is used in nuclear fuels for two nuclear research reactors which are operated by the Peruvian Institute for Nuclear Energy (IPEN) just for research and radioisotopes production activities. The information about these research reactors as provided in previous reports remains basically unchanged although the uranium oxide type fuel has been replaced by uranium silicide fuel.

The country continues strongly committed with the Convention on Nuclear Safety and trying to fulfil its obligations as applying to contracting parts with non-nuclear installations. This commitments are mainly focused on the regulatory framework, emergency preparation and radiation protection matters. The Convention is deemed very important for the country as a strong base for supporting the legal framework on safety and protection.

Also this National Report was prepared following the INFCIRC/575/Rev.5 recommendations for countries without nuclear installations and taking into account the situation in the last report for each issue in order to update it as appropriate. The structure also follows those of previous report and the information provided makes the report being self-sufficient for a clear image of the current situation.

As many aspects of the situation remain the same this report uses information from previous one, including the Appendixes.

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**SUMMARY**

Peru continues not having nuclear power plants and with any formal intention of embarking in a nuclear power program however, it should be noted that a private investor has shown its interest for introducing and operating a nuclear power plant in a commercial fashion and currently this group is collecting information on legal and technical aspects for making a decision.

The nuclear activities in the country continue involving just ionizing radiation sources for applications in industry, medicine and others. In the nuclear field, there are two research reactors for research and radioisotopes production, but one of them remains non-operational since twelve years ago.

The reviewing and updating of the regulation for the regime of authorization and enforcement was concluded and currently it is ready for approval. The reviewing of radiation safety regulation is just starting for lining up to the IAEA International Safety Basic Standards. Also, regulations and guides for uranium mining and milling has been prepared and expecting to be all concluded by the end of 2022.

The National Integrated Plan for Radiation and Nuclear Emergencies is delayed although the Sectorial Plan of Energy and Mines considered the response to radiological emergencies for disasters of Category 5. The National Plan for Radiological Emergencies of IPEN was no tested in the last period.

Regard to regulatory body the limitations on budget and resources have continued and impacted on its activities. The sanitary emergency raised by the pandemic Covid-19 added difficulties for accomplishment of regulatory duties and some adjustments were needed to cope with the most important control activities by using remote and online tools. At this time the intention and steps for promoting the independence of regulatory body is slowing down.

**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, remains as the highest legal regulation by establishing general provisions for safety of practices which uses ionizing radiation sources and setting obligations to operators of radiation sources. This law also empowers the Nuclear Institute for Nuclear Energy (IPEN) as regulatory body. The Law scopes the nuclear reactors by defining them as a complex ionizing radiation source. The Law has been implemented by other regulations by which the regime for authorization, enforcement and technical requirements on nuclear safety and radiation protection were established. In the last year the Regulation of Law 28028 was reviewed as part of the regulatory quality analysis (RQA) under the governmental program and modifications are ready to be approved by the end of 2022. The Regulation on Radiation Safety will start to be reviewed in this year as to line it up with the recommendations of IAEA Safety Standards.
In the last years, as interest on uranium mining is still on a set of regulations and guides have been prepared or being under development and it is expected to be completed by the end of the year 2022. For now, the listing of Laws and Regulations in Nuclear and Radiological Safety Matters in force are shown in the Appendix II.

### *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 power plants as defined in the Convention although the National Energy Policy for Peru 2010 – 2040 included the nuclear power as part of the energy matrix. At this point any formal activity or action has been initiated at governmental level for embarking the country in a nuclear program. In despite of this, in this year the interest of a private company has been raised on operating a nuclear power reactor in the country. Currently this private company is collecting all the technical and legal information to make a decision. In the meantime the perspective for the country continues basing the production of energy by hydropower and electricity by thermic central gas stations and other non-renewable sources.
The only reactors in the country are one critical assembly of zero power (RP0) and another one research reactor of 10 Mw of thermal power (RP10). The characteristics of these installations where described in previous reports and remain the same although the RP10 has changed its nuclear fuel from uranium oxide to silicide uranium type fuel. The RP10 continues operational while the RP0 remains in extended shutdown since twelve years ago. Description of these facilities are shown in the Appendix IV.

Regard to the safety status of research reactors which were described in previous report it should be mentioned that safety is kept as requested and some systematic collection of operational experience and periodic reviews is under development.

The re-assessment of safety for seismic events was carried out and reported before loading the uranium silicide fuels, as well as the review for external and internal events impacts.

### *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 licenses;***
> ***iv. the enforcement of applicable regulations and of the terms of licenses, including suspension, modification or revocation.***

**Article 7 (1)**. Establishing and maintaining a legislative and regulatory framework
The legislative and regulatory framework is based on the Law 28028 – Law for Regulation of Ionizing Radiation Sources which is the highest legal document for governing the safety of nuclear and radioactive installations. This law remain in force and unchanged and being

applicable to all of 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 the harmful effects of ionizing radiation. As mentioned, the scope of Law includes the nuclear reactors which are considered as a complex radiation source. The Law appoint to IPEN as regulatory body and establishing obligations related to authorizations, inspection, enforcement and empowering regulatory body to apply the safety and protection provisions.
The Decree Law 21875 is the law of organization of IPEN where their responsibilities and duties are established as for regulatory body on nuclear energy matters.

Peru has approved the Convention on Physical Protection of Nuclear Material and its Amendment, the Convention on Early Notification of a Nuclear Accident, the Convention on Assistance in the case of Nuclear and Radiological Accident or Radiological Emergency, and the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

**Article 7 (2) (i)**. National safety requirements and regulations
The requirements in the second level of regulations are approved by Supreme Decrees, as may be seen in Appendix III. The details of current status of regulations are as follows:

a) The ***Rule of Law 28028, Law for Regulation of the Use of Ionizing Radiation Sources*** approved by Supreme Decree N° 039-2008-EM. This regulation provides the regime for authorizations, inspections and enforcement. The licensing regime for nuclear installations is contained in a specific section of the regulation. The classification of nuclear installations includes nuclear power plants, nuclear reactors, facilities for treatment of nuclear materials, and facilities for storage of nuclear materials. The licenses for nuclear installations are required 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. The review and updating of Safety Analysis Report of nuclear facilities are required to be performed every ten years. The reviewing of SAR is made by all staff of regulatory body who take charge of chapters according their specialty and using standard references.

   In 2018 this regulation was started to be reviewed as part of the process of Regulatory Quality Analysis (RQA) as required by the Government. The expected modifications were addressed just for the radioactive facilities chapter and did not include the nuclear facilities chapter. This process has ended in this year and the approval of modified regulation is expected by the end of 2022.

b) The ***Regulation for the Physical Security of Nuclear Material and Nuclear Installations*** approved by Supreme Decree N°. 014-2002-EM. This regulation makes provisions and establishes requisites and requirements for physical protection of nuclear installations with

the purpose of assuring an appropriate protection to the nuclear facilities and material during its use, storage and/or transportation. The goal of regulation is preventing and minimizing the unauthorized removal of nuclear material and/or sabotage. The provisions of this regulation are based on the Convention on Physical Protection of Nuclear Material (CPPNM) and INFCIRC/224/Rev. 2 but a revision continues being a need to make adjustments, if needed, against the provisions of the Amendments of CPPNM.

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 safe transport, radioactive waste management and chronic exposures, amongst others. The process for reviewing this regulation will begin this year addressed to updating it accordingly the recommendations of IAEA International Safety Basic Standards (IAEA Safety Standard n.° GSR Part 3).

There are also other specific rules issued for radiation safety on nuclear medicine, teletherapy, industrial radiography, X-ray diagnostic, gamma irradiators, personnel dosimetry services and for radioactive sources security. Currently, other specific rule projects are ready to be sent to interested parts for comments and suggestions.

The process to review, preparing and approval of specific rules and regulations is in charge of the Regulatory Body. The project of regulation is prepared by the Regulatory Body and then sent to the interested parties of governmental and private organizations for 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

All activities involving use of radiation sources or exposure to ionizing radiation sources are requested to obtain an authorization before starting the operation. The practices that they pose the most higher risk, as using of high activity radioactive sources or research reactors, require a license for performing their activities.

The nuclear research reactors (NRR) require licenses for siting, construction, commissioning, operation, modification and decommissioning. The application for a license is performed by submitting of a Safety Analysis Report, Operating procedures, emergency plans, quality assurance program, radiation protection program, radioactive waste management program, and other specific information accordingly to the stage. The application is evaluated and assessed by the Regulatory Body. License is granted when the applicant met all provisions of 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 issued under specific limits and conditions and by a period of validity after which they should be renewed. The validity periods of licenses are set in regulation 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 also require an individual license as for operators, supervisors, safety officers and maintenance personnel duties. 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. The process of licensing require that the applicants take a theoretical and practical examinations which must be passed with 75% of test correctly answered.

The revalidation of individual licenses requires the applicant to be re-trained following an approved training program under licensee responsibility and regulatory supervision. It is also required a written declaration of facility licensee on the performance of applicant and an updated certificate of psycho-physic aptitude.

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

It must be mentioned that during the Covid-19 pandemic all of the authorization processes were performed by on line means. Applicants submitted their documentation remotely to regulatory body which evaluated the requests and granted the authorizations also on line.

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

The IPEN performs inspections on all practices and radiation sources according to an Annual Plan for Inspections. The usual planning for inspections takes into account the risk posed by the installation and radiation source. The radioactive installations classified as Category A – the highest risk – are inspected at least once a year.

The research reactors are usually inspected in a monthly frequency in order to cover within the year all the safety and protection aspects and nuclear security. The verifications include the reactor control systems, radiation protection, maintenance program or quality assurance amongst others. During the inspection inspectors verify, amongst others, the solution of

previous findings, reviewing of operational records, radiation protection measurements and maintenance records, and the compliance of license conditions and limits. The scope of inspections is addressed to nuclear safety and radiation protection and also nuclear security.

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

It should be mentioned that the sanitary emergency due to the Covid-19 pandemic was declared in 2020 March and all activities face-to-face were prevented until the end of 2021 with exception of those deemed essentials, for instance, public services. Due to this situation the inspections were also restricted to only those deemed duly justified. The inspections were turned into remote and limited verifications were performed based on information submitted by the licensees under request from regulatory body. This methodology was applied to selected facilities in Category A and B of regulation and also including the research reactor. The additional verification of the research reactor was performed using the data coming from Acquisition Data System of RP10 which register on line some operational parameters during the operation of the reactor.

In this pandemic time inspections face-to-face were just performed five times in the research reactor being two of them for safeguards verification of the nuclear material and other one on a radioactive facility for covering safeguard verification.

The inspections result allowed to be partially aware of the safety and protection performance of facilities however represented the only way for preventing in some way the loss of regulatory control.

This methodology of inspection was no included in the Manual of Inspection but in light of experiences it needs to be duly considered because the legal implications for being accepted by licensees. The remote inspection needs to be regulated taking into account the legal provisions which regulates the relationships between regulators and managed users in the Laws in the country. This Manual is currently under review and expecting be ready by end 2022.

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

The IPEN is empowered by Law 28028 to apply administrative sanctions to licensees because of 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 actions 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 administrative sanction process may be initiated.

The sanctioning process is carried out under the Procedure for Administrative Sanctions which was modified and approved in 2021.

The process involves two separate stages: one phase for prosecution and another one for imposing the sanction to licensee. This process is performed in line with the provisions of the General Administrative Procedures Law 27444 which rules this kind of process in all the country.

The prosecution stage is developed to collect all of the relevant and needed information and evidences in the case, including the responses of licensee to the notification of presumed offenses, and analyzing and issuing the prosecution report where the offense is typified and the sanction is also proposed. The report is sent to the sanctioning level where the prosecution report is sent to the licensee requiring its disclaimers within a frame time and then imposing the sanction.

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 of IPEN 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 people 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

The Regulatory Body was established in the 3rd article of the Law 28028 as being the Peruvian Institute for Nuclear Energy (IPEN) charged and empowered to apply the provisions of the law and regulations. 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 Nº 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 is responsible 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 of IPEN who is the top authority and the Director of Technical Office for Regulatory Body which is the executive branch of Regulatory Body and directly 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 appeals 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 and having the following duties:

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.

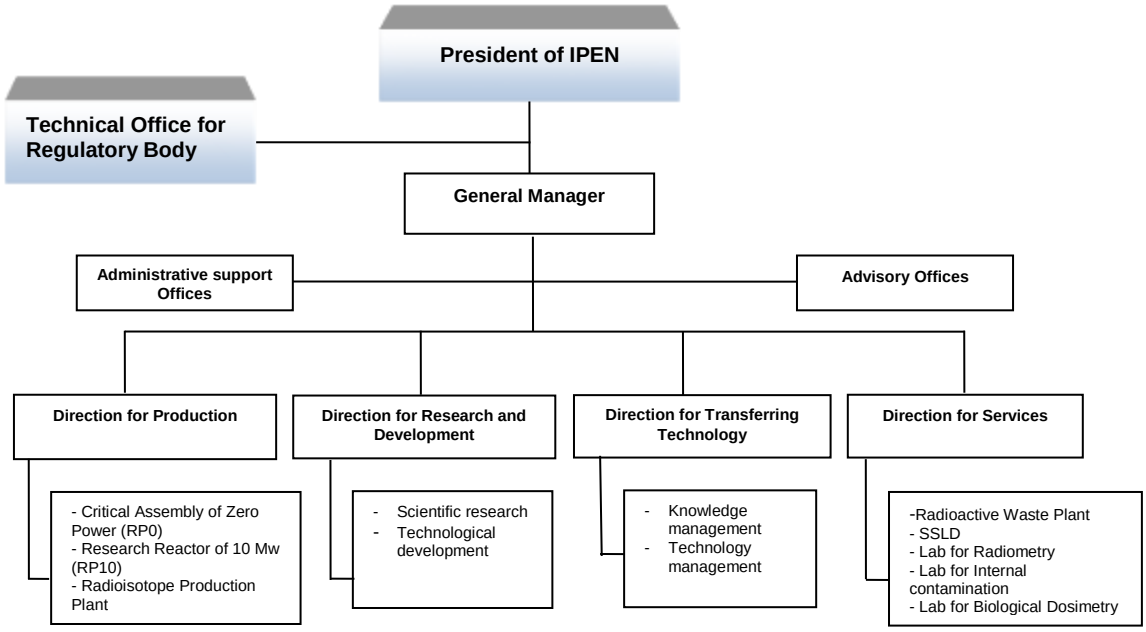
The organization of IPEN and the structure of Technical Office for Regulatory Body remain the same as shown in Figs. 1 and 2. The promotion directorates are under the charge of a Director who depends from the General Manager. The General Manager depends also from the President of IPEN. The main duties of promotion directorates remain the same as the last National Report and they include 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 is currently staffed with twelve radiation and nuclear specialists being one of them re-assigned to the Technical Office from other office. Since 2020 the regulatory body has lost one specialist by retirement and it is foreseen one more will be retired by the end 2022. The workload has increased and the need for more staff is every time evident as radiation activities and users continue yearly increasing. 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. 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 is going to be undertaken by the governmental program from SERVIR as the organization which deals with staffing management for all governmental organizations. Through this program ten additional specialists will be provided to regulatory body by 2023 according to prepared and approved profiles. The competence of current staff are continuously managed through IAEA regional courses and attendance to some regional meetings but also by national training where the self-training method is also considered. Regard to knowledge transfer, a commission was convened in 2021 in order to organize and implementing a program addressed to keep and pass information to the new people, although the advancement is slow.

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 along the last years with occasionally some special extra budgetary funds which are mainly addressed 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 continues being a concern

as the regulatory body foresees that future possible activities on uranium mining and milling will require most resources for regulation and control.

***Fig.1. Organizational Chart of IPEN***

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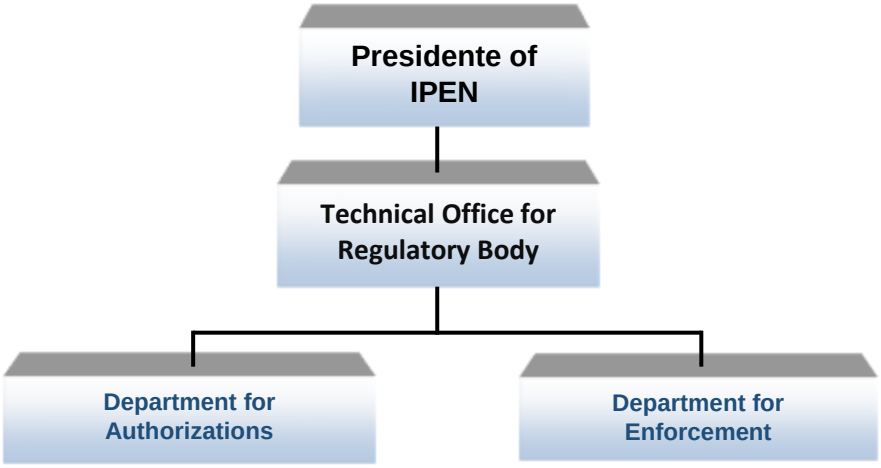
The management system is not yet in place in despite the new directives issued by central government on this subject. The IPEN started a program to prepare Manuals and Procedures and the Technical Office, in coordination with IPEN planning office, and the process is going on. The Technical Office has approved at this time the Manuals for Inspections and Directive for Administrative Sanctioning Procedure as well as some procedures for authorizations.

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. Currently IPEN is going to be part of the National Platform of

Open Data which is a digital governmental platform of data to the public and where licenses data will be available.

***Fig. 2. Structure of Technical Office for Regulatory Body***




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.

In relation to an external mission by IAEA the intention for a new IRRS Mission is still on but due the pandemic Covid-19 this activity has been delayed.

**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 is 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 major prioritization toward most relevant tasks. Because of this situation, the possibility for regulatory body independence has been considered but the pandemic situation slowed down this concern. Until this moment was not possible to propose the way of achieving the independence whether changing the sector to other non-nuclear related or creating a new organization. It is expected that if mining activities are developed or the investment on a nuclear power plant is decided then the independence as well as the significant increase of resources will became a critical issues.

In despite of this situation, in the current state the technical independence is deemed enough as legally provided by the regulation (Supreme Decree n.° 062-2005-EM and Supreme Decree n.° 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 care of all safety issues. The obligations of the licensee include the provisions of means of protection to 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 and currently this situation remains 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.

Intents for developing the safety culture that were initiated some years ago has been not continued and at this time any advance may be measured. Also there are arrangements for safety management and safety monitoring in the research reactor however the self-assessments and independent assessments has been not implemented.

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

The regime of authorization and inspection has been prioritized using a graded approach based on the level of risk of radiation sources and following the regulatory classification of practices. The enforcement actions also are mainly addressed to facilities managing ionizing radiation sources.

***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 continues being provided from the 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 founds have been sometimes provided in one particular year, 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 any approved policy exist on this matter. After sending the first spent fuels to United States of America (USA), any arrangement has been initiated to send the remaining spent fuel which remain stored in the auxiliary pool of the reactor.

**Article 11 (2)** Human resources

The required personal for research reactors involves those for the operation, evaluation, safety and maintenance of the nuclear reactor. The staffing needed has been 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. The licensee is committed to prepare and implementing training and re-training programs for its staff.

The competence of personnel is tested firstly in the process of individual licensing and then by oversighting the training program. Initial training and re-training is required as a regulatory requisite to obtain and keeping updated the individual licenses for supervisors, operators, radiation protection officers and maintenance staff of nuclear reactor.

The competence is kept by re-training programs for operators which are performed by the licensee and they include refreshment and learning courses on the application of 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 keeping a good preparation. The training programs are developed by experts working in the facility and on several other fields.

The training program and its implementation are under reviewing and inspection by Regulatory Body to assure that is appropriately accomplished.

## *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 on human factors and organizational issues are incorporated 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 are considered in the approved procedures. These procedures are duly followed in the reactor operation by licensed qualified and trained personnel.

The consideration of human factors in the design is not directly set in the regulation however it is stressed in a general way 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 application 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.***

The requirement for a quality assurance program is set in the Regulation of Law 28028 and the Radiation Safety Regulation for being applied in the stages of construction, operation and closure of nuclear reactors.
The QA program for research reactor cover the operation, maintenance, assay and inspection, nuclear fuel management, modification of the installation, supply of materials and components. The QA program of research reactor is currently complete and the regulatory body verifies sporadically its accomplishment by reviewing the processes and records.

Regard to management system for research reactors was an INSARR recommendation however it is not a regulatory requirement and therefore remains unfulfilled. The management system for ionizing radiation facilities is going to be considered in the review of regulation.

***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 safety assessments is required for every stage as part of the Safety Analysis Report which is submitted for applying a license. for the research reactors as part of the Safety Analysis Report submitted for applying a license. The initial assessment for the reactor RP10 was performed by applying the probabilistic method and using the concept of Maximum Credible Accident (MCA). A safety evaluation is also required as some condition or new experiment is deemed could affect the reactor safety. The chapter of safety analysis was reviewed and accepted in 2019 by the regulatory body as part of the authorization to modify the type of nuclear fuel from uranium oxide to uranium silicide.

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

**Article 14 (2)** Verification of safety

The verification on safety of research reactors is established as an obligation in the Radiological Safety Regulation. The provisions are set for keeping the safety of systems and components of a radiation source – research reactors – through suitable maintenance.

The preventive and corrective maintenance is carried out according to an annual program trying to cover 100% of the safety systems by surveillance and functional testing. The provisions for ageing safety analysis are included in Safety Analysis Report and the plan for this subject is in progress. The program of maintenance allows the tracking of systems and components performance which facilitate the analyzing of ageing effects.

The safety cases are reviewed by the Reactor Safety Committee for approving the correspondent measures. The Regulatory Body is in charge of reviewing 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 are 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 implemented a radiation protection program with procedures and instructions intended to control the staff exposures for all activities carried out in the facility. 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 effective dose for workers is kept around 0,20 mSv with a maximum dose of 1,6 mSv. These values come from personnel dosimetry records of exposed workers using TLD dosimeters provided by IPEN dosimetry laboratory.

The Regulatory Body also requests the submission of annual reports on 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 to the public.

***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 then 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.° 29664 Law for Creation of the National System of Disaster and Risk Management, issued in 2011, as an inter-institutional, synergic, decentralized, transversal and

participatory system. The purpose of this system is identifying and reducing the associated risks of hazard or minimizing their effects and avoiding new generated risks, as well as for preparation and response to disasters, by setting up principles, policy guidelines, components, processes and tools of the Risk Management of Disasters.

The SINAGER is made up by two organizations: The National Center for Assessment, Prevention and Reduction of Disaster Risks (CENEPRED) and National Institute for Civil Defense (INDECI). The CENEPRED is commissioned for preparing technical and management regulations, and for providing specialized technical assistance to governmental and private organizations on appraisal, prevention and reduction of disaster risks. The INDECI is commissioned for ensuring and optimized response in case of disasters, supervising the attention of affected people, coordinating with responsible organizations the required actions for attending the emergency, and rehabilitation of affected areas, amongst others.

Regarding to nuclear and radiation emergencies, the coordination with INDECI for integrating the radiological emergency plan remain stopped since 2018 and with any provision for continuing.

Currently the radiological emergencies plan under IPEN charge is considered in the Energy and Mines Sectorial Plan for Responding and addressed for attending 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.

The specific National Radiation Emergency Plan of IPEN, approved by Presidential Resolution n.° 318-17-IPEN/OTAN in 2017, establishes the requisites and actions to be carried out by IPEN as for responding to radiation emergencies in the national territory. The institutional plan was prepared based on the 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 is structured by including 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 has not been tested since 2018 however it has been applied successfully in real situations as for orphan sources rescue and theft of radioactive sources, which are included in the emergencies category in the plan.

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. Regard to nuclear reactors, currently just the nuclear reactor RP10 has an emergency plan because the critical facility is currently non-operational with any nuclear fuel in core.

In the case of the Emergency Plan of Research Reactor of 10 Mw the nuclear and radiation emergencies are classified as:

- 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 is postulated as being the melting of 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 routinely trained in the application of the plan and procedures. The Emergency Plans for Research Reactors are also required to be periodically tested as requested in the license limits and conditions. The emergency plan for the research reactor of 10 Mw has not been tested after 2019 due to pandemic restrictions.

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

The communication program has not been continued in the last two years for population located beyond 1500 meters (exclusion zone) from research reactor RP10, due to restrictions caused by the pandemic of Covid-19.

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.

IPEN continues committed for issuing right and on-time communications to the media when an accident happens in order to set the real magnitude of event and dealing with the concerns of 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. However any bilateral with neighboring countries has been considered at the moment.

**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 ***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 re-evaluation of site factors have been updated and submitted in the updated SAR for modification of type of fuel.
The consultation with other Contracting Parties likely to be affected by any nuclear installation is not considered in the regulation and it should be analyzed in the reviewing of this regulations.

***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 nuclear reactors – as a complex radiation source – 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 considered the criteria of defense in-deep by multiple safety barriers for preventing or reducing the probability of radioactive material releases in case of internal and external events.

Also, the criteria of redundancy and diversity were taken into account in the research reactor 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.
Regard to the consideration of VDNS Principles into the regulations this fact is no yet assessed.

***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 to be 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 previsions for dismantling and closure.

The program for commissioning must be 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 time and besides some chapters were reviewed due to replacement of the type of fuel. The Regulatory Body has reviewed the S.A.R. concluding that it is enough suitable to fit the current regulations.

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 considering the operational experience. The preparation of procedures is performed by 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 to report the Regulatory Body all the significant incidents for safety. The INES scale is applicable for communication of all the incidents or accidents with radiation sources and also include to research reactors. In the period 2019 - 2022 any significant incident was reported.

The collection of operational experience and periodic reviews is not regularly 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. The solid wastes containing activated material are sent to radioactive waste plant and some other 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. | International Atomic Energy Agency | IAEA |
| 2. | International Nuclear Event Scale | INES |
| 3. | Instituto Nacional de Defensa Civil | INDECI |
| 4. | Peruvian Institute for Nuclear Energy (Instituto Peruano de Energía Nuclear) | IPEN |
| 5. | Integrated Safety Assessment for Research Reactors | INSARR |
| 6. | Integrated Regulatory Review Service | IRRS |
| 7. | International Reporting System for Research Reactors | IRSRR |
| 8. | Reactor de Potencia Cero | RP0 |
| 9. | Reactor de Potencia Diez | RP10 |
| 10. | 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 cannot 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 Nº 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%. The MTR fuel is currently of uranium silicide fuel type which replaced the older uranium oxide fuel type since 2019 . 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 $^{131}I$, $^{99m}Tc$, $^{153}Sm$ and $^{192}Ir$.

The working core is arranged currently with 10 normal fuels and 5 control and safety rods. The core is surrounded by graphite and beryllium reflectors. The safety system is provided through 3 safety rods 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 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 m$^3$/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 gr/cm$^3$ having 7,3 meters height, 25,3 meters long and 7 meters wide.

The core cooling system is by natural convention 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.

This reactor does not operate more than 12 years ago and with no plan to resume the operation at short time.