

Kingdom of Morocco



Head of the Government

**National Report
Convention on the Nuclear Safety
8th Review Meeting of the Contracting Parties
March 2020**

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A. INTRODUCTION

INFCIRC/572	<p>The Introduction in the National Report should include:</p> <ul style="list-style-type: none"> – general introductory remarks outlining the national policy related to nuclear activities; – an overview of the national nuclear programme; – a statement on the commitment of the Contracting Party to the Convention, including a survey of the main safety issues addressed in the National Report; and – explanations on the preparation, structure and main features of the National Report, (in particular if different from these Guidelines).
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A. 1- NATIONAL CONTEXT

In the early fifties, the Kingdom of Morocco opted for the peaceful use of nuclear applications in different socio-economic sectors such as health, agriculture, mining, industry and research.

Indeed, Morocco, being among the first countries in Africa who joined the IAEA in 1957, became a party of the Treaty of Non-Proliferation of Nuclear Weapons in 1970 and ratified all nuclear and radiological instruments under the IAEA's auspices. The Convention on Nuclear Safety “CNS” was the latest convention ratified by Morocco, in May 2019, by which the country expressed its commitment to nuclear safety and its willingness to actively participate in the development of a safety culture among the contracting parties.

Furthermore, in order to develop and promote nuclear and radiological applications, the Kingdom of Morocco created in 1986 the National Centre for Nuclear Energy, Sciences & Technologies (CNESTEN) that is operating since in 2009 the Maâmora Nuclear Research Centre MNRC, in which is a 2 MW TRIGA Mark II Research Reactor is implemented as well as other facilities used for different sectorial applications (such as radioisotope production, waste management, environment science, Non Destructive Testing and safety and security activities). The above-mentioned reactor is used mainly for neutron activation analysis, production of radioisotopes, research and training. which established in 2003 the Maâmora Nuclear Research Centre MNRC, around a 2 MW thermal power research reactor dedicated to the production of radioisotopes, research and training and other facilities used for different sectorial applications.

In 2009, Morocco adopted a national energy strategy aiming at securing its energy supply and at preserving the environment by mitigating greenhouse gas emissions. The strategic planning studies of the Ministry of Energy, Mines and Environment “MEME” showed that the primary energy demand was expected to double between 2015 and 2030. The electricity demand in 2018 stood at 37,44 TWh and is expected to double by 2030 while the installed electrical capacity in 2018 was 10768 MW and is expected to reach 25 GW by 2030.

As Morocco commitments to climate change via its Nationally Determined Contribution “NDC”, renewable energies will dominate in the future, through additional capacity, bringing the combined share of renewable energies (hydro, wind & solar) in the electricity mix to attain 42% in 2020 and 52% in 2030.

For the period 2021-2030, the strategic plan foresees the deployment of natural liquid gas while nuclear energy is foreseen as a viable option beyond 2030. It is worth mentioning that the interest for nuclear energy dates back to the 80’s when Morocco, through the National Office of Electricity and Potable water utility (ONEE), launched a technical and economic feasibility study and site selection for the introduction of nuclear power plants in the electrical grid with IAEA technical assistance. The siting

study resulted in the selection and qualification of the Sidi Boulbra site in compliance with international and IAEA safety standards.

In order to assess the required conditions to launch a nuclear power programme according to the IAEA “milestones” methodology, the Minister of Energy, Mines and Environment set up in January 2009, a national think tank for nuclear power and desalination (CRED) consisting of representatives of MEME, the ONEE, the CNESTEN, as well as of the president of the nuclear engineers association and a university professor.

Following the guidelines of the MEME, the CRED drafted a first evaluation report of national nuclear infrastructures. This report was submitted to MEME in 2010. The CRED also prepared a self-evaluation report (SER) which covered the 19 areas related to the state of progress and development of the country's nuclear infrastructures, in accordance with the methodology recommended by the International Atomic Energy Agency (IAEA). This report was validated by the MEME.

The SER was reviewed by the IAEA's Integrated Nuclear Infrastructure Review (INIR), which took place in October 2015 at the request of MEME. The report of this mission, containing recommendations, suggestions and good practices, was officially submitted in early 2016 to the Minister, by the Director of the Division of Nuclear Power, IAEA Department of Nuclear Energy.

It should be noted that an integrated work plan (Integrated Work Plan (IWP)) for the implementation of the recommendations of the Integrated Nuclear Infrastructure Review (INIR) mission was established by the CRED for the period 2016-2019, with the support of IAEA experts.

The progress of the implementation of these recommendations will be the subject of a comprehensive report, which will be established by the CRED in 2020, with a view to obtaining a political decision in 2020, concerning the possibility of introducing nuclear power in Morocco by 2030 and beyond.

It's worth to underline, that up to now there is no decision to undertake a nuclear power program in Morocco.

This open and transparent approach contributed to building an effective international cooperation and to speeding up the establishment of the legal framework reform process, which culminated by the adoption, in 2014, of the law 142-12 on Nuclear and Radiological Safety and Security and the creation of the Moroccan Agency for Nuclear and Radiological Safety and Security (AMSSNuR) as an independent regulatory authority, reporting directly to the Head of Government. AMSSNuR oversees regulatory control and inspection of nuclear and radiological activities and facilities.

Currently, beside the research reactor and its associated facilities established by CNESTEN at the Maamora Nuclear Research Centre (MNRC), the nuclear and radiological sector is dominated by medical and industrial uses.

In this regard, AMSSNuR developed a strategy to upgrade the national safety and security framework and to enhance the level of safety and security according to law 142-12, international standards and INIR mission recommendations.

A. 2- NATIONAL REPORT OBJECTIVES

Having ratified the CNS in May 2019, the Moroccan Government hosted a first national meeting on the communication on this international instrument in July 2019 which resulted in establishing an action plan led by AMSSNuR to prepare the first National Report to be submitted to the next contracting parties meeting review in March 2020.

In this framework, this national report was prepared by AMSSNuR in cooperation with all stakeholders (CNESTEN, ONEE, CNRP, Ministry of Energy and Mines and Environment , Ministry of Interior.). It gives an overview of the national policy on nuclear activities, the nuclear programme and the nuclear safety regulatory framework.

The report is a stand-alone document, structured in conformity with the “Guidelines regarding National Reports under the Convention on Nuclear Safety” (INFCIRC/572/Rev.6).

B. SUMMARY

INFCIRC/572	<p>The Summary in the National Report should highlight the Contracting Party’s continued efforts in achieving the Convention’s objectives. It should serve as a major information source by summarizing updated information on matters that have developed since the previous National Report, focusing discussion on significant changes in national laws, regulations, administrative arrangements, and practices related to nuclear safety, and demonstrating follow-up from one Review Meeting to the next.</p> <p>The Summary should:</p> <ul style="list-style-type: none"> – address important safety issues that have been identified in the Contracting Party’s previous National Report or that have arisen since the previous National Report; – address future safety related activities and programmes planned or proposed for the period until the next National Report; – give special attention to issues and topics as identified and agreed upon by the Contracting Parties at the Organizational Meeting. These topics may vary from one Review Meeting to the next and could be related to several articles; – address the responses of the Contracting Party to the results of the previous peer review of the Contracting Party concerned, in particular Suggestions or Challenges summarized in the Country Review Report for that Contracting Party; likewise, any announcement or voluntarily accepted action at the previous Review Meeting; – describe significant changes to the Contracting Party’s national nuclear energy and regulatory programmes and measures taken to comply with the Convention’s obligations; – respond to the IAEA Generic Safety Observations Report (see Section III of the Guidelines regarding the Review Process under the Convention on Nuclear Safety) if provided and if relevant to the particular national situation; – for those Contracting Parties hosting, having hosted or planning to host international peer review missions and follow-up missions, include a description of policies, plans and schedules for such missions; – address the results of international peer review missions including the IAEA missions conducted in the Contracting Party during the review period, progress made by the Contracting Party in implementing any findings, and plans for follow-up; – include the measures taken by the Contracting Party to voluntarily make public the reports on their international peer review missions; – address operating experience, lessons learned and corrective actions taken in response to accidents and events having significance for the safety of nuclear installations; – address lessons learned from emergency drills and exercises;
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	<ul style="list-style-type: none"> – address actions taken to improve transparency and communication with the public; and – respond to any recommendations adopted at the plenary sessions of the previous Review Meeting of the Contracting Parties.
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Since it became a Member State of the IAEA, Morocco has progressively developed the use of ionizing radiation sources in different socio-economic sectors, such as health, agriculture, medicine, industry, energy, environment, water, research and education.

In parallel to this development, the Kingdom of Morocco has continuously upgraded its nuclear legislative and regulatory framework in compliance with the international obligations and standards governing nuclear energy utilizations.

In this framework, the Kingdom of Morocco signed and ratified all the international conventions and instruments related to safety, security and safeguards regulating a global regime (see Art 7 (1b)).

The development of the application of nuclear technologies in different social and economic fields, including the operation of MNRC since 2009, gave rise to awareness with regard to nuclear safety and security, training and education, knowledge management, expertise and national, regional and international cooperation.

The launching, in 2003, of the Maamora Nuclear Research Centre ‘MNRC’ (25 km north of Rabat) and the operation of the TRIGA MARK II research reactor since 2009 gave rise to new considerations in terms of nuclear safety and security, development of new applications, training and education, knowledge management, expertise and national, regional and international cooperation.

The Kingdom of Morocco does not have any “nuclear installation” as defined by the Convention on Nuclear Safety CNS; however, the Government conducted in 2015 the IAEA INIR mission ‘Integrated Nuclear Infrastructure Review’ and set up an action plan to implement its recommendations to make an informed decision with regard to introduction of a NPP.

To be fully in compliance with its international obligations, Morocco promulgated in 2014 a new and comprehensive law addressing safety, security and safeguards and creating the Moroccan Agency for Nuclear and Radiological Safety and Security ‘AMSSNuR’.

In this context, in 2016, AMSSNuR was established as an independent regulatory body to conduct all core regulatory functions (authorization, review and assessment, inspection and enforcement, communication with stakeholders, development of regulations, etc.) as well as a government support for public information and international cooperation.

On this basis, Morocco prepared this national report with the purpose of communicating on the progress made in safety of nuclear applications aspects and of sharing its experience in developing nuclear techniques in a safe, secure and sustainable manner. Morocco is planning to host an IAEA Integrated Regulatory Review Service (IRRS) mission in 2021.

Being involved in regional and international cooperation, Morocco has developed a strong collaboration network at multilateral and bilateral levels, mainly with the IAEA, the African Regional Cooperative Agreement for Research, Development and Training related to Nuclear Science and Technology ‘AFRA’, the Global Nuclear Safety and Security Network ‘GNSSN’, the Regulatory Cooperation Forum ‘RCF’, the Forum of Nuclear Regulatory Bodies in Africa ‘FNRBA’, the Arab Network of Nuclear Regulators ‘ANNuR’ and several operators and regulators in partner countries.

Article 6: Existing Nuclear Installations

CSN	<p>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 reasonably practicable improvements are made as a matter of urgency to upgrade the safety of the nuclear installation. If such upgrading cannot be achieved, plans should be implemented to shut down the nuclear installation as soon as practically 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.</p>
INFCIRC/572	<p>Article 6 of the Convention is an initial obligation for new Contracting Parties. Appropriate reporting on all related measures implemented and decisions taken in the light of this article and in accordance with the provisions in Article 6 of the Convention is mandatory in the first National Report, including:</p> <ul style="list-style-type: none"> – a list of existing nuclear installations as defined in Article 2 of the Convention (provided in an annex, if it is a long list); – an overview of safety assessments performed in the light of Article 6 of the Convention and their major results, and identification of existing nuclear installations at which significant safety upgrading has been found to be necessary as relevant under Articles 10-19 of the Convention, or at which such upgrading cannot be achieved; – an overview of programmes and measures for the safety upgrading of those nuclear installations which will be upgraded; and identification of installations for which decisions on shutdown have been made; – a statement on the position of the Contracting Party concerning the status of each nuclear installation in the list (e.g. decisions taken or planned for shutting it down, justification for continuing to operate it or to restarting it), explaining how safety and other aspects were taken into account in reaching this position. <p>For subsequent reporting, a practice has been developed by Contracting Parties to regard Article 6 of the Convention as a continuous obligation to regularly assess and, when necessary, to improve the safety of existing installations and at the time of reporting to justify and report on related decisions taken in accordance with the provisions in Article 6 of the Convention. Typically, subsequent National Reports include:</p> <ul style="list-style-type: none"> – an updated list of existing nuclear installations as defined in Article 2 of the Convention (provided in an annex, if it is a long list); – an overview of significant safety related issues, including events that occurred in the nuclear installations over the last three years, and measures taken in response to these issues; – an overview of planned programmes and measures for the continued safety upgrading, where appropriate, of each type or generation of nuclear installation (modifications already implemented could be reported under Article 18 of the Convention); – identification of installations for which decisions on shutdown have been made; – a statement on the position of the Contracting Party concerning the continued operation of the nuclear installations, including those that do not comply with the obligations as stated in Articles 10-19 of the Convention, explaining how safety and other aspects were taken into account in reaching this position.

The Kingdom of Morocco does not have any “nuclear installation” as defined in the Convention on Nuclear Safety. Reporting on certain articles of the Convention on Nuclear Safety with regard to the TRIGA Mark II Research Reactor is done on a voluntary basis

The above-mentioned research reactor is a pool type reactor with a 2 MW thermal power, operated by CNESTEN since 2009. This reactor is implemented at the Maamora Nuclear Research Centre (MNRC). Designed and built by General Atomics (GA/USA), the main functions of the reactor are dealing with neutron activation analysis, production of radioisotopes, research and training.

The Licensing process of the MNRC, including the TRIGA Mark II Research Reactor had been conducted in compliance with the national regulation, based mainly on the Decree N° 2-94-666 on the licensing and control of nuclear facilities. The Safety Analysis Report had been prepared and updated during the various stages of the authorization process starting by construction, discharge of gaseous and liquid effluents, commissioning and operation. The regulatory assessment of the license application had been previously performed, at the different above-mentioned stages, by the Ministry in charge of Energy, which was the regulatory body at that time, with the support of the National Commission of Nuclear Safety, an advisory committee of the Ministry of Energy and Mines on nuclear matters.

Presently, CNESTEN prepares, on a regular basis, annual reports with regard to the safety of facilities implemented at the MNRC, including the TRIGA Mark II research reactor. These reports are submitted to the Ministry in charge of Energy and Mines as well as to the AMSSNuR.

Until now, no significant event involving safety occurred at the CENM facilities, including the TRIGA Mark II research reactor.

In addition, CNESTEN had organized several peer reviews in the framework of its cooperation with international partners (mainly IAEA, IRSN (France), USA (DOE)) to review the safety and security of its research reactor. One of these peer review missions was INSARR, conducted by the IAEA in June 2006.

In terms of regulatory supervisions, AMSSNuR, performed, since 2017, a safety inspection program established in cooperation with the IAEA.

In this framework, three regulatory inspections of the TRIGA MARK II research reactor were conducted:

1. The first one in April 2018: it covered operational limits and conditions as well as radiation protection areas;
2. The second one, in April 2019: it focused on maintenance and periodic testing, radioactive waste management areas and the follow up on the first inspection recommendations;
3. The third one, in November 2019: it covered the internal emergency plan and the follow up on the previous inspection recommendations.

Article 7: Legislative and Regulatory Framework

<p style="text-align: center;">CSN</p>	<p>1. Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of nuclear installations.</p> <p>2. The legislative and regulatory framework shall provide for:</p> <ul style="list-style-type: none"> 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 a nuclear installation 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.
<p style="text-align: center;">INFCIRC/572</p>	<p>Article 7 (1) Establishing and maintaining a legislative and regulatory framework</p> <ul style="list-style-type: none"> – Overview of the primary legislative framework for nuclear safety, including interfacing national legislation; – Ratification of international conventions and legal instruments related to nuclear safety. <p>Article 7 (2) (i) National safety requirements and regulations</p> <ul style="list-style-type: none"> – Overview of the secondary legislation for nuclear safety (ordinances, decrees, etc); – Overview of regulations and guides issued by the regulatory body; – Overview of the process of establishing and revising regulatory requirements, including the involvement of interested parties. <p>Article 7 (2) (ii) System of licensing</p> <ul style="list-style-type: none"> – Overview of the licensing system and processes including types of licensed activity and, where appropriate, the procedure for relicensing; – Involvement of the public and interested parties within the Contracting Party; – Legal provisions to prevent the operation of a nuclear installation without a valid license. <p>Article 7 (2) (iii) System of regulatory inspection and assessment</p> <ul style="list-style-type: none"> – Regulatory strategies; – Overview of the regulatory inspection and assessment process with regard to the safety of nuclear installations; – Basic features of inspection programmes. <p>Article 7 (2) (iv) Enforcement of applicable regulations and terms of licenses</p> <ul style="list-style-type: none"> – Power for legal actions; – Overview of enforcement measures available to the regulatory body; – Experience with legal actions and enforcement measures.

Art 7 (1a): Overview of the primary legislative framework

Law 142-12 on “Nuclear and Radiological Safety and Security and the creation of AMSSNuR”

The Law 142-12 defines the processes of authorization, notification, control and inspection of all activities using ionizing radiation sources and provides enforcement provisions and penalties in case of violation of its provisions. It also addresses the aspects related to the transport of radioactive materials, radioactive waste management, public information, deliverance of ‘Agreement’ to service providers in safety and security, setting up of a national emergency plan for nuclear or radiological emergencies, the national physical protection system, and the national system for accounting and control of nuclear materials.

Additionally, law 142-12 established AMSSNuR as an independent regulatory body in charge of nuclear and radiation safety and nuclear security.

Decree n°2-97-30 on radiation protection

The Decree n° 2-97-30 of 28 October 1997 sets the general principles of protection against hazards resulting from the use of ionizing radiation. It provides the following radiation protection principles:

1. The principle of justification requires that no practice implying an exposure to ionizing radiations can be authorized if its application does not produce a net positive advantage;
2. The principle of optimization implies that the irradiation of people and the number of people exposed to ionizing radiations must be kept to a minimum.

In all cases, the received amounts of exposure must be lower than the limits set, as per chapter III of decree n° 2-97-30.

Thus, exposure of the public and workers to ionizing radiation must be kept as low as reasonably possible, as must be the number of individuals and workers exposed to ionizing radiations.

Decree 2-94-666 related to the authorization and inspection of nuclear facilities

Decree n° 2-94-666 of 7 December 1994 is applicable to nuclear installations. It describes the supporting documents required to obtain an authorization for:

1. Construction of nuclear installations;
2. Discharging of liquid and gas effluents to the environment;
3. Commissioning;
4. Operation;
5. Final shutdown and decommissioning.

The above decree states that the license holder remains the primary responsible for nuclear safety in its facility. In fact, the provisions related to the responsibilities of license holders are stated in this decree are covered by law 142-12.

Law No. 99-12 on the National Environment and Sustainable Development Charter

It has the objective to :

1. Strengthen the protection and preservation of natural resources and of the environment, biodiversity and cultural heritage, prevent and fight pollution and nuisances;
2. Integrate sustainable development into the sectorial public policies and adopt a national strategy of sustainable development;

3. Harmonize the national legal framework with international conventions and standards related to the protection of the environment and to sustainable development;
4. Strengthen mitigation and adaptation measures to climate change and for combating desertification;
5. Decide on institutional, economic, financial and cultural reforms in terms of environmental governance;
6. Define the commitments of the State, local authorities, public institutions and state-owned companies, private enterprises, associations of the civil society and citizens for protecting the environment and for sustainable development;
7. Establish an environmental liability regime and an environmental control system.

Law N° 12-03 on Environmental Impact Studies

1. Gives the objectives and contents of the Environmental Impact Study;
2. Creates a national committee and regional committees on Environmental Impact Studies “EIS” to examine the environmental impact and to express their position on the environmental acceptability of projects;
3. Foresees a mechanism to detect cases of non-compliance with the provisions of the present law and its regulatory texts for its implementation;
4. Approves any project submitted for an EIS which is subject to an environmental acceptability decision;
5. Grants the public the right to access the content of EISs, except for information deemed confidential.

Law 12-02 on civil liability on nuclear damage

Law 12-02 was promulgated in January 2005 to ensure civil repair of the damage which may result from certain peaceful nuclear energy uses; this is in accordance with the Vienna Convention pertaining to the civil liability regarding nuclear damage.

It designates the owner of the nuclear installation as the only entity responsible for any nuclear damage caused by any resulted nuclear or radiological accident within its facility. in this regard, the decree n° 2.06.04 of 1st February 2006 gives the government guarantee to CNESTEN.

Art 7 (1b): International Conventions and bilateral agreements

The Kingdom of Morocco has committed to the following legally binding instruments.

1. Convention on the Physical Protection of Nuclear Material (CPPNM) (entered into force on September 22, 2002);
2. Amendment to the Convention on the Physical Protection of Nuclear Material (entered into force on May 08, 2016);
3. Convention on Early Notification of a Nuclear Accident (entered into force on November 7, 1993);
4. Vienna Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (entered into force on October 7, 1993);
5. Convention on Nuclear Safety (signed on December 1st, 1994, ratified in May 2019 and entered into force in August 2019);
6. Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (entered into force on June 18, 2001);
7. Vienna Convention on Civil Liability for Nuclear Damage (signed on November 30, 1984);

8. Protocol to amend the Vienna Convention on Civil Liability for Nuclear Damage (entered into force on October 4, 2003);
9. Convention on Supplementary Compensation for Nuclear Damage (entered into force on April 15, 2015).
10. Treaty on the Non-Proliferation of Nuclear Weapons (entered in force on November 27, 1970)
11. Application of safeguards in the context of the Treaty on the Non-Proliferation of Nuclear Weapons (entered in force on November 30, 1993),
12. Additional Protocol entered in force on April 21, 2011.

In addition to that, Morocco has adhered to the Code of Conduct on the Safety of Research Reactors.

Art 7 (2) (i): National safety requirements and regulations

AMSSNuR has set, within its strategic plan 2017-2021, the objective to upgrade the national regulatory framework based on the consultations it had with all relevant stakeholders. As a result, so far, nine regulatory decrees were elaborated and submitted by AMSSNuR to the Head of Government for approval. These first regulations concern the following areas:

1. Licensing and Registration System of facilities and Ionizing Radiation Sources activities of Category II;
2. Licensing of category I facilities and activities (nuclear safety installation);
3. Population, Workers and Environment Protection against the risks of Ionizing Radiation;
4. Use of Ionizing Radiation for Medical, Forensic, Dental and Veterinary Purposes;
5. Radioactive Sources Security in use, storage and transportation;
6. Safeguards and the Additional Protocol Implementation;
7. Safety of Spent Fuel and Radioactive Waste Management;
8. Nuclear or Radiological Emergency Preparedness and Response;
9. Modalities and conditions for granting technical service approvals

Whenever required and appropriate, these regulations will be completed by guides, ordinances, procedures, technical prescriptions, etc....

Art 7 (2) (i) b: Guides issued by the regulatory body

With regard to nuclear installations of category I, AMSSNuR established the following guides:

1. Annual report on operational safety of research reactors;
2. Form and content of periodic safety review reports for research reactors;
3. Modification and experiments for research reactors;
4. Criteria and modalities regarding the notification and declaration of incidents and accidents related to research reactors.

Art 7 (2) (i) c: Overview of the process for establishing and revising regulatory requirements

As it was highlighted in Art 7 (2) (i), AMSSNuR has adopted a participatory approach to establish the national regulations of nuclear and radiological safety and security. For this purpose, a national committee for upgrading the regulatory framework “CCR” was created. It encompasses thirty-four governmental departments. Three working groups were derived from that committee. One of these working groups is entrusted with the establishment of nuclear safety and radioactive waste management regulations.

The process is depicted in short as follows:

1. Within AMSSNuR, the department concerned drafts a regulation, which is submitted for review to AMSSNuR technical departments to ensure that all relevant safety and security issues have been taken into account in compliance with other regulations and requirements. The modified draft is then discussed with the Working Group (WG) and reviewed by experts. After refining the draft, a new version is issued and is discussed later on within the CCR.
2. The final draft is submitted to the Government for approval. In fact, the general secretariat of the Government “SGG” submits this draft to all governmental departments and agencies concerned as well as to the CNEN to collect their questions, comments and suggestions, which will be answered and discussed with AMSSNuR. This SGG review process also includes the publication of this version on the website for consultation and comments by the public. The final version is then adopted and published by the SGG.

Art 7 (2) (ii): System of licensing

Current status

According to law 142-12, nuclear facilities and disposal activities are authorized by the administration on the basis of AMSSNuR’s review. The following activities are subject to the authorization by decree:

1. Construction of a nuclear facility;
2. Discharge of liquid or gaseous radioactive effluents from the facility;
3. Commissioning tests of the facility;
4. Operation of this facility;
5. Closure, dismantling and decommissioning of the facility.

As stated in article 12 of law 142-12, the applicant for an authorization shall include a safety analysis report of the facility including a report of the site selection and evaluation, an environmental impact study of the facility, an internal emergency plan and a physical protection plan, updated at the different stages of the authorization process.

Furthermore, as indicated above, in Art 7 (2) (i) b, the guide on the content and format of the safety analysis report will be adopted once the decree of Licensing facilities and activities (nuclear safety installation) of category I is published, which describes the licensing process of the above type of authorization.

In addition to that, beside law 12-03 and its associated regulations dealing with environmental protection, especially the requirements related to public hearing, law 142-12, through its articles 13, 14, 15 also emphasizes the issue of public hearing and considers it as a prerequisite for obtaining an authorization.

The following licenses was delivered by the Ministry in charge of Energy during different stages of the lifetime of the Maamora Nuclear Research Centre (MNRC):

1. Construction (1999),
2. Discharge of gaseous and liquid effluents (2005),
3. Commissioning (2006),
4. Operation (2009).

Since 2014, law 142-12 updated the licensing process which is carried out by the Administration on the basis of AMSSNuR’s evaluation.

Art 7 (2) (iii): System of regulatory inspection and assessment

Concerning the regulatory inspection and assessment of the TRIGA MARK II research reactor, AMSSNuR, according to law 142-12 and IAEA requirements, has established an inspection program specifying the frequency of inspections, roles and responsibilities, the legal power of inspectors, the resources allocated to inspections and areas to be covered by the inspections (Operational limits and conditions, Safety culture, Safety committee, Operating organization and reactor management, Training and qualifications, Conduct of operations, Maintenance, Periodic testing and ageing management, Facility Modifications, Utilization and experiments, Management System, Radiation protection, Radioactive waste management, Emergency plan, Extended shutdown, Decommissioning and Safety and Security interface).

Established with the support of the IAEA and the US-NRC, this inspection programme constitutes a long-term basis to ensure a high level of safety and security of this facility.

Furthermore, AMSSNuR has finalized the inspection programme and its associated guidance, reviewed by IAEA experts, and has conducted three inspections (from 2018 to 2019) which covered operational limits and conditions and radiation protection, maintenance and periodic testing, radioactive waste management and internal emergency plan areas.

This programme and its associated guidance will be added to the AMSSNuR's integrated management system which is under development within a European Union cooperation project.

Art 7 (2) (iv): Enforcement of applicable regulations and terms of the licenses

According to title II of law 142-12 on investigating and ascertaining infringements – sanctions and particularly in chapter II, two types of sanctions are defined: administrative and penal sanctions. These sanctions are applied in case of violation of legislative and regulatory requirements by the licensee.

Article 8: Regulatory Body:

– CSN	<p>1. Each Contracting Party shall establish or designate a regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 7, and provided with adequate authority, competence and financial and human resources to fulfil its assigned responsibilities.</p> <p>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.</p>
– INFCIRC/572	<ul style="list-style-type: none"> – Article 8 (1) Establishment of the regulatory body – Legal foundations and statute of the regulatory body; – Mandate, mission and tasks; – Authorities and responsibilities; – Organizational structure of the regulatory body; – Development and maintenance of human resources over the past three years; – Measures to develop and maintain competence; – Developments with respect to financial resources over the past three years; – Statement of adequacy of resources; – (Quality) management system of the regulatory body; – Openness and transparency of regulatory activities including actions taken to improve transparency and communication with the public; – External technical support, if appropriate; – Advisory committees, if appropriate. – Article 8 (2) Status of the regulatory body – Place of the regulatory body in the governmental structure; – Reporting obligations (to the parliament, government, specific ministries); – Means by which effective separation is ensured between the functions of the regulatory body and those of any other body or organization concerned with the promotion or utilization of nuclear energy and means by which independence of the regulatory body in making its safety-related decisions is assured.

Art 8 (1): Establishment of the regulatory body ‘AMSSNuR’**Mission:**

According to articles 170 and 171 of law 142-12, AMSSNuR is a public institution, with legal personality and financial autonomy placed under the umbrella of the Head of Government, committed to ensure compliance of the radiological and nuclear safety and security of all activities and facilities involving Ionizing Radiation Sources with Morocco’s regulatory framework and international commitments.

Governance:

The Agency is administered by a Board of Directors composed of representatives of the administration and personalities recognized for their scientific, technical and legal expertise in the field of nuclear and radiological safety and security identified by the authority, for a period of four years.

As specified in art. 176, the Board of Directors has all powers and approvals necessary for the administration of the Agency. For this purpose, it rules by deliberations general issues of interests to the Agency and shall:

1. Approve the annual actions programme of the Agency;
2. Approve the annual budget, multi-year statements and the arrangements for financing the programme of actions of the Agency and amortization regime;
3. Approve accounts and decide on the allocation of income if applicable;
4. Adopt the organizational chart of the Agency establishing organizational structures and their functions;
5. Adopt the staff regulations of the Agency which sets conditions of recruitment, remuneration and career management;
6. Adopt the regulation laying down the rules and the processes of procurement;
7. Adopt the conditions of issuance of loans and recourse to other forms of bank credits, such as advances or overdraft;
8. Set the prices of services provided by the Agency, if applicable;
9. Adopt the rules of procedure of the Agency;
10. Approve the report of the external auditor appointed by the Board of Directors for the control of the Agency's accounting
11. State on the annual report submitted by the Director.

Responsibilities and Core Functions:

As indicated by art. 172 of law 142-12, in addition to the core mission of the Agency of inspection, enforcement, authorization and assessment, AMSSNuR is responsible for:

- a. Proposing to the Government the legislation and regulations relating to nuclear and radiological safety and security;
- b. Giving its opinion on laws and draft regulations on the subject;
- c. Advising the governmental authorities on matters related to nuclear and radiological safety and security;
- d. Publishing guides of good practices to the attention of operators, as appropriate;
- e. Setting up a national system of accounting and control of nuclear materials;
- f. Assisting the administration in the setting up of a national system of physical protection of materials and nuclear facilities and its implementation;
- g. Setting up a national register of radioactive materials and sources of ionizing radiation;
- h. Assisting the administration in the setting up of the national plan of action referred to in article 118 of the present Act and its implementation;
- i. Establishing cooperative relationships with similar organizations in other countries as well as with international or regional organizations;
- j. Assisting the Government in international negotiations in its areas of competence and participate at the request of the Government, to the Moroccan representation at the level of international bodies concerned;
- k. Taking necessary arrangements for informing the public on regulatory processes and the aspects related to the safety and security of authorized activities;
 - l. Encouraging the establishment of a safety and security culture in facilities and authorized activities in accordance with the provisions of this Act;
- m. Maintaining a list of filed authorizations and statements pursuant to the provisions of this Act;
- n. Ensuring the dissemination of information to the relevant administrations within its scope of competence, as appropriate;

- o. Acting in concert with national organizations with expertise in direct or indirect connection with its activities;
- p. Ensuring a permanent watch on radiological and nuclear safety and security, safeguards and non-proliferation, as well as in scientific, health and medical matters regarding the effects of ionizing radiation on health, considering progress at the international level.

Vision

In accordance with the national context and international best practices, AMSSNuR has established a clear Vision, a Strategic Plan and a Roadmap for 2017-2021 in order to be Independent, Efficient, Credible and Transparent.

Strategic Plan 2017-2021

Considering its vision and national and international challenges, AMSSNuR identified the following strategic objectives:

1. Develop and upgrade the existing regulatory framework in compliance with law 142-12 provisions, international treaties, and international safety, security and nuclear safeguards' standards and guidance;
2. Strengthen the level of Nuclear and Radiological Safety and Security of the activities and facilities involving Ionizing Radiation Sources;
3. Implement, in collaboration with the relevant national departments and organizations, the National Nuclear Security System and the National Emergency Plan in case of radiological emergency;
4. Establish a transparent and reliable communication policy;
5. Develop and maintain the human and organizational capabilities necessary to implement AMSSNuR's Strategic Objectives;
6. Conduct a proactive regional and international monitoring of the progress made in the fields of nuclear and radiological safety and security and promote regional and international cooperation.

Organizational Chart:

To ensure its missions and attributions, AMSSNuR has set an organizational chart based on its core functions, governance and support processes (Appendix n°1).

This organization includes 42 responsibility positions (heads of departments and two lower positions for sections and operational units). 54 % of the responsibility positions have been established by the end of September 2019 and the objective is to establish all positions by 2020. Among all the responsibility positions, 46 % are occupied by women.

Art 8 (1i): Quality management system

AMSSNuR has established a strategy to develop and implement its specific integrated management system based on IAEA requirements (GSR part 2 and SSG 12) (see article 13).

Art 8 (1j): Transparency and information of the public

According to articles 121 and 172 of law 142-12, AMSSNuR is committed to adopt a transparent communication policy with the public, and the various national and international partners (public institutions, operators, media, professional associations, civil society, etc.).

In this regard, AMSSNuR has established an information and communication strategy covering all targets and providing the public and all stakeholders with information regarding nuclear safety and

security of nuclear and radiological facilities and activities. On this basis and according to law 142-12, AMSSNuR has prepared and published its first annual report (2017).

In the framework of its public information strategy, AMSSNuR organized several meetings in the main cities of the country such as Rabat, Casablanca, Marrakech, Tangier, Oujda and Laayoune. The objective of this action is to cover the twelve regions by 2020.

AMSSNuR publishes each year its annual reports addressed to the public and all stakeholders.

Since its creation in 2016, AMSSNuR has established its website: www.amssnur.org.ma, through which all relevant information related to its regulatory activities are published. The number of visitors per month has reached 3700.

At the national level, to enhance its transparency and governance, Morocco has adopted a new law 33-12 regarding the right of access to information. This law stipulates the principles of transparency, accountability and improved civic participation in decision- and policy-making.

Art 8 (1k): External technical support

According to law 142-12, AMSSNuR is developing its capacity building by recruiting and qualifying its human resources. According to art 172 of law 142-12, AMSSNuR could seek external consultants and national or foreign consultants for specific tasks.

AMSSNuR signed Memorandums of Understanding (MoUs) with a number of regulatory bodies worldwide in order to benefit from the exchange of information and experience. These MoUs are useful for AMSSNuR as a mean to obtain specific expertise for safety purposes and share lessons learned and best practices.

AMSSNuR submitted a decree on the modalities and conditions for granting technical service approvals to the Head of Government for approval (see article 7 (2) (i)).

Art 8 (2): Status of the regulatory body

Under the provisions of law 142-12, the government established, in 2016, AMSSNuR as a unique, independent, credible, and transparent nuclear safety and security regulatory body.

AMSSNuR reports directly to the Head of Government and is not related to any department overseeing the promotion of nuclear applications.

According to article 174 of law 142-12, the Agency ensures regulatory functions and does not carry out any activity dedicated to promoting nuclear energy or using ionizing radiation sources.

Article 9: Responsibility of the License Holder

CSN	Each Contracting Party shall ensure that prime responsibility for the safety of a nuclear installation rests with the holder of the relevant license and shall take the appropriate steps to ensure that each such license holder meets its responsibility.
INFCIRC/572	<ul style="list-style-type: none"> – Formulation in the legislation (quotation) assigning the prime responsibility for safety to the license holder; – Description of the main means by which the license holder discharges the prime responsibility for safety; – Description of the mechanism by which the regulatory body ensures that the license holder discharges its prime responsibility for safety; – Description of the mechanisms whereby the license holder maintains open and transparent communication with the public; – Description of the mechanism by which the Contracting Party ensures that the license holder of the nuclear installation has appropriate resources (technical, human, financial) and powers for the effective on-site management of an accident and mitigation of its consequences.

The law 142-12 clearly stipulates that the license holder is solely responsible for the safety of its installation, and its article 23 reads as follows “The operator is responsible for the safety and for the physical protection of the facilities and nuclear material under its responsibility. It is required to implement measures of physical protection of the facility and of the nuclear materials under its responsibility, in accordance with the requirements established by the regulatory body”.

With this regard, CNESTEN has established appropriate organization, policy and programmes to ensure the entire responsibility for safety and physical protection of facilities implemented at the MNRC. Annual reports on safety of the research reactor and its impact on the environment are submitted to AMSSNuR who ensure regulatory control.

Following the internal independent assessment on the safety of its TRIGA research reactor, CNESTEN has set up its “Reactor Safety and Security Committee” which is an advisory committee to the Director General. This committee provides independent advice on the safety of the research reactor and proposes any measure aiming at improving the safety level of the facility.

Article 10: Priority to Safety

CSN	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.
INFCIRC/572	<ul style="list-style-type: none"> – Overview of the Contracting Party’s arrangements and regulatory requirements regarding policies and programmes to be used by the license holder to prioritize safety in activities for design, construction and operation of nuclear installations, including: <ul style="list-style-type: none"> ▪ safety policies, ▪ safety culture programmes and development, ▪ arrangements for safety management, ▪ arrangements for safety monitoring and self-assessment, ▪ independent safety assessments, ▪ discussion on measures to improve safety culture, ▪ a process oriented (quality) management system. – Measures taken by license holders to implement arrangements for the priority of safety, such as those above and any other voluntary activities, examples of Good Practices and safety culture achievements; – Regulatory processes for monitoring and overseeing arrangements used by the license holders to prioritize safety; – Means used by the regulatory body to prioritize safety in its own activities.

According to law 142-12 and to international nuclear safety standards, AMSSNuR is developing a national policy and strategy for nuclear and radiological safety and security as part of its long-term commitment to safety, considering leadership aspects and management for safety, including safety culture.

In this framework, AMSSNuR established its integrated management system “IMS” and its associated processes and procedures which give high priority to safety and security. In fact, all the processes identified are intended to enable AMSSNuR to fulfill its primary mission of protecting workers, society, public and the environment from the harmful effects of ionizing radiation and thus ensure a high level of safety and security in all relevant installations and activities.

In this context, AMSSNuR continued its efforts to develop a nuclear and radiological safety and security culture through training, awareness and communication programmes with operators, stakeholders and through regional and international cooperation. In order to implement the inspection programme of the research reactor, AMSSNuR developed an inspection guide on safety culture which will be a support document for the future inspection activities.

On the operational side of the Research Reactor and in order to meet the requirements of national regulations and international obligations, taking into consideration international safety and security guidance, CNESTEN has established and implemented a policy based on the following cornerstones:

- Set-up of an organization with a clear definition of roles and responsibilities;
- Establishment of Internal Safety and Security Rules;
- Development of appropriate arrangements with regard to radiation protection, nuclear safety, environmental protection, industrial safety, occupational medicine, preparedness for radiological or nuclear emergencies, physical protection and safeguards;
- Additional provisions based on safety culture, prevention, training, audits, exercises, monitoring, response and improvement based on received feedback.

Article 11: Financial and Human Resources

CSN	<p>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.</p> <p>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.</p>
INFCIRC/572	<p>Article 11 (1) Financial resources</p> <ul style="list-style-type: none"> – Mechanism for the provision of financial resources to the licence holder or applicant in order to ensure the safety of the nuclear installation throughout its lifetime; including <ul style="list-style-type: none"> ▪ principles for the financing of safety improvements to the nuclear installation over its operational lifetime, ▪ principles for financial provisions during the period of commercial operation for decommissioning and management of spent fuel and radioactive waste from nuclear installations; – Statement with regard to the adequacy of financial provisions; – Contracting Party's processes to assess the financial provisions; – Description of the Contracting Party's arrangements for ensuring that the necessary financial resources are available in the event of a radiological emergency. <p>Article 11 (2) Human resources</p> <ul style="list-style-type: none"> – Overview of the Contracting Party's arrangements and regulatory requirements concerning staffing, qualification, training and retraining of staff for nuclear installations; – Methods used for the analysis of competence requirements and training needs for all safety related activities in nuclear installations; – Arrangements for initial training and retraining of operations staff, including simulator training; – Capabilities of plant simulators used for training with regard to fidelity to the plant and scope of simulation; – Arrangements for training of maintenance and technical support staff; – Improvements to training programmes as a result of new insights from safety analyses, operational experience, development of training methods and practices, etc.; – Methods used to assess the sufficiency of staff at nuclear installations; – Policy or principles governing the use of contracted personnel to support or supplement the licensee's own staff; – Methods used to assess the qualification and training of contractor's personnel; – Description of the national supply of, and demand for, experts in nuclear science and technology; – Methods used for the analysis of competence, availability and sufficiency of additional staff required for severe accident management, including contracted personnel or personnel from other nuclear installations; – Regulatory review and control activities.

According to article 31 of law 142-12, adequate financial resources and a sufficient number of qualified staff must be available for activities related to the safety of a nuclear facility throughout its lifetime. These activities must cover the design, construction, operation, final shutdown and decommissioning of the nuclear facility.

In order to comply with international obligations and with provisions of law 142-12, the national policy and strategy for nuclear safety stipulates considerations on the needs and provisions for human and financial resources to ensure an effective nuclear safety regime.

As part of its global strategy, AMSSNuR is according a high priority to develop and maintain its human resources and plans to implement the following organizational measures forthwith:

- Adopt an integrated human resources management policy aiming at the development of competences. In this framework, AMSSNuR adopted the IAEA tools such as SARCoN and the Systematic Approach for Training;
- Provide AMSSNuR with the necessary tools for an effective management of its human resources, particularly an Integrated Management System;
- Develop a qualification and training programme;
- Develop and implement a nuclear safety and security culture;
- Elaborate and implement a national strategy for education and training in nuclear safety and security.

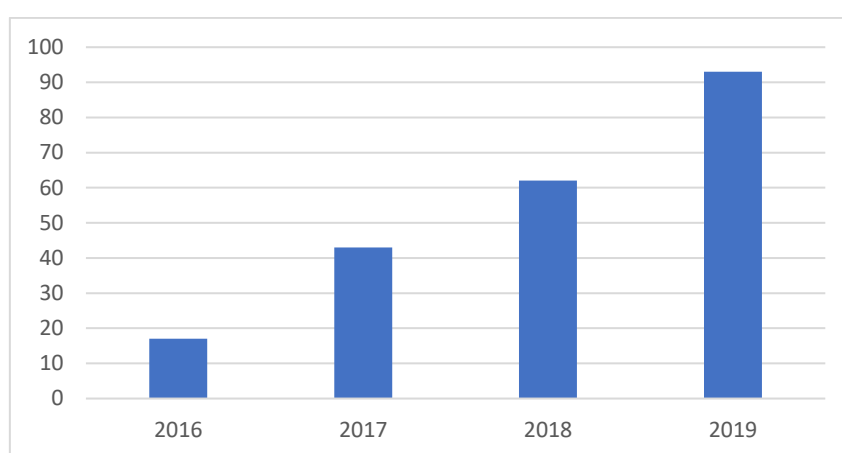


Figure n° 1: AMSSNuR Human Resource Development Programme

Within the framework of human resources development, AMSSNuR is implementing a master plan for its staff and a national strategy for education and training in nuclear and radiological safety and security.

To manage effectively regulatory body competences, AMSSNuR is using the Systematic Assessment of Regulatory Competence Needs (SARCoN) tool in order to determine its required regulatory competences. Furthermore, the implementation of this tool will contribute to the definition of competency needs and assist managers in planning and implementing the necessary training to meet expected future competency needs, when internally sourced.

At the national level, AMSSNuR took the initiative to launch the development of the national training strategy on nuclear and radiological safety and security in order to develop sufficient human resources in nuclear and radiological safety and security with a view to meeting the future needs resulting from the development of the use of ionizing radiation in the socio-economic sectors and the implementation of decrees and regulations on nuclear and radiological safety and security that establish the required level of qualification and training. The development of such a strategy is based on the high guidance of the King of Morocco on vocational training and skills development in all socio-economic fields and is inspired by the national and international experience as well as IAEA best practices on training strategies.

As a result, AMSSNuR has identified more than 13 000 individuals who must be trained in the five coming years in safety and security areas.

Financial resources

According to art. 181 of law 142-12, AMSSNuR's budget comprises:

1- Revenues (products and income) from its movable or immovable assets as follows;

- a. The product of remuneration for services rendered, including the costs of examining authorization requests, declarations and applications for approval;
- b. The proceeds of parafiscal charges assigned to its benefit;
- c. Refundable advances from the Treasury, government or private entities and loans, authorized in accordance with the regulations in force;
- d. Subsidies of the State or of other public or private law entities, donations, gifts and bequests that are not likely to jeopardize the independence of the Agency;
- e. All other revenues related to its business.

2- Expenses:

- a. Operating and investment expenses;
- b. Repayment of advances and loans;
- c. Any other expense in connection with its activities.

Adequacy of resources

AMSSNuR has the necessary funding for its management as an independent regulatory body.

For safe operation of the research reactor, special attention is paid to ensure the availability of adequate financial resources for activities in relation to safety.

Article 12: Human Factors

<ul style="list-style-type: none"> - CSN 	<ul style="list-style-type: none"> - 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.
<ul style="list-style-type: none"> - INFCIRC/572 	<ul style="list-style-type: none"> - Overview of the Contracting Party's arrangements and regulatory requirements to take human factors and organizational issues into account for the safety of nuclear installations; - Consideration of human factors in the design of nuclear installations and subsequent modifications (see also Article 18 (3) of the Convention); - Methods and programmes of the license holder for analyzing, preventing, detecting and correcting human errors in the operation and maintenance of nuclear installations; - Self-assessment of managerial and organizational issues by the operator; - Arrangements for the feedback of experience in relation to human factors and organizational issues; - Regulatory review and control activities.

In accordance with IAEA guidelines 'SARIS Self-Assessment of Regulatory Infrastructure Service', AMSSNuR conducted a self-assessment to evaluate the compliance of the national regulatory system and infrastructure to international commitments and standards and to continually improve its performance and efficiency. The self-assessment covered both organizational aspects and human resources and factor issues.

This self-assessment exercise led to the development and implementation of an action plan for the continuous improvement of national nuclear and radiological safety and security capabilities. It also was instrumental in setting guidelines for AMSSNuR's action plan for the period 2020/2021 and in initiating the preparation of a new strategic plan 2022/2026.

Regulatory review and control activities

In order to implement the inspection programme of the research reactor, AMSSNuR developed an inspection guide on training and qualification of operating staff.

On the operational side of the Research Reactor, CNESTEN has taken human factor into account since its design. Since the commissioning of this facility, CNESTEN established, in compliance with the national legislation and regulations and on the basis of international standards, an efficient training and qualification programme aiming at ensuring that the research reactor is operated by trained and qualified personnel who has a deep knowledge of the technical measures and administrative requirements for safety.

As part of the programme on facing the insider threat and in cooperation with US/DOE, CNESTEN has implemented a Human Reliability Programme (HFP) within MNRC facilities. The main objective of this programme is to ensure a high level of safety and security of the MNRC facilities and to maintain the knowledge developed during the past few years, by giving priority to recruitment of new staff and to overlap between this staff and seasoned senior management

Article 13: Quality Assurance

CSN	Each Contracting Party shall take the appropriate steps to ensure that quality assurance programmes 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.
INFCIRC/572	<ul style="list-style-type: none"> – Overview of the Contracting Party’s arrangements and regulatory requirements for quality assurance programmes, quality management systems, or management systems of the license holders; – Status with regard to the implementation of integrated management systems at nuclear installations; – Main elements of a typical quality assurance, quality management or management system programme covering all aspects of safety throughout the lifetime of the nuclear installation, including delivery of safety related work by contractors; – Audit programmes of the license holders; – Audits of vendors and suppliers by the license holders; – Regulatory review and control activities.

1- IMS vision and objectives

Based on IAEA GSR part 2 document, AMSSNuR has established a strategy to develop and implement its specific integrated management system aiming at anchoring the safety and security culture and consequently at maintaining a high level of safety and security at the national level and at reaching its strategic and organizational objectives.

AMSSNuR gives a high importance to establish, with the assistance of IAEA and EU, a strategy to design, develop, implement and improve its IMS.

The objectives of this strategy are to:

1. Identify gaps in the AMSSNuR management system;
2. Bring together all the necessary elements in a coherent manner to safely manage AMSSNuR activities;
3. Identify required resources and define responsibilities;
4. Develop an implementation plan describing planned and systematic actions in order to have an effective integrated management system for AMSSNuR.

The AMSSNuR vision is to work proactively and effectively in order to achieve all the safety and security goals and to satisfy the needs of internal and external stakeholders as well as interested parties through simple and flexible processes and systems which lead to continuous improvement of safety and security..

2- IMS Benefits

According to law 142-12, national governance guidance and international best practices in nuclear safety, security and safeguards, the benefits of implementing an IMS at AMSSNuR are multiple. The IMS aims at:

a) Improving performance

IMS will have a positive impact on AMSSNuR specific management system components and outcomes such as continuous improvements in safety, security, safeguards, quality, health and the protection of the environment against ionizing radiations.

b) Optimizing processes and resources

The IMS will allow AMSSNuR to:

- Optimize its resources and consequently increase its performance by using process and procedures based on regulatory functions and stakeholders' expectations;
- Establish objectives, processes, and resources in line with safety, security, safeguards, quality, health and the protection of the environment systems;
- Create better consistency between human, material and organizational resources.

c) Developing a systematic and graded approach

The IMS will allow AMSSNuR to:

- Establish a comprehensive view of the functional needs and performance,
- Integrate policies, objectives, processes and resources,
- Be better equipped to accommodate changes, improve communication and facilitate decision making,
- Reduce costs.

3- IMS Strategy

As part of its commitments, AMSSNuR launched, since 2016, several programmes and action plans, especially to establish an integrated and consistent management system to ensure the protection of people and the environment, both now and in the future, based on the objective and principles of safety fundamentals, including human performance, quality and security considerations.

3- a- Management Policy

Based on its mission, vision and values, the AMSSNuR Management policy (including Quality policy) is published in the Integrated Management System Manual. This policy aims at understanding the needs, expectations and demands of AMSSNuR's stakeholders and of the wider society.

AMSSNuR management establishes and maintains a high level of commitment to safety, security and safeguards by:

1. Setting up the "AMSSNuR Management Policy";
2. Developing the strategic objectives and action plans and emphasizing the importance of nuclear safety, security, safeguards and quality;
3. Ensuring that employees are aware of their competences and that they understand "AMSSNuR Management Policy and values" based on:
 - a. Human Resource development;

- b. Process management;
- c. Measurement, assessment and improvement;
- d. Safety Culture / Leadership for safety.

AMSSNuR management is aware that it is ultimately responsible for the establishment, implementation, assessment and continuous improvement of the management system.

AMSSNuR implements the management policy by constantly improving procedures, recognizing creativity as well as motivating its staff and promoting a positive attitude. With their work, employees fulfil management system requirements. AMSSNuR employees are aware that ensuring safety and security is an overriding requirement in the implementation of all activities.

The AMSSNuR management system takes into account all relevant regulations and legislations as well as the requirements of ISO 9001: 2015 standard « *Quality Management System - Requirements* » and the safety requirements of the International Atomic Energy Agency standard GS-R-3 « *The Management System for Facilities and Activities* ».

3- b- IMS Steering Committee and AMSSNuR's IMS status

The Director General, who is aware of the importance of the IMS, designated, since 2018, a steering committee headed by himself and consisting of:

1. The Secretary General of AMSSNuR;
2. The Risk Audit Project Manager;
3. The Head of the Administrative and Financial Department;
4. The Head of the Radiation Safety & Environmental Protection Department;
5. The Head of the Nuclear Security and Safeguards Department;
6. The Head of the Nuclear Safety and Radioactive Waste Department.

The steering committee established thematic working groups for specific areas concerning AMSSNuR macro-processes, processes and associated sub-processes. The main results, achieved in 2019, are presented in the manual of the IMS (French version) and the description of the core processes which were drafted internally by the working groups and reviewed in April 2019 by IAEA experts.

4- The improvement and management review

4- a. Continuous Improvement

AMSSNuR continually strives to increase the effectiveness of its IMS through its implementation translated by:

- The definition of the nuclear safety and security policy of the Agency;
- The setting of the objectives of the nuclear safety and security policy;
- Data collection and measurement;
- The development of corrective actions;
- The Management Review.

4- b. Management Review

The Director General conducts a Management Review to ensure that IMS remains relevant, adequate and effective.

The review should look for opportunities for improvement and assess the need to modify the IMS, including the nuclear safety and security policy and its objectives.

5- IMS Management Responsibility

- Director General

The Director General of AMSSNuR has demonstrated his commitment to the development and continuous improvement of the IMS by integrating it in the project of cooperation with the European Union spread over the period 2017-2021 and also by setting up a Steering Committee responsible for its development and implementation.

The Director General assumes responsibility and authority over the IMS and ensures that it is reviewed for adequacy and effectiveness and, if necessary, for taking actions to correct and improve it. The Director General is responsible for the provision of resources for the establishment of the IMS in terms of human resources, organizational resources and software.

- IMS Officer

Under the supervision of the Director General of AMSSNuR, the IMS Officer, with a transversal role, is called upon to collaborate with all entities, in order to ensure their adhesion and active contribution to the definition of the system and to put it in place in accordance with IAEA recommendations on this matter and the cooperation project with the European Union.

- Process Managers

In order to guarantee a better functioning of the IMS, the Director General will designate, in accordance with the ISO 9001: 2015 standard, process managers or owners, whose main tasks will be the following:

1. Develop and document the process;
2. Monitor and report on process performance;
3. Decide on actions to correct any dysfunction or improve the process.

- Managers and Staff

The implementation, monitoring and continuous improvement of the IMS concern all AMSSNuR's staff members, especially the heads of departments, divisions and services. They must :

1. Establish and monitor the implementation of objectives, strategies and plans in accordance with AMSSNuR policies;
2. Conduct regular assessments of the organization's compliance with objectives and ensure that steps are taken to correct any discrepancy;
3. Ensure that the roles and responsibilities of the IMS are clearly defined within their respective teams.

At the license holder level, CNESTEN had set up its management system for the operation of facilities at the MNRC. With regard to the research reactor, this management system involves the definition of

the roles and responsibilities of the main three safety and security actors: Safety and Security Directorate (DSS), Nuclear facilities Directorate (DIN) and Reactor Safety and Security Committee.

Under the authority of the Director General, the Safety and Security Directorate (DSS) is carrying out activities in terms of advice, training, prevention, surveillance, control, technical support and response in different areas related to safety and security. In order to ensure the conduct of such activities in an appropriate manner, the DSS has a trained staff member as well as a platform of laboratories and equipment used mainly for dosimetry, calibration and radioactivity measurement.

As part of safety and security actors within CNESTEN's organization, the research reactor is operated under the responsibility of the Reactor Manager, who is the head of the Nuclear Facilities Directorate (DIN).

To ensure an internal independent assessment of the safety of its TRIGA research reactor, CNESTEN set up its "Reactor Safety and Security Committee" which is an advisory committee to the Director General. This committee provides independent advice on the safety of the research reactor and proposes any measure aiming at improving the safety level of the facility.

A specific quality assurance programme has been established for the research reactor and was examined during the AMSSNuR regulatory inspection.

Article 14: Assessment and Verification of Safety

CSN	<p>Each Contracting Party shall take the appropriate steps to ensure that:</p> <p>i) comprehensive and systematic safety assessments are carried out before the construction and commissioning of a nuclear installation and throughout its life. Such assessments shall be well documented, subsequently updated in the light of operating experience and significant new safety information, and reviewed under the authority of the regulatory body;</p> <p>ii) verification by analysis, surveillance, testing and inspection is carried out to ensure 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.</p>
INFCIRC/572	<p>Article 14 (1) Assessment of safety</p> <ul style="list-style-type: none"> – Overview of the Contracting Party’s arrangements and regulatory requirements to perform comprehensive and systematic safety assessments; – Safety assessments within the licensing process and safety analysis reports for different stages in the lifetime of nuclear installations (e.g. siting, design, construction, operation); – Re-evaluations of hazard assumptions (e.g. according to international best practice, using deterministic and probabilistic methods of analysis); – Overview of periodic safety assessments of nuclear installations during operation, including references to appropriate standards and practices and illustrations on how new evidence is taken into account (e.g. in the light of operating experience, and of other significant new safety information); – Overview of safety assessments performed and the main results of those assessments for existing nuclear installations including the summary of significant results for individual nuclear installations and not only according to their type and generation; – Regulatory review and control activities. <p>Article 14 (2) Verification of safety</p> <p>Overview of the Contracting Party’s arrangements and regulatory requirements for the verification of safety;</p> <ul style="list-style-type: none"> – Main elements of programmes for continued verification of safety (in-service inspection, surveillance, functional testing of systems, etc.); – Elements of ageing management programme(s); – Arrangements for internal review by the license holder of safety cases to be submitted to the regulatory body; – Regulatory review and control activities.

Article 14 (1) Assessment of safety

According to article 23 of law 142-12, the operator is responsible for the safety and for the physical protection of the facilities and nuclear material under its responsibility.

In addition, article 24 of law 142-12 stipulates that the operator must proceed, at regular intervals defined in the authorization, to a periodic safety review of the facility by taking into account international good practices. The operator submits a report to AMSSNuR with the conclusions of this review and, if applicable, the measures to remedy the effects raised or to improve safety of the facility. AMSSNuR may, after analyzing the report, impose new technical requirements.

In order to perform the content of these requirements, AMSSNuR has established a draft regulation on nuclear safety installation by which the operator shall perform the Periodic Safety Review (PSR) every 10 years. An ordinance will be established to define the content and the format of the PSR report.

As it is mentioned in article 12 of law 142-12, the authorization application, whose contents is defined by the regulation, must include a safety analysis report of the facility, including a report on the site selection and evaluation and an evaluation of the environmental impact of the facility, as well as an internal emergency plan and physical protection plan, updated at the different phases of the authorization process.

Moreover, the article 7 of the Decree No. 2-94-666 relating to authorization and control of nuclear installations, the application for a construction authorization must be complemented by Preliminary safety analysis report.

In addition to that, the article 12 of the same decree, stipulates that the application for authorization of the commissioning tests shall be accompanied by the provisional safety analysis report which supplements and updates the preliminary safety analysis report referred to in Article 7.

The article 15 of the same decree considers that the application for an operating authorization must be complemented by the final safety analysis report which complete and update the provisional safety analysis report referred to in Article 12.

AMSSNuR has established a new decree on nuclear safety installation where the safety analysis report will be defined, if it is needed, taken into account, the type of installation or nuclear activity.

It is noted that the new decree on nuclear safety analysis report requires the operator to carry out safety analysis.

The Licensing process of MNRC facilities, including the TRIGA Mark II research reactor, had been conducted in compliance with the national regulation, based mainly on the Decree number 2-94-666 on the licensing and control of nuclear facilities. The Safety Analysis Report had been prepared and updated during the different stages, starting by construction, discharge of gaseous and liquid effluents, commissioning and operation. The regulatory assessment of license application had been previously performed, at the different above-mentioned stages, by the Ministry in charge of Energy with the support of the National Commission on Nuclear Safety.

CNESTEN is carrying out, on a continuous basis, activities covering verification by analysis, surveillance, testing and inspection, aiming at ensuring that the physical status and the operation of the TRIGA Mark-II facilities are maintained in compliance with national legislative and regulatory requirements as well as Operating Limits and Conditions (OLCs).

In responding to the national nuclear law and to IAEA safety standards, CNESTEN is planning to perform a Periodic Safety Review (PSR) of the TRIGA Mark-II reactor.

In the framework of the preparation of the above mentioned PSR, CNESTEN hosted, with the participation of AMSSNuR, last October 2019, an IAEA expert mission with the objective to provide it with technical support on establishing a PSR project for the reactor. It covered the PSR objectives, scope, management system, and safety factors. The scope and tasks for safety factor reviews, the review methodology, the categorization of findings as well as the safety improvement plan were covered by the scope of the mission.

Article 14 (2) Verification of safety

At this stage, where the new regulations implementing the law n° 142-12 are not adopted yet, AMSSNuR will review and control activities based on current regulation and international practices and IAEA standards

In order to achieve and maintain a high level with regard the safety and security during the operation of TRIGA Mark II research reactor, CNESTEN paid a particular attention to the establishment of required organizational tools that are playing a role in its internal independent assessment of reactor's safety and security. In this regard, CNESTEN established its Reactor Safety and Security Committee, playing an advisory role, as recommended by the IAEA safety standards on research reactors.

As part of safety assessment of facilities implemented at the MNRC, including the TRIGA Mark II research reactor, CNESTEN is preparing annual reports with regards to the safety of these facilities, these reports are submitted regularly to the Ministry in charge of Energy as well as to the AMSSNuR.

Article 15: Radiation Protection

CSN	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.
INFCIRC/572	<ul style="list-style-type: none"> – Overview of the Contracting Party's arrangements and regulatory requirements concerning radiation protection at nuclear installations, including applicable laws not mentioned under Article 7; – Regulatory expectations for the license holder's processes to optimize radiation doses and to implement the 'as low as reasonably achievable' (ALARA) principle; – Implementation of radiation protection programmes by the license holders, including <ul style="list-style-type: none"> ▪ observation of dose limits, main results for doses to exposed workers, conditions for the release of radioactive material to the environment, operational control measures and main results, ▪ processes implemented and steps taken to ensure that radiation exposures are kept as low as reasonably achievable for all operational and maintenance activities, ▪ environmental monitoring and main results; – Regulatory review and control activities.
CSN	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 regulatory principles and objectives for protection against ionizing radiations in relation to radiation protection are established in the law n°142-12.

The regulatory requirements governing the protection of exposed workers and the public against the risks arising from exposure to ionizing radiations are governed by the decree n° 2-97-30.

The regulations on the protection against ionizing radiations for exposed workers according to article 14 of the decree n° 2-97-30 establish the following dose limits:

- Effective dose of 20 mSv per year on average over five consecutive years,
- Effective dose of 50 mSv in a single year,
- Dose Equivalent to the lens of 150 mSv in a single year,
- Dose Equivalent relevant to the extremities (hands, feet) or skin of 500 mSv in a single year.

Article 21 of the decree n° 2-97-30, related to dose limits of the exposure of the public to ionizing radiations stipulates the following:

- Effective dose of 1 mSv in a single year,
- In special circumstances, effective dose reaches 5 mSv in a single year only if average dose for five consecutive years does not exceed 1 mSv per year,
- Dose Equivalent related to the lens of 15 mSv in a single year,
- Dose Equivalent corresponding to the skin of 50 mSv in a single year.

The principles of justification, optimization and limitation of individual doses, which are the basis of the radiological protection system are provided in the decree n° 2-97-30 and ensure that radiation doses

arising from normal and anticipated operational occurrences are optimized and do not exceed the dose limits during the full life cycle of an authorized facility.

Licensees design, construction, operation, effluents release, dismantling and decommissioning phases must comply with ALARA principle taking into account the radiological impact of modifications relevant to the safety of the facility.

The principle of optimization or the “as low as reasonably achievable (ALARA)” principle is considered as the main objective to be achieved by licensees through the implementation at their facilities of the dose limits and criteria defined in the decree n° 2-97-30.

AMSSNuR requires license holders to comply with radiation protection regulatory provisions. The licensee is responsible for the assessment and implementation of the necessary preventive measures to protect its personnel against the risks arising from exposure to ionizing radiation.

CNESTEN implemented a specific Radiation Protection Programme for the TRIGA Mark II research reactor. This programme describes practical arrangements with regard to the implementation of radiation protection requirements set forth in the national legislation and regulations as well as IAEA safety standards dealing with radiation protection.

The adopted approach in the establishment of the above-mentioned radiation protection programme aims to satisfy the three fundamental principles of the protection of workers against ionizing radiation, namely: justification of activities, optimization of protection and limitation of exposures.

In 2018, AMSSNuR conducted an inspection on radiation protection at the research reactor and verified whether the radiation protection programme applied by the operator met safety objectives and complied with regulatory requirements.

AMSSNuR evaluated the compliance of the MNRC environmental monitoring programme for 2018 with legislative and regulatory requirements.

Article 16: Emergency Preparedness

CSN	<p>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.</p> <p>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.</p> <p>3. Contracting Parties which do not have a nuclear installation on 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 the preparation and testing of emergency plans for their territory that cover the activities to be carried out in the event of such an emergency.</p>
INFCIRC/57 2	<p>Article 16 (1) Emergency plans and programmes</p> <ul style="list-style-type: none"> – Overview of the Contracting Party’s arrangements and regulatory requirements for onsite (including multi-unit nuclear installations and/or multi-facility sites) and off-site emergency preparedness, including applicable laws not mentioned under Article 7; – Overview and implementation of main elements of national plan (and regional plan, if applicable) for emergency preparedness, including the chain of command and roles and responsibilities of the license holder, the regulatory body, and other main actors, including State organizations; – Implementation of emergency preparedness measures by the license holders: <ul style="list-style-type: none"> ▪ classification of emergencies; ▪ main elements of the on-site and, where applicable, off-site emergency plans for nuclear installations, including, availability of adequate resources and authority to effectively manage and mitigate the consequences of an accident; ▪ facilities provided by the license holder for emergency preparedness (if appropriate, give reference to descriptions under Article 18 and Article 19 (4) of the Convention, respectively); – Training and exercises, evaluation activities and main results of performed exercises including lessons learned; – Regulatory review and control activities; – International arrangements, including those with neighbouring States, as necessary. <p>Article 16 (2) Information of the public and neighbouring States</p> <ul style="list-style-type: none"> – Overview of the Contracting Party’s arrangements for informing the public in the vicinity of the nuclear installations about emergency planning and emergency situations; – Arrangements to inform competent authorities in neighbouring States, as necessary. <p>Article 16 (3) Emergency preparedness for Contracting Parties without nuclear installations</p> <p>Contracting Parties with no nuclear installations on their territory, but that are likely to be affected by an emergency at a nuclear installation in another country, should describe:</p> <ul style="list-style-type: none"> – measures for the preparation and testing of emergency plans that cover the activities to be carried out on their territory in the event of such an emergency; <p>international arrangements, including those with neighbouring States, as necessary.</p>

Law 142-12 requires the applicant to submit the internal emergency plan which complements the application and requires the emergency plan to be reviewed periodically. This periodicity is fixed by the drafted decree on “preparation and conduct of interventions in case of nuclear or radiological emergency situation” as at least once every 5 years.

AMSSNuR expects emergency plans to be in place for any action that could give rise to a need for emergency intervention and to be based on an assessment of the consequences of foreseeable accidents, including those with off-site consequences.

At operational level, CNESTEN prepared its Internal Emergency Plan (PUI) in order to respond to emergency situations, should they occur at MNRC facilities, including the TRIGA Mark research reactor. This plan defines mainly the organization to be established (including responsibilities of involved actors), the human resources to be deployed and the equipment to be used in case of emergency.

This internal emergency plan requires conducting periodic exercises on particular aspects of the plan. Major exercises have been held regularly in accordance with the plan. The reports on these exercises are reviewed by AMSSNuR inspectors.

In the event of an emergency situation related to the Research Reactor, CNESTEN immediately triggers the internal emergency plan in order to limit radiological consequences and informs the territorial authority of the region concerned.

The Monitoring and Coordination Center has communication systems that would be set up in the event of a major emergency as they have enough channels to deal with internal and external lines. This includes communication with external authorities and the public.

In the event of a nuclear or radiological accident, information will be provided to the Ministry of Interior, which will continuously monitor the situation and inform stakeholders, including the public, of important updates, in accordance with the National Emergency Plan.

Morocco is a Contracting Party to the Convention on the Early Notification of a Nuclear Accident and the Convention on Assistance in the case of a Nuclear Accident or Radiological Emergency.

AMSSNuR is the designated National Competent Authority for these Conventions, and the Moroccan Monitoring and Coordination Center, located in the Crisis Room at the Ministry of Interior, is the designated National Warning Point.

Morocco is not geographically close to any country operating a nuclear installation surrounding 300 km of the border.

Nevertheless, Morocco has appropriate precautions in place in relation to radiation emergencies in other countries, including the provision of law 142-12 related to the information of the public and of decision makers.

In order to implement the inspection programme of the research reactor, AMSSNuR developed an inspection guide on emergency preparedness and response. This inspection aims at verifying, in accordance with current regulations, that CNESTEN has the qualified personnel, as well as sufficient equipment and operational procedures required to deal with an emergency situation.

Article 17: Siting

CSN	<p>Each Contracting Party shall take the appropriate steps to ensure that appropriate procedures are established and implemented:</p> <p>i) for evaluating all relevant site-related factors likely to affect the safety of a nuclear installation for its projected lifetime;</p> <p>ii) for evaluating the likely safety impact of a proposed nuclear installation on individuals, society and the environment;</p> <p>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;</p> <p>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.</p>
INFCIRC/572	<p>Article 17 (1) Evaluation of site related factors</p> <ul style="list-style-type: none"> – Overview of the Contracting Party’s arrangements and regulatory requirements relating to the siting and evaluation of sites of nuclear installations, including applicable national laws not mentioned under Article 7 of the Convention: <ul style="list-style-type: none"> ▪ overview of assessments made and criteria applied for evaluating all site related factors affecting the safety of the nuclear installation, including multi-unit failure, loss of infrastructure, and site access following an event; ▪ overview of design provisions used against human made external events and natural occurring external events such as fire, explosion, aircraft crash, external flooding, severe weather conditions and earthquakes and the impact of related sequential natural external events (e.g. tsunami caused by an earthquake, mud slide caused by heavy rain); – Regulatory review and control activities. <p>Article 17 (2) Impact of the installation on individuals, society and environment</p> <ul style="list-style-type: none"> – Criteria for evaluating the likely safety related impact of the nuclear installation on the surrounding population and the environment; – Implementation of these criteria in the licensing process. <p>Article 17 (3) Re-evaluation of site related factors</p> <ul style="list-style-type: none"> – Activities for re-evaluation of the site related factors as mentioned in Article 17 (1) of the Convention to ensure the continued acceptability of the safety of the nuclear installation conducted according to appropriate standards and practices; – Results of recent re-evaluation activities; – Regulatory review and control activities. <p>Article 17 (4) Consultation with other Contracting Parties likely to be affected by the installation</p> <ul style="list-style-type: none"> – International arrangements; – Bilateral arrangements with neighbouring States, as applicable and necessary.

As mentioned in article 12 of law 142-12, the authorization application, whose contents is defined by the relevant regulation, must include a safety analysis report of the facility including a report on the site selection and evaluation and an evaluation of the environmental impact of the facility, and an internal emergency plan and physical protection plan, updated at the different stages of the authorization process.

In addition, the decree n°2-94-666 relative to the authorizations and inspections of nuclear installations provides specific requirements to the phase of site selection and evaluation prior to applying for a construction authorization which should consider:

- Evaluations showing that natural phenomena and site characteristics are taken into account along the environmental impact study,
- External events resulting from natural hazards or man-induced actions occurring in the site area,
- Characteristics of the site or its environment which are likely to influence the transfer of radioactive material released to living beings,
- Density and distribution of the population with a preliminary assessment of radiological effects on the population.

In compliance with the above-mentioned regulation and in the basis of international good practices, CNESTEN had carried out all the required activities with regard siting and proceeded mainly with the followings:

- the investigation of the site characteristics that might affect the safety of MNRC facilities.
- the assessment of the impact of MNRC facilities, including the TRIGA Mark II research reactor on the public and the environment.

The above-mentioned investigation and assessment as well as their results had been compiled in the Safety Analysis Report (SAR).

The environmental law n° 12-03 related to environment impact studies provides full requirements for the design of the facility that should take into account all aspects that might have an impact on the environment, such as:

- Adopted measures taken by the licensee to optimize, reduce or compensate any impact of the facility on the biological system during the phases of construction or operation,
- A description of the main characteristics of the facility including manufacturing processes, the nature and quantities of raw materials and energy resources used,
- A description of the liquid, gaseous and solid discharges as well as the waste generated by the facility.

Furthermore, the draft decree on safety of facilities of category I requires for the siting and site evaluation phase the preparation of a preliminary safety analysis report that includes in particular:

1. Siting and site evaluation report
2. Environmental impact study of the facility;
3. Preliminary safety analysis study;

AMSSNuR is currently developing a regulatory guide for the drafting of a periodic safety review related to the TRIGA MARK II reactor. The regulatory guide will be based on international good practices: Regulatory provisions for reevaluating the characteristics and suitability of the site will be included.

Article 18: Design and Construction

CSN	<p>Each Contracting Party shall take the appropriate steps to ensure that:</p> <p>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;</p> <p>ii) the technologies incorporated in the design and construction of a nuclear installation are proven by experience or qualified by testing or analysis;</p> <p>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.</p>
INFCIRC/572	<p>Article 18 (1) Implementation of defense in depth</p> <ul style="list-style-type: none"> – Overview of the Contracting Party’s arrangements and regulatory requirements concerning the design and construction of nuclear installations; – Status with regard to the application for all nuclear installations of the defense in depth concept, providing for multiple levels of protection of the fuel, the primary pressure boundary and the containment, with account taken of internal and external events and the impact of related sequential natural external events (e.g. tsunami caused by an earthquake, mud slide caused by heavy rain); – Extent of use of design principles, such as passive safety or the fail safe function, automation, physical and functional separation, redundancy and diversity, for different types and generations of nuclear installations; – Implementation of design measures or changes (plant modifications, backfitting) with the objective of preventing beyond design basis accidents and mitigating their radiological consequences if they were to occur (this applies to the entire nuclear installation including spent fuel pools); – Implementation of particular measures to maintain, where appropriate, the integrity of the physical containment to avoid long term off-site contamination, in particular actions taken or planned to cope with natural hazards more severe than those considered in the design basis; – Improvements implemented for designs for nuclear power plants as a result of deterministic and probabilistic safety assessments made since the previous National Report; and an overview of main improvements implemented since the commissioning of the nuclear installations; – Regulatory review and control activities. <p>Article 18 (2) Incorporation of proven technologies</p> <ul style="list-style-type: none"> – Contracting Party’s arrangements and regulatory requirements for the use of technologies proven by experience or qualified by testing or analysis; – Measures taken by the license holders to implement proven technologies; – Analysis, testing and experimental methods to qualify new technologies, such as digital instrumentation and control equipment; – Regulatory review and control activities. <p>Article 18 (3) Design for reliable, stable and manageable operation</p> <ul style="list-style-type: none"> – Overview of the Contracting Party’s arrangements and regulatory requirements for reliable, stable and easily manageable operation, with specific consideration of human factors and the human–machine interface (see also Article 12 of the Convention); – Implementation measures taken by the license holder; – Regulatory review and control activities.

Article 31 of law 142-12 states that adequate financial resources and a sufficient number of qualified staff members should be available for activities related to safety of a nuclear facility throughout its life cycle. These activities are covering the design and construction of a nuclear facility.

AMSSNuR has drafted a new regulation related to nuclear safety and authorization for nuclear installation, within it, some provisions dealing with design and construction are presented as follows.

According to article 15 of the draft decree, while respecting the defense-in-depth concept, the operator must design its installation, in order to prevent anticipated operational incidents and, if necessary, to limit the consequences.

In addition, article 16 of the draft decree states that the design basis shall include the identification of normal operating conditions, anticipated operational incidents and accidents resulting from postulated initiating events, their classification for nuclear safety purposes, significant assumptions and, in some cases, specific analytical methods.

The design basis shall include specifications concerning the capacity of the installation to cope with a specified range of operating conditions and design basis accidents, in accordance with the requirements for the protection of workers, the public and the environment.

According to article 17 of the draft decree, the events of internal and external origin must be taken into consideration in the design of the installation. The list of these events is adapted to the type of installation and approved by the Agency.

Article 14 of the decree states that the operator must make design arrangements to ensure that potential radiological consequences for workers, the public and the environment do not exceed the prescribed limits and are kept as low as reasonably achievable.

In addition to that, article 18 stipulates that components important to safety in a nuclear facility are designed so that they can be manufactured, constructed, assembled and installed in accordance with established procedures to ensure the achievement of the design specifications and the required level of safety.

Article 19 of the decree states that safety measures, security measures and provisions relating to the national system of accounting and control of nuclear material in a nuclear installation shall be designed and implemented in an integrated manner so that they do not adversely affect each other.

At CNESTEN level, the research reactor had been designed in compliance with national requirements as well as good practices. In this regard, CNESTEN conducted, during the design of this facility, many international peer review missions, in the framework of its cooperation with the IAEA and the IRSN, to assess the safety of the facility on the basis of international safety standards and good practices.

The defense-in-depth is an important safety concept that has been taken into consideration since the design of this facility. Due to its special fuel composition (which is U-Zr-H), the TRIGA reactor is an inherently safe reactor with a negative temperature coefficient of the fuel.

Article 19: Operation

CSN	<p>Each Contracting Party shall take the appropriate steps to ensure that:</p> <p>i) the initial authorization to operate a nuclear installation is based upon an appropriate safety analysis and a commissioning programme demonstrating that the installation, as constructed, is consistent with design and safety requirements;</p> <p>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;</p> <p>iii) operation, maintenance, inspection and testing of a nuclear installation are conducted in accordance with approved procedures;</p> <p>iv) procedures are established for responding to anticipated operational occurrences and to accidents;</p> <p>v) necessary engineering and technical support in all safety-related fields is available throughout the lifetime of a nuclear installation;</p> <p>vi) incidents significant to safety are reported in a timely manner by the holder of the relevant license to the regulatory body;</p> <p>vii) programmes 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;</p> <p>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.</p>
INFCIRC/572	<p>Article 19 (1) Initial authorization</p> <ul style="list-style-type: none"> – Overview of the Contracting Party’s arrangements and regulatory requirements for the commissioning of a nuclear installation, demonstrating that the installation, as constructed, is consistent with design requirements and safety requirements; – Conduct of appropriate safety analyses; – Commissioning programmes; – Programmes of verification that installations, as constructed, are consistent with the design and in compliance with safety requirements; – Regulatory review and control activities. <p>Article 19 (2) Operational limits and conditions</p> <ul style="list-style-type: none"> – Overview of the Contracting Party’s arrangements and regulatory requirements for the definition of safe boundaries of operation and the setting of operational limits and conditions; – Implementation of operational limits and conditions, their documentation, training in them, and their availability to plant personnel engaged in safety related work; – Review and revision of operational limits and conditions as necessary; – Regulatory review and control activities. <p>Article 19 (3) Procedures for operation, maintenance, inspection and testing</p> <ul style="list-style-type: none"> – Overview of the Contracting Party’s arrangements and regulatory requirements on procedures for operation, maintenance, inspection and testing of a nuclear installation;

	<ul style="list-style-type: none"> – Establishing of operational procedures, their implementation, periodic review, modification, approval and documentation; – Availability of the procedures to the relevant nuclear installation staff; – Involvement of relevant nuclear installation staff in the development of procedures; – Incorporation of operational procedures into the management system of the nuclear installation; – Regulatory review and control activities. <p>Article 19 (4) Procedures for responding to operational occurrences and accidents</p> <ul style="list-style-type: none"> – Overview of the Contracting Party’s arrangements and regulatory requirements on procedures for responding to anticipated operational occurrences and accidents; – Establishment of event based and/or symptom based emergency operating procedures; – Establishment of procedures and guidance to prevent severe accidents or mitigate their consequences; – Establishment of procedures and guidance to manage accident situations at multi-unit nuclear installations and/or multi-facility sites; – Regulatory review and control activities. <p>Article 19 (5) Engineering and technical support</p> <ul style="list-style-type: none"> – General availability of necessary engineering and technical support in all safety related fields for all nuclear installations, under construction, in operation, under accident conditions or under decommissioning; – General availability of necessary technical support on the site and also at the license holder or utility headquarters, and procedures for making central resources available for nuclear installations; – General situation with regard to dependence on consultants and contractors for technical support to nuclear installations; – Regulatory review and control activities. <p>Article 19 (6) Reporting of incidents significant to safety</p> <ul style="list-style-type: none"> – Overview of the Contracting Party’s arrangements and regulatory requirements to report incidents significant to safety to the regulatory body; – Overview of the established reporting criteria and reporting procedures for incidents significant to safety and other events such as near misses and accidents; – Statistics of reported incidents significant to safety for the past three years; – Documentation and publication of reported events and incidents by both the license holders and the regulatory body; – Policy for use of the INES scale; – Regulatory review and control activities. <p>Article 19 (7) Operational experience feedback</p> <ul style="list-style-type: none"> – Overview of the Contracting Party’s arrangements and regulatory requirements on the license holders to collect and analyze and share operating experience; – Overview of programmes of license holders for the feedback of information on operating experience from their own nuclear installation, from other domestic installations and from installations abroad; – Procedures to analyze domestic and international events; – Procedures to draw conclusions and to implement any necessary modification to the installation and to personnel training programmes and simulators; – Mechanisms to share important experience with other operating organizations; – Use of international information databases on operating experience; – Regulatory review and control activities for license holder programmes and procedures;
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	<ul style="list-style-type: none"> – Programmes of the regulatory body for feedback of operational experience and the use of existing mechanisms to share important experience with international organizations and with other regulatory bodies. <p>Article 19 (8) Management of spent fuel and radioactive waste on the site</p> <ul style="list-style-type: none"> – Overview of the Contracting Party's arrangements and regulatory requirements for the on-site handling of spent fuel and radioactive waste; – On-site storage of spent fuel; – Implementation of on-site treatment, conditioning and storage of radioactive waste; – Activities to keep the amount of waste generated to the minimum practicable for the process concerned, in terms of both activity and volume; – Established procedures for clearance of radioactive waste; – Regulatory review and control activities.
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Current status

In compliance with Decree n° 2-94-666 on the licensing and control of nuclear facilities, the operating license was granted to CNESTEN in 2009 on the basis of a regulatory assessment of the Safety Analysis Reports (SAR) which has been updated several times during the previous stages (construction, commissioning) of the lifetime of the TRIGA Mark II research reactor.

As it is mentioned in Article 7 (2) (ii): System of licensing- the operation of a nuclear facility requires an authorization issued by the administration after AMSSNuR's review.

To comply with this article, AMSSNuR has drafted a decree related to nuclear safety and authorization for nuclear installations. The draft defines provisions on the pre-requisite for obtaining such authorization, namely: final SAR, provisional SAR indicating that the commissioning test programme was conducted as appropriate.

In addition, according to its assigned mission, AMSSNuR has the authority to assess and to conduct regulatory controls to make sure that the commissioning programme is performed in compliance with the provision of the design requirement as stated in the FSAR and regulations in force.

With regard to the TRIGA Mark II Research Reactor, Operational Limits and Conditions (OLCs) are part of the Final Safety Analysis Report which had been subject to regulatory assessment, they had been derived from the carried-out safety analysis of the facility. Maintenance, inspection and testing of a nuclear installation are conducted in accordance with approved procedures.

According to article 25 of law 142-12, the operator shall proceed with verifications by analysis, monitoring and testing, in order to check whether the physical status of the installation and its operation are consistent with regulatory provisions and with operational limits and conditions.

Furthermore, as stipulated in article 26 of law 142-12, any modification to operational limits and conditions, or other modifications relating to safety and / or to the nuclear and radiological security of the facility must be the subject of a report to be submitted by the operator to AMSSNuR, including all supporting documents. These modifications are authorized, if necessary, by administrative act after examination of the case by AMSSNuR.

In addition to that, article 3 of the operational authorization n°2004-08 stipulates that the reactor shall be operated in accordance with OLCs, approved by the regulatory body.

To comply with this article, AMSSNuR has drafted, beside a decree on nuclear safety and authorization for nuclear installations, an inspection programme of the TRIGA Mark II reactor. The first inspection was allocated to OLCs and the radiation protection programme.

In addition, AMSSNuR assesses CNESTEN's annual safety operational report, in which CNESTEN needs to demonstrate that the reactor is operated according to the OLCs.

According to art 21 of law 142-12, commissioning tests, operation and maintenance of a category I facility must be carried out in accordance with the OLCs as defined in the SAR.

In compliance with legislative and regulatory framework as well as OLCs, CNESTEN developed and approved detailed procedures with regard to operation, maintenance, inspection and testing of the TRIGA Mark II research reactor.

As stipulated in article 5 of the operating authorization n°2004-08, periodic control reports and maintenance of installations and equipment of the TRIGA Mark II reactor shall be established by CNESTEN, according to quality assurance procedures, and consulted by the regulatory authority whenever required during the operational phase of the TRIGA Mark II reactor. CNESTEN shall regularly update the safety documents, particularly the SAR, OLCs and the emergency plan.

Within the framework of its mission, established by law 142-12, AMSSNuR makes sure that the operator has procedures in place to operate its installation according to the SAR and regulations in force.

In this regard, AMSSNuR has carried out its second inspection that was dedicated to maintenance & ageing management as well as radioactive waste management.

As stipulated in article 12 of the operational authorization n°2004-08, CNESTEN shall immediately inform the regulatory body of any incident or accident that could impact the installation safety or could expose the staff and the public.

AMSSNuR has drafted a guide dealing with the modalities of notification of a significant event. This guide will be communicated to CNESTEN after review with an IAEA expert.

v. necessary engineering and technical support in all safety-related fields is available throughout the lifetime of a nuclear installation;

According to article 31 of law 142-12, adequate financial resources and a sufficient number of qualified staff should be available for activities related to safety of a nuclear facility throughout its life cycle. These activities must cover the design, construction, operation, closure and the dismantling of the nuclear facility.

Within the framework of its mission, stipulated in law 142-12, AMSSNuR assesses the technical, financial and organizational capabilities of the license holder to undertake its responsibilities according to the legislation and regulation in force, namely the requirements given by the authorization acts.

i. incidents significant to safety are reported in a timely manner by the holder of the relevant license to the regulatory body;

Article 6 of the operational authorization n°2004-08, states that, during the operational phase of the TRIGA Mark II reactor, non-compliance events shall be recorded, analyzed and treated. CNESTEN shall establish reports on the treatment of non-compliance for the purpose of traceability of information. These reports could be consulted by the Regulatory body as and when required.

In compliance with the above-mentioned article, CNESTEN developed written procedures for the responding implementation of corrective actions with regard to in case of responding to operational occurrences and to accidents.

AMSSNuR is preparing a draft of ordinance related to the modalities of notification of significant incidents and accidents, which will be reviewed in the course of this year. It will then be discussed with

CNESTEN. Once the decree on nuclear installations is approved by the government, this ordinance will come into force as a binding document.

Meanwhile, in order to manage this transitional phase, the draft of this ordinance will be used as a guide by CNESTEN to report on any significant event.

vii. Programmes to collect and analyze operating experience are established, results obtained and conclusions drawn are acted upon and existing mechanisms are used to share important experience with international bodies and other operating organizations and regulatory bodies;

According to the regulation on nuclear safety and authorization of nuclear installations, the license holder shall proceed to analyze each significant event based namely on lessons learned from operations feedback.

In addition, the operator shall proceed with the PSR, taking into consideration international practices and accumulated experience gained during the entire life cycle of the installation.

AMSSNuR will take into consideration this aspect in assessing the first periodic safety report of the TRIGA Mark II reactor.

The feedback is one of the topics covered by the inspection programme for the future.

CNESTEN is exchanging and analyzing information on the operational experience feedback with regard the safety of research reactors. this exchange is done in the framework of cooperation with other TRIGA reactors users as well as with the IAEA.

iii. 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.

According to article 85 of law 142-12, the management of radioactive waste must meet the following principles:

1. Achieve and maintain a high level of safety and security regarding the management of spent fuel and radioactive waste;
2. Ensure adequate protection of people, the environment and future generations against the harmful effects of ionizing radiation, without compromising their abilities to fulfill their aspirations;
3. Prevent accidents and mitigate the consequences.

In addition, as stated in article 86 of law 142-12, the operator implements measures of radioactive waste management with the purpose of:

1. Keeping the level of production and activity of radioactive waste as low as possible;
2. Taking into account the links of interdependence between the different stages of the radioactive waste management such as the preprocessing, processing, packaging, warehousing and storage;
3. Taking into account the biological, chemical and other risks associated with the management of radioactive waste;
4. Implementing the characterization and management procedures of this waste, according to the provisions set by the regulatory body.

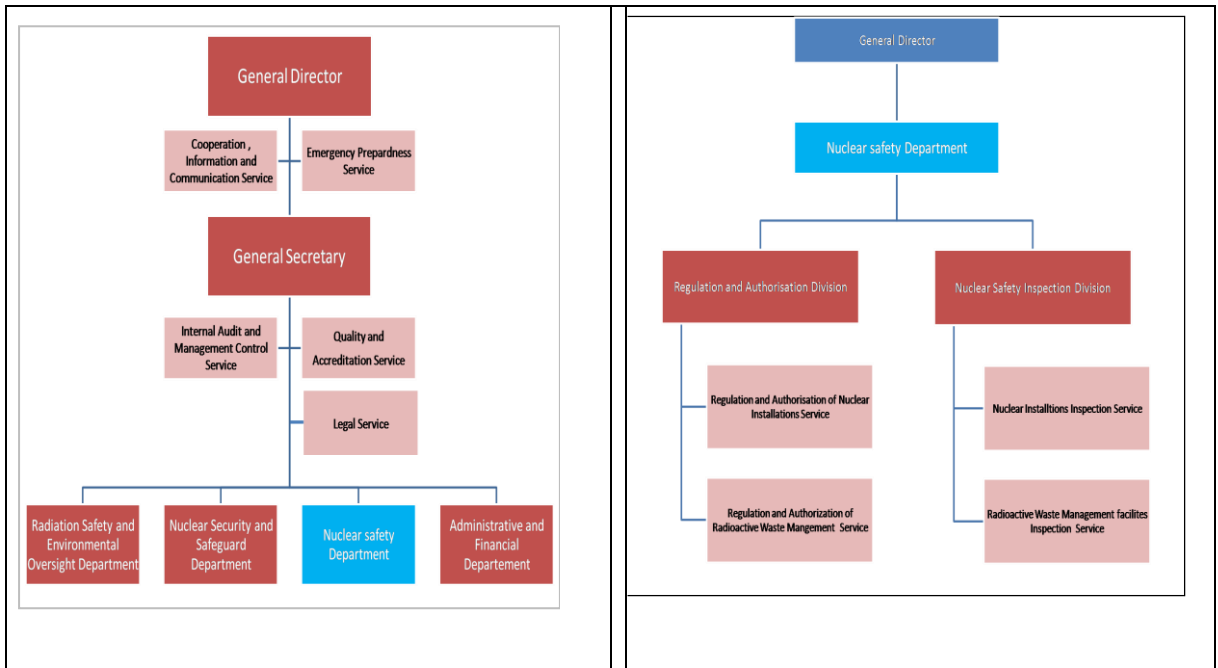
Two facilities had been constructed to deal respectively with treatment and storage of radioactive waste generated at MNRC facilities, including the TRIGA Mark II research reactor. In addition, a special attention had been paid.

Within the framework of its mission, provided by law 142-12, AMSSNuR has assessed the radioactive waste management programme provided by CNESTEN during the second inspection that was carried out in April 2019.

Moreover, AMSSNuR regularly assesses CNESTEN report dedicated to RWM.

APPENDICES

APPENDIX N°1: Organizational Chart



ABBREVIATIONS

Abbreviation	Signification
AFRA	Regional Cooperation Agreement for Africa on Research, Development and Training in Nuclear Science and Technology
ALARA	As low as reasonably achievable
AMSSNuR	Moroccan Agency for Nuclear and Radiological Safety and Security
ANNuR	Arab Network of Nuclear Regulators
CCR	National committee for upgrading the regulatory framework
CNEN	National Council of Nuclear Energy
CNESTEN	National Center for Energy, Science and Nuclear Techniques
CNRP	National Radiation Protection Center
CSN	Convention on Nuclear Safety
CRED	National think tank for nuclear power and desalination
CPPNM	Convention on the Physical Protection of Nuclear Material
DIN	Nuclear facilities Directorate
DOE	Department Of Energy
EIS	Environmental Impact Studies
EU	European Union
FNRBA	Forum of Nuclear Regulatory Bodies in Africa
FSAR	Final Safety Analysis Report
DSS	Safety and Security Directorate
GA/USA	General Atomics/United States of America
GNSSN	Global Nuclear Safety and Security Network
HFP	Human Reliability Programme
IAEA	International Atomic Energy Agency
IMS	Integrated Management System
INIR	Integrated Nuclear Infrastructure Review
IRRS	Integrated Regulatory Review Service
IRSN	Institute of Radiation Protection and Nuclear Safety
IWP	Integrated Work Plan
MEME	Ministry of Energy, Mines and Environment
MNRC	Maamora Nuclear Research Centre
MoU	Memorandums of Understanding
NPP	Nuclear Power Plant
OLC	Operating Limits and Conditions
ONEE	National Office of Electricity and Potable water utility
PUI	Internal Emergency Plan
PSR	Periodic Safety Review
RCF	Regulatory Cooperation Framework
RWM	Radioactive Waste Management
SAR	Safety Analysis Report
SARCoN	Systematic Assessment of Regulatory Competence Needs
SARIS	Self-Assessment of Regulatory Infrastructure Service
SER	Safety Evaluation Report
SGG	General Secretariat of the Government
US-NRC	United States-Nuclear Regulatory Commission
WG	Working Group