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INTEGRATED REGULATORY REVIEW SERVICE (IRRS)

MISSION

TO

KINGDOM OF SAUDI ARABIA

Riyadh, Saudi Arabia

1-10 October 2023

DEPARTMENT OF NUCLEAR SAFETY AND SECURITY

Integrated
Regulatory
Review Service

IRRS

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REPORT OF THE
INTEGRATED REGULATORY REVIEW SERVICE (IRRS) MISSION
TO
KINGDOM OF SAUDI ARABIA

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Mission dates:	*1-10 October 2023*
Regulatory body visited:	*Nuclear and Radiological Regulatory Commission*
Location:	*Riyadh, Saudi Arabia*
Regulated facilities, activities, and exposure situations in the mission scope:	*Radiation sources facilities and activities, waste management facilities, decommissioning, transport of radioactive materials, medical exposure, occupational exposure and public exposure and emergency preparedness and response*
Organized by:	*IAEA*

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IAEA-2024

The number of recommendations, suggestions and good practices is in no way a measure of the status of the national infrastructure for nuclear and radiation safety. Comparisons of such numbers between IRRS reports from different countries should not be attempted.

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EXECUTIVE SUMMARY

At the request of the Kingdom of Saudi Arabia (hereinafter referred to as 'The Kingdom'), an international team of senior radiation safety experts met representatives of the Nuclear Radiation Regulatory Commission (NRRC), the regulatory body in the Kingdom to review the effectiveness of the Kingdom regulatory framework for radiation safety. The mission took place at the headquarters of the NRRC, in Riyadh, Saudi Arabia.

The reviewers assessed the Kingdom's regulatory framework for radiation safety against IAEA safety standards as the international benchmark for safety. The mission was also used as an opportunity to exchange information and experience between the IRRS team members and NRRC counterparts in the areas covered by the IRRS.

The IRRS team consisted of 10 senior regulatory experts from 10 IAEA Member States, three IAEA staff members and one observer. The IRRS team carried out the review in the following areas: responsibilities and functions of the Government; the global nuclear safety regime; responsibilities and functions of the regulatory body; the management system of the regulatory body; the activities of the regulatory body including the authorization, review and assessment, inspection and enforcement processes; development of regulations and guides; emergency preparedness and response; occupational radiation protection, patient protection, public and environmental exposure control, transport of radioactive material, waste management and decommissioning.

The IRRS mission also included the following regulatory policy issues for discussion: Independence of the Regulatory Body; and the Regulatory aspects for the NORM industry.

The IRRS mission included observations of regulatory activities and a series of interviews with the staff of the NRRC, including discussions with the licensee personnel and management, for an objective assessment of the effectiveness of the regulatory system.

These activities included observations of inspections at a nuclear medicine facility, an industrial irradiator facility, and a radioactive waste storage facility.; and NRRC's environmental monitoring laboratories. The IRRS team members observed the working practices during inspections carried out by NRRC, including discussions with the licensees' personnel and management. The team noted that relationships between the regulatory body and authorized parties were constructive and open.

The NRRC provided the IRRS team with comprehensive advanced reference material and documentation including the results of the self-assessment exercise carried out for all areas within the scope of the mission, including the initial action plan for improvements of the regulatory infrastructure for safety. The IRRS team commends the Kingdom for the extensive self-assessment and detailed action plan. The team noted that of the 19 recommendations made by the team 13 of these had already been identified in that self-assessment, and, of the 12 Suggestions, 8 had already been identified. The IRRS team also identified two good practices and four good performances; related with the NRRC maintains small regional offices at Jeddah, Riyadh, and Dammam International Airport. The NRRC has implemented comprehensive measures for ongoing communication with stakeholders. The NRRC has developed a location map of all radioactive sources in the Kingdom, regularly updating it for reference by NRRC staff and the IRRS team acknowledged also the location mapping and implementation of tracking system for mobile source.

Throughout the mission, the IRRS team was extended full cooperation in its review of the national regulatory framework for safety, and in the discussions of the technical and policy issues. The staff of the NRRC were very open, transparent, and professional in all discussions and provided full support and assistance.

The Kingdom has adopted the policies, principles, and strategies to further continue the development of the regulatory programme for radiation safety.

The IRRS team concluded that the Kingdom is fully committed to safety in all applications of atomic technology in the country.

The IRRS team identified some issues warranting attention and action by the Kingdom, the majority of which had already been identified by the Kingdom itself in its self-assessment. The Government should:

- establish national strategy for radioactive waste management to outline arrangements for ensuring the implementation of the national policy.
- develop a strategy to ensure availability of technical services in the country.
- establish, within its national strategy, requirements for interim targets and end states to enable effective management in the safe disposal of radioactive waste.
- consider establishing long-term storage for disused radioactive sources in the Kingdom
- consider establishing the competence framework led by the NRRC for building and maintaining competence in safety.
- consider establishing long-term storage for disused radioactive sources in the Kingdom
- consider undertaking a systematic review to identify and establish Joint Government organization Policies (JGoPs) between NRRC and all relevant national agencies with responsibilities for safety including finalising JGoPs under development

The IRRS team made recommendations and suggestions to the NRRC where improvements will enhance the effectiveness of the regulatory framework and functions in line with the IAEA Safety Standards. The main areas for further improvement are:

- The NRRC should finalize the competency needs assessment and the training operational plan as provided in the policy on human capacity development to ensure adequate competence within the organization
- The NRRC should produce any remaining supporting documents and incorporate them in its management system in particular to ensure that the statutory and international obligations are being fulfilled, with emphasis on regulatory requirements to help preventing safety from being compromised.
- The NRRC should broaden the implementation of the graded approach in authorization by implementing authorization by registration
- The NRRC to complete and implement a protection strategy for NORM exposure situations in oil and gas industry and other industries.
- The NRRC should formally recognize Technical Service Organizations in The Kingdom that may have significance for safety.
- The NRRC should develop requirements for recognition of qualified experts and implement them.
- The NRRC should develop and implement a methodology for evaluation of exercises on Emergency Preparedness and Response (EPR) arrangements.
- The NRRC should consider completing the recruitment of its staff to ensure that it has a sufficient number of staff to effectively carry out all its regulatory functions
- The NRRC should consider finalising the criteria for recognition of all Technical Services in Kingdom that may have significance for safety.
- The NRRC should consider developing and implementing national comprehensive arrangements, with clear role of other relevant organization, to search and regain control over legacy sources including orphan sources.

The IRRS team acknowledged the following good practices:

- The establishment of JGoPs as a legally binding mechanism for ensuring legal division of labour to deliver effective joint working arrangements and coordination between the NRRC and other relevant Government agencies for the tasks and responsibilities to be clearly assigned to avoid any omissions or undue duplication and to avoid conflicting requirements.

- The establishment of an accredited business continuity management system by the NRRC for maintaining the regulatory oversight of facilities and activities continuity of its critical regulatory functions.

Overall, the IRRS team concluded that the regulatory programme of the Kingdom is well established, considering that it was only established four years ago. The IRRS team welcome the commitment of NRRC to continue to progress its regulatory systems and to continuously improve.

The IRRS team findings are summarized in Appendices V and VI.

An IAEA press release was issued at the end of the mission.

I. INTRODUCTION

At the request of the Government of The Kingdom of Saudi Arabia (The Kingdom), an international team of senior safety experts met representatives of the Nuclear and Radiological Regulatory Commission (NRRC) from 1 to 10 October 2023 to conduct an Integrated Regulatory Review Service (IRRS) mission. The purpose of this peer review was to review The Kingdom governmental, legal and regulatory framework for radiation safety. The review mission was formally requested by the Government of Kingdom in August 2019. A preparatory mission was conducted 28 February to 1 March 2022 at NRRC Headquarters in Riyadh, The Kingdom of Saudi Arabia to discuss the purpose, objectives, and detailed preparations of the review in connection with regulated facilities and activities in The Kingdom and their related safety aspects and to agree the scope of the IRRS mission.

The IRRS team consisted of 10 senior regulatory experts from 10 IAEA Member States, 3 IAEA staff members and 1 observer. The IRRS team carried out the review in the following areas: responsibilities and functions of the government; the global nuclear safety regime; responsibilities and functions of the regulatory body; the management system of the regulatory body; the activities of the regulatory body including the authorization, review and assessment, inspection and enforcement processes; development and content of regulations and guides; emergency preparedness and response; occupational radiation protection, control of medical exposure, public and environmental exposure control, transport of radioactive material, waste management and decommissioning. In addition, policy issues were discussed, including Independence of the Regulatory Body and Issue No. 2: Regulatory aspects for the NORM industry.

The NRRC conducted a self-assessment in preparation for the mission and prepared a preliminary action plan. The results of NRRC self-assessment and supporting documentation were provided to the IRRS team as advance reference material for the mission, two months in advance. During the mission the IRRS team performed a systematic review of all topics within the agreed scope through review of The Kingdom advance reference material, conduct of interviews with management and staff from NRRC and direct observation of NRRC regulatory activities at regulated facilities.

Throughout the mission the IRRS team received excellent support and cooperation from NRRC. The IRRS team has expressed its gratitude for the well-developed action plan in the self-assessment stage.

II. OBJECTIVE AND SCOPE

The purpose of this IRRS mission was to review The Kingdom's radiation safety governmental, legal and regulatory framework and activities against the relevant IAEA safety standards to report on effectiveness of the regulatory system and to exchange information and experience in the areas covered by the IRRS. The agreed scope of this IRRS review included all facilities and activities regulated in The Kingdom. It is expected that this IRRS mission will facilitate regulatory improvements in The Kingdom, utilising the knowledge gained and experiences shared between NRRC and IRRS reviewers and the evaluation of The Kingdom regulatory framework for nuclear safety, including its good practices.

The key objectives of this mission were to enhance the national legal, governmental and regulatory framework for radiation safety, and national arrangements for emergency preparedness and response through:

a) providing an opportunity for continuous improvement of the national regulatory body through an integrated process of self-assessment and review;
b) providing the host country (regulatory body and governmental authorities) with a review of its regulatory technical and policy issues;
c) providing the host country (regulatory body and governmental authorities) with an objective evaluation of its regulatory infrastructure with respect to IAEA safety standards;
d) promoting the sharing of experience and exchange of lessons learned among senior regulators;
e) providing key staff in the host country with an opportunity to discuss regulatory practices with IRRS team members who have experience of other regulatory practices in the same field;
f) providing the host country with recommendations and suggestions for improvement;
g) providing other states with information regarding good practices identified in the course of the review;
h) providing reviewers from Member States and IAEA staff with opportunities to observe different approaches to regulatory oversight and to broaden knowledge in their own field (mutual learning process);
i) contributing to the harmonization of regulatory approaches among states;
j) promoting the application of IAEA Safety Requirements;
k) providing feedback on the use and application IAEA safety standards; and
l) providing feedback on the regulatory implications of pandemic situations

III. BASIS FOR THE REVIEW

A) PREPARATORY WORK AND IRRS TEAM

At the request of the Government of The Kingdom, a preparatory meeting for the Integrated Regulatory Review Service (IRRS) was conducted from 28 February to 1 March 2022. The preparatory meeting was carried out by the appointed Team Leader Mr Daniel Collins, from the United Sates Regulatory Commission as Team Leader, and Mr Ronald Pacheco Jimenez IAEA's Team Coordinator.

The IRRS mission preparatory team had discussions regarding regulatory programmes and policy issues with the senior management of NRRC represented by Mr Khalid Aleissa, CEO of NRRC, other senior management and staff. It was agreed that the regulatory framework with respect to the following facilities and activities would be reviewed during the IRRS mission in terms of compliance with the applicable IAEA safety requirements and compatibility with the respective safety guides:

- Waste management facilities;
- Radiation sources facilities and activities;
- Decommissioning;
- Transport of radioactive materials;
- Control of medical exposure;
- Occupational radiation protection;
- Public and Environmental exposure control;
- Waste management (policy and strategy, predisposal and disposal); and
- Selected policy issues.

Mr Nawaf Aljebali Representative made presentations on the national context, the current status of NRRC and the self-assessment results to date.

IAEA staff presented the IRRS principles, process and methodology. This was followed by a discussion on the tentative work plan for the implementation of the IRRS in The Kingdom in March 2022.

The proposed composition of the IRRS team was discussed and tentatively confirmed. Logistics including meeting and workplaces, counterparts and Liaison Officer identification, proposed site visits, lodging and transportation arrangements were also addressed.

The Liaison Officer for the IRRS mission was confirmed as Mr Nawaf Aljebali, Liaison Officer and deputy Mr Fahad Alzakari.

NRRC provided IAEA with the advance reference material (ARM) for the review at the end of August 2023, In preparation for the mission, the IAEA review team members reviewed The Kingdom advance reference material and provided their initial impressions to the IAEA Team Coordinator prior to the commencement of the IRRS mission.

B) REFERENCES FOR THE REVIEW

The relevant IAEA safety standards and the Code of Conduct on the Safety and Security of Radioactive Sources, were used as review criteria. The complete list of IAEA publications used as the references for this mission is provided in Appendix VII.

C) CONDUCT OF THE REVIEW

The initial IRRS team meeting took place on Saturday, 30 September, 2023 in Riyadh, directed by the IRRS team Leader and the IRRS IAEA Team Coordinator. Discussions encompassed the general overview, the scope and specific issues of the mission, clarified the bases for the review and the background, context and objectives of the IRRS programme. The understanding of the methodology for review was reinforced. The agenda for the mission was presented to the team. As required by the IRRS Guidelines, the reviewers presented their initial impressions of the ARM and highlighted significant issues to be addressed during the mission.

The host Liaison Officer was present at the initial IRRS team meeting, in accordance with the IRRS Guidelines, and presented logistical arrangements planned for the mission.

The IRRS entrance meeting was held on Monday, 1 October, 2023, with the participation of senior management and staff from NRRC. Opening remarks were made by Mr Khalid Aleissa, CEO, NRRC and the recently appointed Mr Paul Dale, IRRS team Leader. Mr Nawaf Aljebali, Liaison Officer, gave an overview of The Kingdom, context, NRRC activities and the Action Plan prepared as a result of the pre-mission self-assessment.

During the IRRS mission, a review was conducted for all review areas within the agreed scope with the objective of providing The Kingdom and NRRC with recommendations and suggestions for improvement and where appropriate, identifying good practice. The review was conducted through meetings, interviews and discussions, visits to facilities and direct observations regarding the national legal, governmental and regulatory framework for safety.

The IRRS team performed its review according to the mission programme given in Appendix II.

The IRRS exit meeting was held on Tuesday, 10 October, 2023. The opening remarks at the exit meeting were presented by Ms/Mr Representative and were followed by the presentation of the results of the mission by the IRRS team Leader Mr Paul Dale Team Leader. Closing remarks were made by Ms Hildegarde Vandenhove Director, IAEA, Director, Division of Radiation Transport and Waste Safety, IAEA.

An IAEA press release was issued.

1. RESPONSIBILITIES AND FUNCTIONS OF THE GOVERNMENT

1.1. NATIONAL POLICY AND STRATEGY FOR SAFETY

The system of governance in The Kingdom of Saudi Arabia is monarchical and consists of the Judicial authority, Executive authority and the Regulatory authority. These Authorities cooperate in the discharge of their functions in accordance with the Basic Law of Governance and the other laws with the King being the ultimate head of these authorities.

The Council of Ministers, established under the Law of the Council of Ministers, is the executive authority with full power over all executive and administrative affairs of The Kingdom. The government has established its national policies and strategies for safety with the legislative provisions for the implementation of these policies set out in several legal documents.

The framework for safety is promulgated under a number of Royal Decrees and Cabinet Resolutions which provide for national policies regarding safety of facilities and activities. The following three national policies reflect The Kingdom's long-term commitment to safety and to protect people and the environment from harmful effects of ionizing radiation:

- The National Policy for the Atomic Energy Program established under Cabinet Resolution No. (333) on 13 March 2018 which limits nuclear development activities to peaceful purposes, including applying safety and security standards in nuclear and radiological facilities, and optimal use of natural resources of nuclear material;
- The National Policy for Radioactive Waste Management promulgated under Cabinet Resolution No. (371) on 16 February 2021 sets the national framework for the safe and transparent management of radioactive waste; and
- The National Policy for Occupational Safety and Health promulgated by the Cabinet Resolution No. (328) on 26 January 2021 seeks to protect the right of the worker against threats to safety or heath. The Occupational Safety and Health policy framework underpins the need for the protection of the workers, general public, and the environment, in accordance with local standards and regulations, as well as international treaties and agreements to which the country is a party to.

The *National Policy for Occupational Safety and Health*; the *National Policy for the Atomic Energy Program* and *National Policy for Radioactive Waste Management* express a commitment to protect people and the environment within the scope of the application of the policies. The intent to implement the safety principles is also captured within these three policy documents.

The review by the IRRS team has revealed that the fundamental safety objective and the ten underpinning principles have been captured under the *Law of Nuclear and Radiological Control* (the Law), the suite of regulations and the *Statute of the Nuclear and Radiological Regulatory Commission* (the Statute). The scope of safety and protection should extend to all exposure situations including existing exposure situations. This is further discussed in section 1.2.

The Kingdom through the national policies and the legal framework has expressed long commitment to safety to ensure that the radiation risks associated with facilities and activities are appropriately managed in the country.

1.2. ESTABLISHMENT OF A FRAMEWORK FOR SAFETY

The framework for safety is provided for under a number of Royal Decrees and Cabinet Resolutions which give effect to national policies regarding radiation safety.
The legal and regulatory framework for safety established under the *Law of Nuclear and Radiological Control* (the Law) promulgated by Royal Decree No. (M/82) on 10 April 2018, aims to:

- achieve the highest standards of security, safety and nuclear safeguards for activities and facilities;
- provide protection for people and the environment from harmful effects of ionizing radiation; and
- fulfil the government's obligations under treaties and conventions.

The *Statute of the Nuclear and Radiological Regulatory Commission* and the *Law of Civil Liability for Nuclear Damage* also form part of the legal framework. A number of regulations are promulgated under the Law to support its implementation.

The Statute promulgated by Cabinet Resolution No. (334) on 13 March 2018 defines the NRRC's objectives and functions. The NRRC has been established as an independent regulatory body and assigned the full scope of responsibility for the regulation of facilities and activities. There are other agencies that support the national regulatory framework for radiation safety.

The requirements established under the framework are largely in alignment with requirements specified under IAEA GSR Part 1 (Rev. 1). The law sets the objectives for the protection of people and the environment against radiation risks by ensuring the safety in the operation of facilities and the conduct of activities. The requirement for the protection of present and future generations is more explicitly provided for in the context of radioactive waste management under the Law. The need for protection and safety of future generations and populations may also arise from existing exposure situations; for example, past activities that were never subject to regulatory control or that were subject to regulatory control but not in accordance with the requirements of current protection and safety standards.

The Law specifies the scope of activities and facilities that are within the framework of safety as well as the types of authorizations that may be granted. The legal framework provides for a graded approach in all regulatory activities including authorization, review and assessment, and inspection and enforcement activities. The responsibilities for safety are also clearly assigned, with the prime responsibility for safety being placed on the authorized person even if the authorization is suspended, revoked or not renewed. If the licensees fail to meet their legal obligations, the King Abdullah City for Atomic and Renewable Energy (KACARE) takes over the responsibility for the safety and security of the radioactive sources, without relieving the authorized person of obligations for safety or financial responsibilities. The Law allows for appeal against the decisions of the NRRC.

The legal framework has also made provisions for emergency preparedness and response plans for activities and facilities, as part of authorization requirements. Transfer of radiation sources must only be between authorized parties with the approval of the NRRC.

The *National Policy for the Atomic Energy Program* and the Statute provides for ensuring adequate human and financial resources to enhance the country's national capabilities in its endeavour to achieve sustainability for its national nuclear program.

The Law provides for responsibilities to be assigned to the authorized person for the management of radioactive waste and spent fuel and for decommissioning of facilities, and termination of activities. The *National Policy for Radioactive Waste Management* requires that authorized persons for activities which generate radioactive waste are fully responsible for the safety and handling of radioactive waste, including the financial, technical, logistical, and administrative aspects required for the management of radioactive waste from the moment of production until final disposal. If the authorized person fails to undertake their responsibility, KACARE would then assume this responsibility, without relieving the authorized person the obligation including financial responsibilities.

The Law has placed requirements for the import, transhipment and export of radioactive, nuclear material, and nuclear-related items from, to, and via The Kingdom. These requirements apply to all movements into, out of, or through The Kingdom as well as the use of maritime, air, land modes of transportation. Other relevant national authorities (e.g., General Authority of Civil Aviation, the Saudi Ports Authority, the Economic Cities and special Zones Authority, and Transport General Authority) have been involved in developing and implementing requirements under the leadership of the NRRC.

1.3. ESTABLISHMENT OF A REGULATORY BODY AND ITS INDEPENDENCE

The NRRC is the sole regulatory body established in 2018 under the *Statute of the Nuclear and Radiological Regulatory Commission* (the Statute) promulgated under Cabinet Resolution (No.334).

The NRRC has been established as an independent Government body reporting directly to the Prime Minister. The Statute specifies the NRRC's duties and powers, organizational structure, governance, functions, as well as financial resources and budget. Under the Statute, the NRRC's objective is to regulate facilities and activities involving the peaceful use of nuclear energy and ionizing radiation; to control and ensure the safety and security of such use and compliance with nuclear safeguards; to protect humans and the environment against any actual or potential exposure to radiation, including exposure to natural radiation; and to implement the country's obligations under relevant treaties and conventions. The Government, through the provisions in the Law and the Statute, has empowered the NRRC to make any safety related decisions as appropriate.

The functions assigned to the NRRC under the Law and the Statute are largely consistent with the IAEA Safety Standards.

The Government has made appropriate arrangements to coordinate with other relevant authorities such the Zakat, Tax and Customs Authority (ZATCA), Saudi Ports Authority (MAWANI), General Authority of Civil Aviation (GACA), Ministry of Industry and Mineral Resources with complementary responsibilities for safety in areas such as nuclear security, emergency preparedness and safe transport of sources. These coordination efforts are overseen by the Bureau of Experts under the Council of Ministers responsible for implementing national mechanisms enabling authorities to perform their functions in compliance with their approved statutes.

The NRRC is governed by a Board of Directors comprised of a Chairman appointed by a Royal Decree, the Chief Executive Officer (CEO), and five members appointed by a Cabinet Minister Decision on recommendation by the Chairman of the Board of Directors. The Board of Directors oversees the management and discharge of functions by the NRRC, specifically:

- Propose draft laws including amendments and secure approval in accordance with applicable statutory procedures;
- Approve the Commission's organizational structure and submit it for approval in accordance with applicable statutory procedures;
- Approve technical regulations relating to activities, practices and facilities;
- Approve administrative, financial and other general policies;
- Approve NRRC's annual budget and auditor's report,
- Approve the NRRC's annual report on its activities; and
- Determine the fees for licenses and charges for NRRC services; etc.

Under the Statute, the NRRC has been assigned financial and administrative independence. The NRRC's management system and the functional separation between the Board and the NRRC support independent decision-making by the NRRC in the performance of its regulatory functions. The NRRC's management system also ensures that responsibilities assigned to the regulatory body are properly discharged and are not based on decision making by individual staff members.

Under the Statute, the NRRC plans its activities and programs annually and allocation of resources needed for implementation are submitted to the Board of Directors for approval. The NRRC financial resources may consist of allocations in the State budget, fees for the issuance of licenses and the provision of services and other resources approved by the Board. The fees received by NRRC are transferred to the consolidated funds being managed by the Ministry of Finance and disbursed in accordance with the Commission's approved budget.

1.4. RESPONSIBILITY FOR SAFETY AND COMPLIANCE WITH REGULATIONS

The legal and regulatory framework assigns the prime responsibility for the safety of activities and facilities to the authorized person. The Law provides for the prime responsibility for safety, security and safeguards of the nuclear activity to be placed on the authorized person. This applies even if the licence is suspended, revoked or not renewed. The responsibility for safety is extended for the lifetime of the facility or activity including siting, design and operation of the facility until release from regulatory control.

The Law has also assigned responsibility to other parties with responsibilities for protection and safety such as radiation safety officers, qualified persons, suppliers of sources, medical practitioners, etc.

The prime responsibilities of the authorized person are not diminished by the appointment of a radiation safety officer, or by the use of qualified experts or technical support organizations.

The Law requires that the applicants for a licence demonstrate appropriate capabilities and financial resources to operate the facility or carry out an activity.

The Law requires that authorized persons demonstrate compliance with safety requirements as specified under the NRRC regulations and guidelines. This does not, however, relieve the authorized persons of their prime responsibility for safety as prescribed under NRRC-R-01.

Under the legal framework, the authorized persons and other persons responsible for safety are required to establish a radiation protection program that is commensurate with the radiation risks associated with the facility or activity in accordance with the requirements prescribed under NRRC-R-01. The authorized person and any other person having responsibilities in relation to protection and safety are required to ensure that all persons engaged in activities relevant to protection and safety have appropriate education, training and qualification, so that they understand their responsibilities and able to perform their duties competently.

The regulation requires that authorized parties consult with qualified experts as necessary in regard to ensuring the requirements of regulation are appropriately fulfilled.

The IRRS team notes that the allocation of responsibility to authorized persons and other parties responsible for safety under the legal framework are consistent with the IAEA Safety Standards.

1.5. COORDINATION OF AUTHORITIES WITH RESPONSIBILITIES FOR SAFETY WITHIN THE REGULATORY FRAMEWORK

Under the Statute, the NRRC is required to coordinate and cooperate, as appropriate with other relevant national and international authorities and organizations, in the performance of its regulatory functions in ensuring safety, security and safeguards.

As a proactive measure the NRRC sought Government approval for establishing a Joint Government Organizations Policy (JGoP) between NRRC and each of the relevant Government organizations that have a role in ensuring safety. The JGoPs describe in detail the tasks and responsibilities of each entity and the concept of operation between NRRC and the other entities to conduct these tasks. The JGoPs are approved by the Council of Ministers with mandatory implementation and overseen by the Bureau of Experts at the Council of Ministers.

The IRRS team was informed that the Government has approved JGoPs between the NRRC and:

- Ministry of Energy and the Ministry of Foreign Affairs in relation to the role of each entity in the international representation of The Kingdom, including IAEA, and in relation to the peaceful use of nuclear energy, nuclear regulatory matters, and nuclear non-proliferation; and

- Other Governmental entities (Ministry of Foreign Affairs, Ministry of Interior, Customs, Presidency of State Security) in relation to specifying the roles and responsibilities of these entities for IAEA Safeguards inspections.
- The NRRC is also in process of finalising the JGoPs with other national agencies. These agencies include:
- Zakat, Tax and Customs Authority (ZATCA) responsible for the control of the import and export of nuclear materials, radioactive materials, and nuclear related items. ZATCA has a role in controlling illicit trafficking including items that could be contaminated with radioactive material through all the national ports (air, sea, and land).
- Riyadh Airports Company - Dammam Airports Company - King Abdulaziz International Airport in Jeddah to limit the illegal movement of nuclear and radioactive materials;
- Ministry of Commerce, Ministry of Industry and Mineral Resources, and Ministry of Health to clarify the respective roles in issuing licenses in all activities in which nuclear materials are used for non-nuclear purposes, and
- Saudi Standards, Metrology and Quality Organization (SASO) that sets and issues special standards.

The IRRS team commends as good practice The Kingdom's arrangement for overseeing and mandating the need for national coordination and cooperation arrangements (JGoPs) under the leadership of the Council of Ministers and the Bureau of Experts at the Council of Ministers. Such arrangements have provided the framework for the NRRC in taking proactive steps to coordinate joint working arrangements and *to ensure delineation of* roles and responsibilities *(legal division of labour)* with agencies with complementary responsibilities for safety. The collaboration will also assist in benefiting from each other's operating experiences including pre-empting risks and issues that may lead to degradation of safety. Further discussions are in Module 3.4.

The IRRS team encourages The Kingdom to complete the number of JGoPs under development.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The NRRC took the initiative of establishing Joint Government organization Policies (JGoPs) between the NRRC and other relevant Government agencies to ensure legal division of labour between Government agencies for fulfilling the specific safety, security and safeguards objectives and provisions of the relevant laws.*	
(1)	**BASIS: GSR Part 1 Requirement 7 states that** *"Where several authorities have responsibilities for safety within the regulatory framework for safety, the government shall make provision for the effective coordination of their regulatory functions to avoid any omissions or undue duplication and to avoid conflicting requirements being placed on authorized parties'*
GP1	**Good Practice: Establishment of JGoPs as a legally binding mechanism for ensuring legal division of labour to deliver effective joint working arrangements and coordination between the NRRC and other relevant Government agencies for the tasks and responsibilities to be clearly assigned to avoid any omissions or undue duplication and to avoid conflicting requirements.**

The NRRC may also benefit by establishing coordination arrangements with other national agencies that have a complementary responsibility for safety, such as in the areas of safety and protection of workers and the environment, etc. In this regard, the Government should encourage the NRRC to undertake a systematic review to identify all national agencies with complementary responsibilities for safety that may impact on radiation safety and seek to establish JGoPs as appropriate.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The Government established some Joint Government organization Policies (JGoPs) between the NRRC and other relevant Government agencies to ensure clear legal division of labour. Other relevant national agencies with responsibilities for safety are yet to be identified and considered.*	
(1)	**BASIS: GSR Part 1 Requirement 7, para. 2.18 states that** *"…This coordination and liaison can be achieved by means of memoranda of understanding, appropriate communication and regular meetings. Such coordination assists in achieving consistency and in enabling authorities to benefit from each other's experience.*
S1	**Suggestion: The Government should consider undertaking a systematic review to identify and establish JGoPs between NRRC and all relevant national agencies with responsibilities for safety including finalising JGoPs under development.**

1.6 SYSTEM FOR PROTECTIVE ACTIONS TO REDUCE EXISTING OR UNREGULATED RADIATION RISKS

The Government has established as part of the legal and regulatory framework measures to deal with existing and unregulated risks.

Under NRRC-R-01, the NRRC is required to take measures using the principles of justification and optimisation to identify and assess the existing exposure situations and to determine the appropriate corrective or protective measures. As part of this assessment, the corresponding occupational and public exposures are also assessed.

The NRRC-R-01 specifies requirements for protective actions to reduce undue radiation risks associated with unregulated sources (natural and artificial origin) and contamination from past activities or events. The NRRC has also established a specific regulation on the Management of Naturally Occurring Radioactive Materials (NORM) in Non-radiological Industries (NRRC-R-01-SR11) seeking to control exposures.

The Government has designated organizations responsible for the protection of workers, the public and the environment to deal with existing exposure situations. Under NRRC-R-01, general responsibilities for the management of existing situations, including requirements for the remediation of areas with residual radioactive material, have been assigned. NRRC-R-01 specifies:

- reference levels for public exposure when planning and implementing remedial and protective actions;
- the requirement to comply with the objectives and protection strategy approved by the NRRC to reduce public exposure when remedial and protective actions are determined to be justified; and
- the requirement for individuals subject to exposures to be provided with the information on potential health risks and on the means available for reducing their exposures and the associated risks.

The NRRC has a significant role in the National Emergency Response Plan for Radiological and Nuclear Accidents (NERPRNA).

The NRRC has also been proactive in the recovery of legacy sources in The Kingdom. The IRRS team was apprised that the NRRC has embarked on a campaign to write to parties, such as universities, oil and gas industry, hospitals, etc., where there is a potential for legacy sources, to undertake an internal audit to catalogue and characterise radiation sources including safe and secure storage and disposal options. Under this initiative a number of sources have been retrieved and returned to international suppliers or sent to KACARE for safe storage pending disposal. However, additional expert support may need to be given to such parties to appropriately identify and make safe all legacy sources in The Kingdom.

1.7. PROVISIONS FOR THE DECOMMISSIONING OF FACILITIES AND THE MANAGEMENT OF RADIOACTIVE WASTE AND OF SPENT FUEL

The *National Policy for Radioactive Waste Management*, the Law and Regulations provide for the legal framework for the decommissioning of facilities and the management of radioactive waste. The Law also applies to radioactive waste generated from naturally occurring radioactive materials.

The *National Policy for Radioactive Waste Management* prohibits the importation of radioactive waste and requires that:

- disused radioactive sources are returned back to the supplier/manufacturers;
- options are considered for the final disposal of radioactive waste prior to its generation; and
- the organizations responsible for radioactive waste management, such as the KACARE, provide assistance to the NRRC in recovering and storing orphan sources and seized radiation sources.

The NRRC internal policy documents allow authorized persons to retain disused sources on the authorized premises.

The *National Policy on Radioactive Waste Management* also requires the authorized person to be responsible for the safe management and handling of radioactive waste including the financial, technical, logistic and administrative aspects necessary for radioactive waste management, from waste generation to disposal. This may include the final disposal, i.e., either transfer of radioactive waste to national facilities licensed for management of radioactive waste or until the release of such waste from regulatory control. The authorized person is required to provide financial assurances and resources to cover the costs associated with safe decommissioning, including the management of the resulting radioactive waste.

The Law empowers the NRRC to set terms and conditions for the management of radioactive waste. The regulatory measures under NRRC-R-16 set out the safety objectives, criteria and requirements for the protection of human health and the environment for the predisposal management of radioactive waste, including disused sealed sources declared as radioactive waste. The obligations for ensuring safety and security of radioactive waste are placed on the authorized person.

In relation to decommissioning, the Regulation on Decommissioning of Radiation Facility (NRRC-R-01-SR15), sets the safety requirements and process for the decommissioning of a radiation facility and is applicable to all aspects of the decommissioning of a facility, including the planning, conduct and completion of decommissioning actions and the termination of the authorization for those actions.

While the *National Policy on Radioactive Waste Management* and the Law have made provisions for the safe management of radioactive waste and decommissioning of facilities, the IRRS team notes that certain key elements of radioactive waste management have not been provided for in the legal framework, such as the need for:

- current and future inventory of waste sources in The Kingdom;
- options for pre-disposal management of radioactive waste and planed technologies;
- schedule of development of disposal facilities;
- financial aspects of management of radioactive waste including options for user-pay;
- construction of disposal facilities; and
- interdependences of steps in the predisposal management of radioactive waste and impact of the anticipated disposal option; etc.

The National Policy for Radioactive Waste Management also requires that the authority/organization for radioactive waste management develop a strategy and plans for radioactive waste management including disposal. Therefore, establishment of a comprehensive national strategy is needed to underpin the *National Policy on Radioactive Waste Management*.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *There are some aspects of radioactive waste management strategy scattered in legal framework of The Kingdom but consolidated national strategy for radioactive waste management is yet to be established.*	
(1)	**BASIS: GSR Part 5 Requirement 2, states that** *"To ensure the effective management and control of radioactive waste, the government shall ensure that a national policy and a strategy for radioactive waste management are established. The policy and strategy shall be appropriate for the nature and the amount of the radioactive waste in the State, shall indicate the regulatory control required, and shall consider relevant societal factors. The policy and strategy shall be compatible with the fundamental safety principles and with international instruments, conventions and codes that have been ratified by the State. The national policy and strategy shall form the basis for decision making with respect to the management of radioactive waste.*
(3)	**BASIS: GSR Part 5 Requirement 2, para 3.6, states that** *"The national strategy for radioactive waste management has to outline arrangements for ensuring the implementation of the national policy. It has to provide for the coordination of responsibilities. It has to be compatible with other related strategies such as strategies for nuclear safety and for radiation protection."*
R1	**Recommendation: The Government should establish a national strategy for radioactive waste management to outline arrangements for ensuring the implementation of the national policy.**

The requirements under NRRC-R-16 has provided for the management of disused sources. When a source becomes disused, the authorized person is required to explore options for the further management of the source, which include:

- Return to the manufacturer or supplier;
- Recycle and reuse by other authorized person;
- Transfer to a licensed, interim or long-term storage facility; and
- Safe disposal in accordance with the national regulation.

Although there is requirement for the authorized persons to transfer disused sources to an interim or long term storage facility the government has yet to enable the establishment of such storage facilities.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *There is no long-term storage for disused radioactive sources in The Kingdom.*	
(1)	**BASIS: Code of Conduct on the Safety and Security of Radioactive Sources, para. 20 states that** *"Every State should ensure that the regulatory body established by its legislation has the authority to:…* *(q) ensure that, where disused sources are stored for extended periods of time, the facilities in which they are stored are fit for that purpose."*
(2)	**BASIS: Guidance on the Management of Disused Radioactive Sources para. 11 states that** *"Each State should establish a national policy and strategy for the management of disused sources that reflects the State's long-term commitment to their safe and secure management. The policy and strategy together should:…* *f. Ensure the availability of short-term storage and transport arrangements for the management options adopted;…* *h. Ensure the timely availability and sustainability of long-term storage, and the necessary financial and organizational resources;* *i. Provide for the development of a national disposal programme for disused sources in a timely manner;"*
S2	**Suggestion: The Government should consider establishing long-term storage for disused**

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
	radioactive sources in The Kingdom.

The NRRC tracks the inventory of disused sources using its information management system AMAN system and the National Registry. However, the *National Policy on Radioactive Waste Management* does not address the requirements for interim targets and end states to enable effective management in the safe disposal of radioactive waste. Such requirements are important for the management of long-lived sources awaiting disposal to ensure a planned approach which clearly specifies criteria for storage and transfer to interim or long-term storage facility (when available) to deal with high level waste, including maintaining appropriate long term institutional control.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The Government has yet to establish the requirements for interim targets and end states to enable effective management in the safe disposal of radioactive waste.*	
(1)	BASIS: GSR Part 1 Requirement 10, para. 2.28 (X) states that *"Decommissioning of facilities and the safe management and disposal of radioactive waste shall constitute essential elements of governmental policy and the corresponding strategy over the lifetime of facilities and the duration of activities. The strategy shall include appropriate interim targets and end states. Radioactive waste generated in facilities and activities necessitates special consideration because of the various organizations concerned and the long timescales that may be involved. The government shall enforce continuity of responsibility between successive authorized parties. …".*
R2	**Recommendation: The Government should within its National Strategy establish requirements for interim targets and end states to enable effective management in the safe disposal of radioactive waste.**

1.8. COMPETENCE FOR SAFETY

The *National Policy for the Atomic Energy Program* has established the framework for providing human and financial resources to achieve sustainability for the country's national nuclear program and to this end, the Government is seeking to establish collaborative bilateral and multilateral partnerships with other States and technical organizations within and outside The Kingdom.

The NRRC is developing a technical competency framework for its core business sectors and functional mandates which will embed the competencies in all human resources activities. The NRRC is also in the process of developing an Expert Development Program to develop specific expertise (Subject Matter Experts) within the NRRC, including leadership development programs.

In relation to developing competence of NRRC staff, the NRRC Statute empowers the CEO of the NRRC to approve and monitor the Commission's training, scholarships and secondment plans and programs. The *NRRC Policy Manual on Human Capability Development Program to Perform an Effective Regulatory Functions* (NRRC-PoM-001) is consistent with The Kingdom's National Policy for Human Resources Development. In particular, the policy establishes strategies for human resources to effectively implement its regulatory functions. For example, the NRRC has initiated a comprehensive program for the training of its personnel to develop inspectors' competencies in order to fulfil their regulatory functions of review and assessment, inspection, and enforcement. Specifically, a certification system of assessors and inspectors based on three levels of competence has been established for NRRC staff prior to their appointment in order to perform their regulatory tasks and duties.

The Radiation Safety regulation NRRC-R-01 requires the authorized person to ensure that all personnel engaged in activities relevant to protection and safety have appropriate education, training and qualification(s), so that they

understand their responsibilities and be able to perform their duties competently. The NRRC has placed reliance on authorized parties to secure training for their staff. While there are competency requirements for some activities, many are still under development.

Some NRRC initiatives include:

- Training Course on Radiation Protection and the Safety of Radiation Sources for professionals from different national stakeholders who need to acquire advanced knowledge in radiation protection and safety of radiation sources; and
- Development of appointment criteria for the Radiation Safety Officer; a training syllabus for the certification of Radiation Safety Officer is still under development, as well as training material to further enhance a support mechanism for the certification examination. Criteria for the identification (and eventually certification) of training providers have not been established yet.

In relation to qualified experts, the regulation (NRRC-R-01) requires authorized persons to identify and use qualified experts for providing advice on compliance with the regulatory requirements. The qualifications and experience of qualified experts are required to be appropriate for the assigned tasks commensurate with the risks of the activity or facility for which their advice is requested. The NRRC is yet to provide competency requirements or guidance for the recognition of qualified experts. This issue is addressed in Recommendation in Section 5.1.

The NRRC is also preparing guidelines and competence requirements for workers with responsibilities for safety for specific activities and facilities. The need to establish criteria for the certification of training providers has also been recognised.

For health professionals, the Saudi Commission for Health Specialties (SCFHS) has developed a professional classification and registration of all medical practitioners and other health professionals, including medical physicists, technologists, nurses, and radiographers. The assessment of the competence for medical practitioners and other health professionals is performed by SCFHS.

The NRRC acknowledges that there is a need for additional measures to systematically build and maintain competence of all parties having responsibilities for safety of facilities and activities.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *Although a range of provisions and mechanisms have been developed to build competence in safety, the competence framework has not been fully established for all parties with responsibility for safety. (As Addressed in the Action Plan).*	
(1)	**BASIS: GSR Part 1 Requirement 11, states that** *"The government shall make provision for building and maintaining the competence of all parties having responsibilities in relation to the safety of facilities and activities"*
S3	**Suggestion: The Government should consider establishing the competence framework led by the NRRC for building and maintaining competence in safety.**

1.9. PROVISION OF TECHNICAL SERVICES

There are seven (7) Technical Service Operators (TSOs) providing dosimetry services and three (3) organizations for the calibration of equipment.

The requirement for authorized persons to use recognised technical services which provide personal dosimetry, environmental monitoring, and calibration of equipment has been provided for under the Law. The regulation also specifies requirements for appointing a Technical Service Organization (TSO). The authorized person is required to

ensure that the appointed TSO has been approved by the NRRC. In this regard, the NRRC has developed the *NRRC Policy Manual on Recognition of Dosimetric Service Providers*, which requires that authorized persons only use service providers who have adequate competence. However, competency requirements for TSOs are yet to be specified. Further, the NRRC has not implemented measures to recognise TSOs and therefore the TSOs are at present not recognised by the Commission.

The NRRC is working with the IAEA on a project to develop clear mechanisms for setting the criteria to recognise TSOs, in collaboration with the relevant national authorities such as King Faisal Hospital and Research Centre (KFSH & RC), KACST, and the Saudi Standards, Metrology and Quality Organization.

The technical services available in The Kingdom for assessment of internal doses currently only include the monitoring of radioactive iodine to the thyroid gland. The range of facilities and activities in the country includes the handling of unsealed radioactive sources which comprise several different isotopes that may present a risk for internal contamination. This highlights the need to complement existing capabilities with a wider range of direct and indirect methods and capabilities to carry out such dose assessments.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *Measuring capabilities in The Kingdom for direct and indirect monitoring of internal contamination cover only the assessment of the committed dose to thyroid due to iodine. This issue was identified in the ARM.*	
(1)	**BASIS: GSR Part 1 (Rev1) Requirement 13 states that** *"The government shall make provision, where necessary for technical services in relation to safety, such as services for personal dosimetry, environmental monitoring and the calibration of equipment."*
R3	**Recommendation: The Government should develop a strategy to ensure availability of technical services in the country.**

1.10. SUMMARY

The Kingdom of Saudi Arabia through the national policies and the legal framework has expressed long commitment to safety to ensure that the radiation risks associated with facilities and activities are safely and effectively managed in the country. The requirements established under the framework are largely in alignment with requirements specified in the IAEA GSR Part 1 (Rev. 1).

The IRRS team commends as good practice The Kingdom's arrangement for overseeing and mandating the need for national coordination and cooperation arrangements through the Joint Government Organizations Policies developed under the leadership of the Council of Ministers and facilitated by the Bureau of Experts.

The IRRS team has made a number of recommendations and suggestions to the Government to strengthen The Kingdom's legal framework for safety and protection. These include:

- undertaking a systematic review to facilitate JGoPs with all national agencies with complementary responsibilities for safety;
- Establishing long-term storage for disused radioactive sources in The Kingdom; and
- developing requirements for interim targets and end states to enable effective management in the safe disposal of radioactive waste.

2. THE GLOBAL SAFETY REGIME

2.1 INTERNATIONAL OBLIGATIONS AND ARRANGEMENTS FOR INTERNATIONAL COOPERATION

The Government has established multilateral treaties, conventions, and agreements to participate and promote international cooperation and assistance to enhance global safety including strengthening nuclear and radiation safety. In this regard the government has committed to a number of international resolutions and codes and assigned the responsibility to the NRRC for fulfilling the country's obligations including being a national contact for such arrangements. These obligations include preparing national reports, participating in international review conferences and meetings and adhering to Codes of Conduct as part of its regulatory functions.

The Kingdom has entered into the following multilateral treaties, conventions and agreements in relation to nuclear safety:

- Convention on Early Notification of a Nuclear Accident (ratified by Royal Decree No. M/51 on 21 May 1989) - The NRRC is the president of the National Committee for Response to Radiological and Nuclear Emergencies. As such it receives communications about nuclear and radiological accidents including evaluating risks and implementing appropriate measures;
- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (ratified by Royal Decree No. (M/51) on 21 May 1989) - The NRRC is responsible for all communications with the IAEA on nuclear and radiological emergencies within the framework of the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency and the Convention on Early Notification of a Nuclear Accident;
- The Convention on Nuclear Safety (CNS) (ratified by Royal Decree No. (M/8) on 2 February 2010) - Under the CNS, the NRRC has prepared and submitted The Kingdom's national reports, reviewed several contacting parties' national country reports and shared knowledge and experience feedback in matters related to nuclear safety; and
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (ratified by Royal Decree No. (M/64) on 9 October 2010). To demonstrate compliance with this Convention, the NRRC participated in the review of other contracting parties' reports in The Kingdom's country group and shared best practices for overcoming challenges. The country group identified four areas of good performance in the safety and security requirements developed by the NRRC to authorize interim storage.

The Kingdom has also entered into bilateral agreements with eleven countries contributing to the global safety regime. The countries include the Arab Republic of Egypt, The Republic of Finland, Russian Federation and the Republic of China. The focus areas of the agreements are:

- Cooperation in developing human capacity programs;
- Sharing experiences in regulating nuclear facilities and radiation practices;
- Information and exchange of expertise; and
- Joint efforts to enforce nuclear security and non-proliferation.

The Kingdom has also adopted IAEA safety standards under its regulatory framework, including participation in international peer review missions (IRRS, EPREV, INIR and ORPAS) coordinated by IAEA.

In addition to being a signatory to many IAEA conventions, The Kingdom has made a political commitment with regard to the Code of Conduct on the Safety and Security of Radioactive Source including the Guidance on Import and Export of Radioactive Sources and the Guidance on the Management of Disused Radioactive Sources. This Code of Conduct aims at helping national authorities to ensure that radioactive sources are used within an appropriate framework of radiation safety and security.

The IRRS team notes the strong efforts made by The Kingdom in fulfilling its international obligations and cooperation arrangements.

2.2. SHARING OF OPERATING EXPERIENCE AND REGULATORY EXPERIENCE

The Kingdom has signed a range of bilateral international agreements with a number of Member States (e.g., Finland, France, China, Republic of Korea, Russian Federation) with extensive experience in the peaceful use of nuclear technologies. These agreements include provisions on sharing technical expertise and services, including exchange of personnel.

The NRRC Statute stipulates that the NRRC shall "cooperate with relevant governmental agencies and similar authorities in other countries and international organizations". Under this provision, the NRRC has established partnerships with regulatory authorities in other Member States to exchange experience on the regulatory control of facilities and activities: the Finnish Nuclear Safety Regulatory Authority (STUK), the UAE Federal Authority for Nuclear Regulation (FANR); the Spanish Council for Nuclear Safety (CSN); the Czech State Office for Nuclear Safety (SÚJB) (formal agreement to be ratified).

The NRRC participates on a regular basis in IAEA conferences and meetings where regulatory authorities from IAEA Member States share their knowledge and regulatory experience.

Operational experience is collected from authorized parties at national level on both normal operation and abnormal conditions that are significant for protection and safety. This information is available to the NRRC, including a written report of any formal investigation relating to events as prescribed by the NRRC (NRRC-R-01: Section 29(90).

Although provisions and mechanisms have been established by the NRRC to exchange the regulatory and operational experience, procedures have not been established to systematically collect and analyze the information related to the operating and regulatory experience, and for the dissemination of the lessons learned, domestically and internationally.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The NRRC has yet to establish procedures to systematically collect the information and experience from authorized parties and regulatory bodies (from other Member States) in order to identify and disseminate lessons learnt from operating and regulatory experience . (As Addressed in the Action Plan).*	
(1)	**BASIS: GSR Part 1 Requirement 15 states that** *"The regulatory body shall make arrangements for analysis to be carried out to identify lessons to be learned from operating experience and regulatory experience, including experience in other States, and for the dissemination of the lessons learned and for their use by authorized parties, the regulatory body and other relevant authorities"*
R4	**Recommendation: The NRRC should develop and maintain a mechanism for systematically collecting, analysing, and providing feedback (at both national and international level) on measures taken in response to information from the operating and regulatory experience.**

2.3 SUMMARY

The Kingdom has implemented measures to enhance participation in the international community to promote global safety. The Kingdom has also entered into bilateral agreements with eleven countries contributing to the global safety regime. In addition to being a signatory to many IAEA conventions, The Kingdom has made a political commitment

with regard to the Code of Conduct on the Safety and Security of Radioactive Source including the Guidance on Import and Export of Radioactive Sources and the Guidance on the Management of Disused Radioactive Sources.

Although provisions and mechanisms have been established by the NRRC to exchange the regulatory and operational experience, procedures have not been established to systematically collect and analyze the information related to the operating and regulatory experience, and for the dissemination of the lessons learned, domestically and internationally.

3. RESPONSIBILITIES AND FUNCTIONS OF THE REGULATORY BODY

3.1. ORGANIZATIONAL STRUCTURE OF THE REGULATORY BODY AND ALLOCATION OF RESOURCES

The NRRC is the sole regulatory body responsible for nuclear and radiation safety and its roles and responsibilities are clearly defined in the Law and Statute of the Commission. The establishment of the NRRC is described in Section 1.3 above.

As per Article VI (6) of the Statute, the NRRC has the authority to decide on its organizational structure. The current organizational structure of the NRRC was developed with the aim to effectively discharge its responsibilities and perform its functions in a manner commensurate with the radiation risks associated with facilities and activities being carried out in the country.

The NRRC organizational structure comprises the following five (5) Sectors:

- Nuclear Control Sector,
- Radiation Control Sector,
- Nuclear Security and Non-Proliferation Sector,
- Risk, Emergency and Business Continuity Sector, and
- Organizational Support Sector.

The NRRC is headed by the CEO who reports to the Board of Directors. The following five (5) organizational departments of the Commission report directly to the CEO:

- General Department of International and Legal Affairs,
- General Department of Planning and Development of National Human Capacities,
- General Department of Organizational Relations and Communication,
- Office of Data Management and National Nuclear Registry, and
- Internal Audit.

The roles and responsibilities of the various Sectors, departments and offices of the NRRC, as well as the responsibilities of the CEO, the Vice-Presidents, the managers and other staff of the Commission are well defined.

At its commencement in 2019, the NRRC had 98 staff. The number of staff of the Commission has gradually increased during the past years, and currently the NRRC has 252 staff, of which 136 technical staff with different technical backgrounds perform the core regulatory functions. According to its Workforce Plan, the NRRC has planned to further expand its workforce. The NRRC is actively pursuing its efforts to complete the recruitment of its staff to ensure that it has adequate number of competent staff to effectively and efficiently carry out all its regulatory functions.

The Head Office of the NRRC is in the capital city of Riyadh. The Commission has three satellite offices located in Riyadh, Jeddah and Dammam airports, and also an office in Vienna, Austria. The three (3) offices at the airports, Jeddah, Riyadh and Dammam, are mainly to intercept and control import and export of nuclear and radioactive items at the borders. They also provide support for response to radiological emergencies, carrying out inspections at remote sites and performing follow up actions as and when needed. The office in Vienna is responsible for communication and coordination with the IAEA in relation to matters of safety, security, and safeguards. The NRRC efforts for proactive surveillance at the three main airports for ensuring an effective control on the import of nuclear and radioactive material and for ensuring their safe transportation is viewed by the IRRS team as a good performance.

The NRRC has the authority to modify its own organizational structure with the approval of the CEO and the Board of Directors, thereby rendering the organizational structure flexible and adaptable to different circumstances and demands.

Since its inception, the NRRC has been periodically reviewing its organizational structure and adapting itself to the rapid evolution of the Commission and the emerging needs of The Kingdom. The NRRC is encouraged to continue to optimize its organizational structure to ensure effective and efficient discharge of its responsibilities. In this process, it is advisable for the NRRC to give due attention to the distribution of expertise and competencies within its different organizational units, including the integration and interaction of the technical and administrative units involved in implementing the core and supporting regulatory functions.

3.2 EFFECTIVE INDEPENDENCE IN THE PERFORMANCE OF REGULATORY FUNCTIONS

The Government has established the NRRC as an independent regulatory body with financial and administrative autonomy reporting directly to the office of the Prime Minister. The NRRC has been given the power and authority by the provisions of the Law and the Statute, to make independent decisions related to the safety of activities, practices and facilities.

The annual budget of the NRRC is provided by the Government in accordance with procedures governing the State budget.

In line with the provisions made in the Procedure Manual for the Control of Externally Provided Services (NRRC-PM-062), the NRRC ensures that there is no conflict of interest while hiring services from TSOs and advisory bodies, thereby ensuring effective independence in its safety-related decision-making process.

Through its established management system, the NRRC ensures clear assignment of responsibilities for safety and a clear set of procedures for the execution of its core regulatory functions. The NRRC also ensures that its decision-making process for safety is not based on individual staff members.

The IRRS team was informed that the NRRC plans to provide some technical services such as dosimetry and calibration of radiation equipment. The NRRC may provide such services if alternate service providers are not available in The Kingdom. In such case, the NRRC will have to ensure that arrangements are in place to manage any conflict of interest that may arise.

Through the provisions of the law and statute, the NRRC has effective independence for the conduct of all its regulatory activities. However, the NRRC should ensure that, in practice, its effective independence is maintained and sustained. It is not only important for the NRRC to be independent but also be seen to be independent by all interested parties.

The IRRS team concluded that NRRC has effective independence in fulfilling its regulatory obligations and that there are adequate provisions in the Law and Statute for ensuring the independence in its regulatory decision-making processes.

3.3. STAFFING AND COMPETENCE OF THE REGULATORY BODY

At present, the NRRC has 252 staff, of which 136 technical staff with different technical backgrounds perform the core regulatory functions. The IRRS team was informed that the NRRC currently does not have adequate competent staff to carry out all its functions and that the recruitment process is ongoing. A Workforce Plan has been prepared by the NRRC and the Commission is working towards expanding its workforce to ensure that it is able to effectively carry out all of its functions and activities. The NRRC is encouraged to continue its efforts in this regard.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The IRRS team was informed that the NRRC does not consider that it has sufficient qualified and competent staff to fulfil its current responsibilities. (As Addressed in the Action Plan).*	
(1)	**BASIS: GSR Part 1 Requirement 18, states that** *"The regulatory body shall employ a sufficient number of qualified and competent staff, commensurate with the nature and the number of facilities and activities to be regulated, to perform its functions and to discharge its Responsibilities."*
S4	**Suggestion: The NRRC should consider completing the recruitment of its staff to ensure that it has a sufficient number of staff to effectively carry out all its regulatory functions.**

A comprehensive human resources plan for the NRRC, with a detailed description of each position and position requirements, recruitment, rotation of staff and departure of staff, is yet to be developed. The competency needs assessment has been drafted and is expected to be in place in the second quarter 2024. The IRRS team also suggests that the NRRC include in its human resources plan provisions for the competence and knowledge management.

The NRRC conducts performance assessment of its staff; however, this assessment is currently limited to behavioral competence and not to the technical competence of its staff. There is still a need for the NRRC to carry out a comprehensive assessment of the technical competence of its staff and to develop a comprehensive training plan to address any competence gap.

There is no systematic training program to assist the development and maintenance of staff competence at the NRRC. This issue has been recognized in the NRRC self-assessment findings and has also been included in its action plan.

The NRRC regularly conducts seminars for senior staff and subject matter experts to share their knowledge and expertise with other staff. Such initiatives will contribute to professional development of NRRC staff while ensuring the transfer and preservation of knowledge within the organization.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The NRRC has developed a policy on human capacity development, however, supporting documents such as the competency needs assessment and the training operational plan are yet to be finalized and implemented. (As Addressed in the Action Plan).*	
(2)	**BASIS: GSR Part 1 (Rev 1) Requirement 18, states that** *"The regulatory body shall employ a sufficient number of qualified and competent staff, commensurate with the nature and the number of facilities and activities to be regulated, to perform its functions and to discharge its Responsibilities."* **BASIS: GSR Part 1 (Rev 1) Requirement 18, para. 4.11 states that** *"…A human resources plan shall be developed that states the number of staff necessary and the essential knowledge, skills and abilities for them to perform all the necessary regulatory functions."*
R5	**Recommendation: The NRRC should finalize the competency needs assessment and the training operational plan as provided in the policy on human capacity development to ensure adequate competence within the organization.**

3.4. LIAISON WITH ADVISORY BODIES AND SUPPORT ORGANIZATIONS

Article III (7) of the Statute provides for the NRRC to cooperate with relevant governmental agencies as well as with other regulatory bodies in other countries and international organizations. This is also being leveraged by the NRRC as an authority to liaise with advisory bodies and support organizations for the purpose of obtaining technical or other expert professional advice or services, as may be necessary.

Recognizing the need for effective coordination between the NRRC and other relevant government agencies, the Government has agreed for the establishment of Joint Government Organizations Policies (JGoP) between the NRRC and other government organizations with complementary regulatory roles for safety and security.

The JGoPs are being established between the NRRC and other relevant government organizations, namely Zakat, Tax and Customs Authority (ZATCA), security agencies, Ministry of Industry and Mineral Resources, General Authority of Civil Aviation (GACA), Saudi Ports Authority (MAWANI), Transport General Authority, etc. The JGoP describes, in detail, the tasks, roles and responsibilities of each entity and the need for *legal division of labour to deliver effective* joint working arrangements between the NRRC and the other government agency to perform the tasks. The provisions of the JGoP are legally binding on both the NRRC and to the counterpart agency as they are mandated by the Council of Ministers. The JGoP is acknowledged as a sound mechanism to ensure effective coordination between the NRRC and other government agencies.

The initiative of the NRRC to establish JGoPs is commendable and is acknowledged by the IRRS team as a good practice (referred GP1 section 1.5). Such a mechanism for ensuring effective joint working arrangements and coordination between government agencies is considered to be more effective than other coordination mechanisms such as the Memoranda of Understanding which are not legally binding.

The NRRC also has a mechanism in place to hire the services of other advisory bodies and TSOs. During the hiring process, the NRRC ensures that the advisory body or the TSO does not have a direct or indirect interest in performing the assigned task. So far, the NRRC has used TSOs in a few projects, in particular -

- For the licensing of the Low Power Research Reactor in KACST, Riyadh, where the NRRC had appointed KINS as the TSO to assign in the licensing process, more specifically for the review and assessment of the application.
- For siting the nuclear power plant, where the NRRC has appointed AFRY, a multinational company, for the engineer's consultancy services for the assessment of the proposed.

The hiring of the services of the TSOs was done in a manner to avoid any conflict of interest. The NRRC also exercises due diligence to ensure that there is impartially in the advice being provided by the TSOs. For some big projects, the NRRC may also use more than one advisory body to ascertain objectivity and impartially in the advice being received.

3.5. LIAISON BETWEEN THE REGULATORY BODY AND AUTHORIZED PARTIES

There is a good communication between the NRRC and the authorized parties. The NRRC has established formal and informal mechanisms of communication with authorized parties on safety related issues.

The NRRC has issued a series of guidance documents to assist the authorized parties in complying with the regulatory requirements.

Formal communications with the authorized parties also include the use of the AMAN system and the Governmental Consultation Platform known as *'Istitlaa'.*

3.6. STABILITY AND CONSISTENCY OF REGULATORY CONTROL

The NRRC has established a comprehensive management system with clearly defined processes and procedures for the execution of the core regulatory processes. The NRRC has digitized many of its processes through the AMAN system. All the applications for authorization are submitted to the NRRC through the AMAN system. This helps to ensure consistency in regulatory control.

The NRRC recognized that business continuity is essential for maintaining its reputation, credibility, and public trust as the national nuclear and radiological regulatory authority in The Kingdom. The NRRC has identified a commendable practice by establishing and maintaining a Business Continuity and Resilience Plan that ensures the continuity of its critical regulatory functions in any disruption or emergency that may affect its operations, staff, facilities, partners, and stakeholders. By adopting the Business Continuity Management System, the NRRC has demonstrated its resilience and compliance with the ISO 22301 standard, which is the recognized international standard for business continuity management.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The NRRC has established a comprehensive Business Continuity and Resilience Plan to ensure the continuity of its critical regulatory functions in any disruptive or emergency situation that may affect its operations, staff, facilities, partners, and stakeholders.*	
(1)	**BASIS: GSR Part 1 Requirement 22 Para 4.26 states that "**The regulatory process shall be a formal process that is based on specified policies, principles and associated criteria, and that follows specified procedures as established in the management system. The process shall ensure the stability and consistency of regulatory control…"
GP2	**Good Practice: The establishment of a certified Business Continuity Management System by the NRRC for maintaining the regulatory oversight of facilities and activities continuity of its critical regulatory functions in any disruptive or emergency situation.**

3.7. SAFETY RELATED RECORDS

The NRRC has developed an interactive electronic system, known as the National Registry System for managing the safety related information. The system is comprehensive with the capabilities to handle all the safety related records that are required to be maintained by the NRRC and has the following main features -

- Register of facilities information from the NRRC to conduct practices with radiation sources,
- Register of radiation sources within any activity or practice that requires an authorization issued by the NRRC and following up and monitoring the status of radioactive sources,
- Recording the data of workers and accumulated radiation doses for individual workers who perform tasks inside facilities that use radiation,
- Recording the radioactive waste;
- Flexibility that enables the NRRC and system users to update information and data continuously and directly, to enter and modify radiation source inventory data, and to request the transfer of ownership of any radiation source; and
- Presenting reports on the facilities and activities, including occupational doses.

The National Registry System is linked with the AMAN system. The IRRS team encourages the NRRC to implement measures for improving the integration between the two systems.

Both the AMAN system and the National Registry System are operational. However, the National Registry System has to be completed and then maintained with all the safety related records. It is suggested that NRRC expedite the process for populating its National Registry System to maintain all the required safety records.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The NRRC has developed an information system for maintaining all safety related information. The National Registry System is operational but not complete with all the safety related records that are required to be maintained. (As Addressed in the Action Plan).*	
(3)	**BASIS: GSR Part 1 (Rev. 1), para 4.63 and GSR Part 3, para 2.35 state that** *"The regulatory body shall make provision for establishing and maintaining the following main registers and inventories:* • *Records of doses from occupational exposure;* • *Registers of sealed radioactive sources and radiation generators;* • *Records relating to the safety of facilities and activities;* • *Records that might be necessary for the shutdown and decommissioning (or closure) of facilities;* • *Records of events, including non-routine releases of radioactive material to the environment;* • *Inventories of radioactive waste and of spent fuel."*
S5	**Suggestion: The NRRC should consider completing and then maintaining its National Registry System.**

3.8. COMMUNICATION AND CONSULTATION WITH INTERESTED PARTIES

The NRRC has assigned a dedicated department, namely the Stakeholders Relation Department, to communicate with the interested parties. The NRRC has also developed the Customer Relationship Management (CRM) system that is used by the department to communicate with stakeholders, with the aim to enhance management of stakeholder relations and communications.

The NRRC has implemented measures for ongoing communication with stakeholders including awareness campaigns, workshops, stands at malls and conferences, for licensees and for the general public. This has helped maximize the understanding of NRRC's role in nuclear safety and radiation protection. Results of sessions are publicly available on the NRRC website and social media. The IRRS team commends these dedicated efforts, including the establishment of dedicated Department to maintain proactive communications, as a good performance.

The NRRC also uses the governmental consultation platform known as *'Istitlaa'* for communicating with stakeholders and interested parties. The platform is a unified electronic platform that aims to receive views and feedback from anyone on law or regulation drafts before they are submitted for approval. The platform has proven to be an efficient means for the NRRC to communicate and consult with its stakeholders.

3.9. SUMMARY

The Kingdom has established the NRRC as the sole independent regulatory body for the regulatory control of facilities and activities. The NRRC has effective independence in the exercise of the regulatory functions.

Overall, the responsibilities and functions of the NRRC are in good compliance with IAEA safety standards. However, the following areas for further improvement have been identified:

- Human capacity development and competence management; and
- Maintaining safety related information.

The IRRS team recognizes the establishment of an accredited Business Continuity Management System by the NRRC as a good practice.

4. MANAGEMENT OF THE REGULATORY BODY

The Kingdom provided comprehensive information in the ARM on the management of the NRRC and provided further documentation during the Mission itself.

The management system has been developed since the NRRC was established. It contains the key elements of an integrated management system and comprises extensive documentation.

The NRRC has developed its management systems to be in line with the *Establishment Strategic Plan 2021-2023* , and continues to actively develop it.

4.1. RESPONSIBILITY AND LEADERSHIP FOR SAFETY

The NRRC has a defined leadership chain of responsibility that consists of:

- The Board of Directors consisting of a Chairman, Deputy Chairman, Chief Executive Officer and five specialists with experience,
- The Chief Executive Officer (CEO) who manages the organisation, according to the Board's decisions and provisions of the Statute, and
- The Vice-Presidents and General Managers of the General Departments which are accountable for their respective Sectors within the NRRC.

There is a management structure within the Sectors which is dependent on the functions of that sector.

The NRRC Vision Statement is: "*To be recognized as a highly competent, transparent, and accountable nuclear and radiological regulator"* and its Mission Statement is "*To regulate nuclear and radiological practices and provide high-quality nuclear and radiological regulatory services to protect people and the environment from the harmful effects of radiation".*

The overall goal of the NRRC, as stated in the NRRC *Establishment Strategic Plan 2021-2023,* is to *"Ensure safety from radiation while regulating beneficial uses".* The Strategy has a total of 15 objectives composed of a total of 57 initiatives.

The *Management System Policy Manual NRRC-PoM-008* provides the management system structure, including descriptions of the main functions and processes by which the NRRC achieves its mandate and goal.

As stated in the *Management System Policy Manual* the NRRC's aim is to manage and organize NRRC's overall operations in line with its core values, namely to:

- Be open to collaborate in new ideas, and information exchange,
- Be independent in making decisions,
- Be committed to perform its mission,
- Make decisions consistently and fairly according to science and Law, and
- Be transparent of its actions.

The NRRC has an annual planning cycle which is in alignment with the 57 strategic planning initiatives of the *Establishment Strategic Plan 2021-2023*. Under the planning cycle, the Project Management Office and the Strategy and Corporate Performance Department within the Planning and Development of National Human Capacities General Department monitor progress in the attainment of goals and produce reports on monthly and quarterly basis, respectively.

The workforce's commitment to safety is monitored as one aspect of the performance management system.

Recruited personnel are required to certify that they have read and understood the *"Code of Conduct of professional job and ethics of NRRC employees"*. This Code is designed to promote professionalism, deal with conflicts of interest as well as promotion of safety culture.

4.2. RESPONSIBILITY FOR INTEGRATION OF SAFETY INTO THE MANAGEMENT SYSTEM

The CEO is accountable by virtue of the Statute *Assuring the overall effectiveness of the NRRC's management system.* The CEO manages the NRRC, in accordance with the Board of Directors' decisions and provisions provided in Article VIII of the Statute.

The Vice-Presidents and General Managers of the General Departments are accountable for their respective areas and are to ensure that the management system is developed, implemented and assessed.

The Planning and Development of National Human Capacities General Department ensures the effectiveness of the implementation of the NRRC strategic plan by implementing a continuous evaluation mechanism with clear measurable criteria to monitor the progress of actions and the achievements of the strategic objectives. In this regard, there is a joint role of the Project Management Office (PMO) and Strategy & Corporate Performance Department to ensure the execution of projects and programs as derived from the strategic initiatives.

4.3. THE MANAGEMENT SYSTEM

The management system is designed to incorporate: National Policies; National Nuclear Laws; Technical Regulations; Implementing Regulations; Specific Regulations; Joint Government Policy Manuals; NRRC Policy Manuals; National Standards; Procedure Manuals; Stakeholder Guidelines; Internal Guidelines and Forms.

The NRRC has developed the structure of integrated management system with policy manuals covering a wide area of topics, including such topics as quality, business continuity, information security, occupational health and safety, etc.

A key policy manual is the *Management System Policy Manual NRRC-PoM-008* which presents the management system structure, including descriptions of the main functions and processes by which the NRRC achieves its mandate.

Processes within the NRRC are divided into three categories: core; strategic management and support.

The NRRC has developed a substantial amount of documentation and is actively producing further documentation.

As was noted in the action plan, not all documentation has been developed. This issue is addressed in Recommendation R6 in Section 4.5.

With regard to the review of the management system there is a *Procedure Manual for management review NRRC-PM-064*. The stated purpose of this Procedure Manual is "*To ensure periodic review of the management system such that its integrity is maintained and improved regularly."* The reviews are to be performed by a Quality Team which reports to the Management Review Meeting (meeting to be held at least annually).

The General Manager of Planning and Development of National Human Capacities is responsible for the management of conflicts of interest arising in decision making processes. The NRRC uses the "Procedure for nonconformity and corrective action" the NRRC-PM-063 to identify and resolve all non-conformances, errors, deviations, and deficiencies appearing in the processes that result or might result in noncompliance with any requirement within the scope of the Management System.

The Documents and Archives Centre under the Organizational Support Sector is responsible for managing, organizing, and protecting documents and records. Documents and records are controlled as per the NRRC procedure

manual *Documented Information NRRC-PM-059*. This procedure manual does not detail document retention times However, the NRRC documents and records are subject to the national laws and regulations applicable in The Kingdom and consistent with the National Centre for Archives and Records. The list of NRRC documents and their retention time were classified in the CEO letter number (13901) date (17-01-2023) to the National Centre for Archives and Records.

The NRRC has an internal portal which is the repository of management system documentation. Various software applications have been or are in the process of being developed to support the activities of the NRRC, namely:

- AMAN system - for notification, review and assessment, authorization and inspection processes;
- National Registry System - for facility records, radioactive sources, and occupational doses;
- Customer Relationship Management System - for communication with the stakeholders;
- Radiation Officers Portal - provides many services to the Radiation Safety Officers, as well as the necessary tools for managing and storing their related records; and
- Masar System - provides automated administrative communication services, to register correspondence workflow; and

4.4. MANAGEMENT OF RESOURCES

The NRRC follows the Human Resource Administrative Regulation which is a high-level document approved by the Board of the NRRC for use within the organization.

In March 2023 the NRRC developed a policy manual which outlines the approach for the development of human capabilities through *Human Capacity Development Program to Perform an Effective Regulatory Functions NRRC-PoM-001*. The NRRC is still to develop the supporting documents referenced in the policy including the Competency Needs Assessment and Training Operation Plan. This issue is addressed in Recommendation R5 in Section 3.3. The NRRC identified in its Action Plan for this IRRS Mission the need to periodically assess their operational training plan.

The NRRC has developed an internal guide for the selection of participants for the capacity building program: *Management of Capacity Building Program Nomination NRRC-IG-003*. The Planning and Development of National Human Capacities General Department is developing an instruction guide with respect to knowledge management. This issue is addressed in Recommendation R6 in Section 4.5.

4.5. MANAGEMENT OF PROCESSES AND ACTIVITIES

Processes within the NRRC have been divided into the following categories:

- Core processes - those activities that directly link to the NRRC's mandated responsibilities;
- Strategic management processes - those activities associated with managing the NRRC; and
- Support processes - those that support the optimal effectiveness of the core processes and the strategic management processes.

The NRRC has developed numerous Policy Manuals, Procedure Manuals, Instruction Guides and other documentation as part of their management system. However, as was recognised in the Action Plan, not all of the documentation has been developed.

There is need for the NRRC to produce further documentation to underpin its management system (such as procedures, criteria, strategies, guidance).

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The NRRC has developed a management system but further supporting documentation is required to be completed. (As Addressed in the Action Plan).*	
(1)	**BASIS: GSR Part 2 Requirement 10 states that** *"Processes and activities shall be developed and shall be effectively managed to achieve the organisation's goals without compromising safety".*
(2)	**BASIS: GSR Part 2 Requirement 10 para. 4.28 states that** *"Processes shall be documented and the necessary supporting documentation shall be maintained. It shall be ensured that process documentation is consistent with any existing documents of the organization. Records to demonstrate that the results of the respective process have been achieved shall be specified in the process documentation".*
(3)	**BASIS: GSR Part 1 (Rev. 1) Requirement 19 para 4.17 states that** "*The management system shall specify, in a coherent manner, the planned and systematic actions necessary to provide confidence that the statutory obligations placed on the regulatory body are being fulfilled. Furthermore, regulatory requirements shall be considered in conjunction with the more general requirements under the management system of the regulatory body; this helps to prevent safety from being compromised".*
R 6	**Recommendation: The NRRC should produce any remaining supporting documents and incorporate them in its management system in particular to ensure that the statutory and international obligations are being fulfilled, with emphasis on regulatory requirements to help preventing safety from being compromised.**

The workforce from the different sectors within the organisation have access to the documentation through the internal portal and have the appropriate access rights to software applications (referred to in section 4.3). The IRRS team was informed that there was no issue with the communication between the different sectors of the organisation.

The Government Tenders and Procurement Law is followed when the NRRC needs to outsource activities to support its functions. The *Management System Policy Manual* states that experts and TSOs are informed of the importance of avoiding conflicts of interest. The NRRC has developed the *Procedure Manual for Control of Externally Provided Services NRRC-PM-062* that is applicable to externally provided services. The IRRS team encourages the NRRC to further develop this procedure manual to detail all the provisions given in GSR Part 2 Requirement 11.

4.6. CULTURE FOR SAFETY

The performance management system is used to monitor an individual staff member's commitment to safety on an annual basis. The performance management system allocates 15% of an individual's performance target to safety culture promotion. The promotion of safety culture for the individual is included in the *Code of conduct of professional job and ethics of NRRC employees.*

On the organisational level there is a safety culture programme which the NRRC is seeking to further develop.

4.7. MEASUREMENT, ASSESSMENT AND IMPROVEMENT

The NRRC has a developed the *NRRC Procedure Manual Internal Audit NRRC-PM-061* for internal audits. An internal audit was performed in August 2022 by the Quality and Operations Department within the Planning and Development of National Human Capacities Sector.

The NRRC also has an external ISO9001 certificate issued in October 2022 and will be annually subject to recertification audits. The stated scope on the certificate was "*Oversight and control of nuclear and radiological facilities and practices".*

The IRRS team was also informed that the NRRC holds ISO 45001 certification which is applicable to any organization that wishes to establish, implement and maintain an occupational health and safety management system.

4.8. SUMMARY

The NRRC has developed its management system in line with the organisation's goals. It was evident to the IRRS team that the NRRC has given the development of its management system high priority and has made significant progress in a short period of time.

The IRRS team noted that the development of the management system has the full support of the Board.

Aware of the need to complete its management system, the NRRC has recently developed and introduced more documentation which will need to be implemented throughout the organization.

It was evident that the NRRC has already been working on addressing the issues in their action plan related to the management systems.

The IRRS team identified the following areas of improvement:

- The NRRC should produce all necessary documents and incorporate them in its management system.

5. AUTHORIZATION

5.1. GENERIC ISSUES

The NRRC is responsible for the authorization of facilities and activities. The Law provides for authorization by registration, license, permit and approvals. Permits are issued for specific activities, such as import and export while approvals are related to transport of radioactive material. All phases of a lifecycle of a facility are included in authorization, i.e. siting, design, construction, testing, commissioning, operational phase and closure phase. The modifications are also subject to authorization as well as discharges of radioactive material. The regulatory framework includes exemptions and clearance levels, authorization of discharges and requirements related to consumer products. The provision for renewal, suspension, revocation, and termination of authorizations are also provided for under the Law. The regulatory framework includes appeal against regulatory decision.

The NRRC authorization processes include notifications, registrations and licenses using graded approach. However, the IAEA team was informed that registration has not been implemented yet.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The graded approach has been embedded in legislation, however, authorization by registration has yet to be implemented.*	
(1)	**BASIS: GSR Part 3, Requirement 6 states that** *"The application of the requirements of these Standards in planned exposure situations shall be commensurate with the characteristics of the practice or the source within a practice, and with the likelihood and magnitude of exposures."*
(2)	**BASIS: GSR Part 3, Requirement 2, para 2.5 states that** *"The government shall promulgate laws and statutes to make provision for an effective governmental, legal and regulatory framework for safety. This framework for safety shall set out the following:…* *(3) The type of authorization that is required for the operation of facilities and for the conduct of activities, in accordance with a graded approach. Foot Note: Authorization takes the form of a written permission which could include, for example, licensing, certification or registration."*
R7	**Recommendation: The NRRC should broaden the implementation of the graded approach in authorization by implementing authorization by registration.**

In 2022 around 700 licenses have been issued and about 300 permits for import, export, and transfer of ownership of radioactive material. The authorization process is conducted by the NRRC staff organized in two departments within Radiation Control Sector which has about 50 people. The review and assessment process is conducted by the responsible department of the NRRC which has about 20 people. Another department within the Sector conducts communication with the applicants and prepares the authorization which is approved by the CEO. As a relatively new regulatory body the NRRC is implementing measures to build competence of its staff and the issue is addressed in Recommendation R5 in Section 3.3. The NRRC is also able to involve external experts to assist in the authorisation process.

The NRRC has published several Stakeholder Guidelines to be used by an applicant for the authorization. The guidelines are specific for specific practices and include requirements to be submitted with the authorization application, e.g. independent safety assessment. The AMAN system is an online platform that enables the applicant to provide all documents electronically.

The regulations contain general requirements for authorization of facilities and activities by registration or licensing processes. The regulations do not provide technical specifications and conditions to be used when operating specific facility or conducting an activity. The IRRS team was informed that NRRC is yet to develop a complete set of specific regulations and guides in relation to criteria to be used in authorization process. The IRRS team was informed that several technical guides are under development, e.g., for industrial radiography including criteria for authorization on a practice specific basis.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The NRRC is yet to develop full set of specific criteria to be used in authorization process for all facilities and activities.*	
(1)	**BASIS: GSR Part 1 (Rev. 1) Requirement 32 states that** *"The regulatory body shall establish or adopt regulations and guides to specify the principles, requirements and associated criteria for safety upon which its regulatory judgements, decisions and actions are based."*
R8	**Recommendation: The NRRC should develop full set of detailed and specific criteria to be used in authorization process for specific facilities or activities with radiation sources.**

The IRRS team was informed that TSO providing technical services to authorized parties with radiation sources, such as conducting leak tests of sealed sources, have not been recognised as service providers under the regulatory framework. The IRRS team was informed the NRRC plans to collaborate with Metrology and Quality Organization (SASO) in this respect.

The NRRC developed a location map of all radioactive sources in The Kingdom. The map is regularly updated and available for use by the NRRC staff. In addition, authorized parties using mobile radioactive sources are required to have a tracking system, which is a prerequisite for authorization. The IRRS team acknowledges location mapping and implementation of tracking system for mobile sources as **good performances**.

The regulations address qualified experts but there are no formally recognised qualified experts in The Kingdom.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation:. *There are no criteria for the recognition for the qualified experts within the framework for safety.*	
(1)	**BASIS: BASIS: GSR Part 3, Requirement 2, para 2.21 states that** *"The government shall ensure that requirements are established for:* *(a) Education, training, qualification and competence in protection and safety of all persons engaged in activities relevant to protection and safety;* *(b) The formal recognition of qualified experts;* *(c) The competence of organizations that have responsibilities relating to protection and safety."*
R9	**Recommendation: The NRRC should develop requirements for recognition of qualified experts and implement them.**

Criteria exist for authorized parties to ensure the competence of the dosimetry services. In addition, criteria for recognition of other technical service organizations by the NRRC should also be established. The NRRC is yet to formally recognize Technical Service Organizations in The Kingdom.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The Law and the regulations have specified that technical service organisations must be recognized and also requires authorized persons to use recognised Technical Service Organisations. The NRRC is yet to formally recognize Technical Service Organizations in The Kingdom*.	
(1)	**BASIS: GSR Part 1 Requirement 13, para. 2.41 states that** *". … The regulatory body shall authorize technical services that may have significance for safety, as appropriate.*
R10	**Recommendation: The NRRC should formally recognize Technical Service Organizations in The Kingdom that may have significance for safety.**

5.2. AUTHORIZATION OF RADIOACTIVE WASTE MANAGEMENT FACILITIES

The IRRS team noted that currently there is no spent nuclear fuel in The Kingdom. Nevertheless, there are general provisions for authorization of facilities and activities related to spent fuel management in the Law on Nuclear and Radiological Control (Articles I and V). The procedure of authorization begins with the approval of the Council of Ministers, which must be obtained prior to review of licence applications for nuclear facilities (Article VI). But currently there is no need for authorization of such facilities, as there are no such facilities in operation or under construction in The Kingdom.

According to the ARM information there are no centralized processing and storage or disposal facilities in The Kingdom. The IRRS team was informed that licensing of one storage facility is underway.

Radioactive waste is stored at waste producer facilities without processing. The licence application for use of sources or operation of radiation facility includes a radioactive waste management plan. The NRRC Stakeholder Guideline on Application for Authorization of Interim Storage for Radioactive Waste (NRRC-SG-004) gives the applicant and/or the authorized person clear and specific guidance on the submission for the purpose of authorization of interim storage of radioactive waste practices that include NORM waste. The Guideline sets provisions for location and design of the facility, operation stage including provisions on waste characterization, waste acceptance criteria, management of disused sealed radioactive sources, discharge or release of radioactive materials to the environment, and clearance.

The specific regulation on exemption and clearance levels, NRRC-R-01-SR01, establishes specific criteria concerning the exemption and clearance of radioactive materials based on which NRRC provides a regulatory decision for exemption or clearance. The regulation includes requirements on exemption levels for solid radioactive materials in quantities greater than one tonne containing radionuclides of artificial origin, activity concentrations of radionuclides of artificial origin, clearance levels for solid radioactive materials containing radionuclides of artificial origin and containing natural radionuclides, as well as mixtures of radionuclides of artificial origin and natural radionuclides.

5.3. AUTHORIZATION OF RADIATION SOURCES FACILITIES AND ACTIVITIES

The IRRS team was informed that 50% of facilities undertaking radiodiagnostic examinations using X-ray generators are not authorized in The Kingdom. The NRRC has identified such facilities and commenced with pre-authorization activities.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *Some facilities and activities using X-ray generators in radiodiagnostic examinations are not authorized in The Kingdom. The NRRC already identified them. (As Addressed in the Action Plan).*	
(1)	**BASIS: GSR Part 1 (Rev. 1) Requirement 23, states that** *"Authorization by the regulatory body, including specification of the conditions necessary for safety, shall be a prerequisite for all those*

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
	facilities and activities that are not either explicitly exempted or approved by means of a notification process."
R11	**Recommendation: The NRRC should expand the enforcement of the requirements that all facilities and activities using X-ray generators in radiodiagnostic examinations are authorized.**

The use of radiation sources in The Kingdom started in the 1950s, i.e. well before establishment of the regulatory regime. The NRRC identified in the Action plan a need to continue the search for orphan sources in particular those used in industrial facilities. The IRRS team was informed that the NRRC has commenced a search for radioactive sources which has resulted in identification of several sites where orphan sources were found. However, a comprehensive strategy to regain control over legacy sources is yet to be prepared.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *Although NRRC has in the past identified legacy sources. There is no comprehensive strategy or programme related to regaining control over legacy sources in the Kingdom. (As Addressed in the Action Plan).*	
(1)	**BASIS: GSR Part 3 para. 2.26 states that** *"The government shall ensure that arrangements are in place for regaining control over radioactive sources that have been abandoned, lost, misplaced, stolen or otherwise transferred without proper authorization."*
(2)	**BASIS: SSG-19 para. II.44 states that** *"The first element of any targeted search for an orphan source is the development of a systematic search plan. The search plan should specify:* *— The objectives of the search;* *— The boundaries of the search (geographical or temporal);* *— The radionuclide, or range of radionuclides, to be searched for;* *— The limits of the detection capabilities of the equipment;* *— Monitoring methods (hand-held detectors, vehicle mounted detectors or aerial surveys) to be used;* *— Procedures for dealing with a found source (including for ensuring radiation protection and the safe transport, interim storage and disposal of the source, and, if criminal activity is suspected, for ensuring that forensic aspects are addressed [50]);* *— Responsibilities and mechanisms for coordination of the various parties involved in the search;* *— The provision of human and financial resources;* *— Criteria for stopping the search (see paras II.52 and II.53)*
S6	**Suggestion: The NRRC should consider developing and implementing national comprehensive arrangements, with clear role of other relevant organization, to search and regain control over legacy sources including orphan sources.**

Reuse and recycling of disused radioactive sources are included in the framework. All imported sources are required to be returned to the supplier. If this is not possible, the source can be stored at the operator's premises for two years under the authorization for storage issued by the NRRC. After that time the source is declared as radioactive waste and must be taken by KACARE. The IRRS team noted that there is no long-term storage authorized in The Kingdom for disused radioactive sources as required in Article 100 (c) of the NRRC-R-16. This has been addressed in Suggestion S2 section 1.7.

5.4. AUTHORIZATION OF DECOMMISSIONING ACTIVITIES

In accordance with information provided by the ARM, there is no facility under decommissioning in The Kingdom. Stakeholder Guideline on Application for Authorization of Decommissioning of Multi-Stage Facilities (NRRC-SG-003) sets requirements for authorization for decommissioning activities. This guideline addresses the need for a management system, radiation protection, safety assessment and security aspects, decommissioning plan, radioactive waste management, and transport including security measure. However, it is considered that a graded approach in the application of the requirements taking into account the risks inherent to each facility. This guideline covers application for new, renewal and amendment applications.

In accordance with the provisions of NNRC-R-02, the strategy and initial plan of decommissioning is provided to the NRRC as part of an application for authorization of facilities. The decommissioning plan is evaluated during review of a licence renewal application in case of significant changes to the regulations, and technologies used in the facility, or due to accidents that have occurred.

5.5. AUTHORIZATION OF TRANSPORT

The NRRC is the Competent Authority in charge of regulating transportation of radioactive material in The Kingdom. The Law establishes the authority of the NRRC to regulate: (1) all activities and facilities that involve peaceful uses of nuclear power and ionizing radiation; (2) any actual or potential radiation exposure by humans or the environment in The Kingdom; and (3) transport of radioactive materials as well as import and export of nuclear materials and nuclear related items. For transport, the NRRC developed regulations based on IAEA SSR-6, "Regulations for the Safe Transport of Radioactive Material" (2018), in NRRC-R-15, "Safe Transport of Radioactive Materials" and NRRC-R-15-SR01, "Packaging and Transport of Radioactive Material." While the NRRC is the sole regulatory authority responsible for transport of radioactive materials in The Kingdom, the transport regulations were developed in coordination with other relevant authorities, including the General Authority of Civil Aviation, the Saudi Ports Authority, the Economic Cities and Special Zones Authority, and the Transport General Authority.

The NRRC can issue approvals for all of the transport designs and activities covered by SSR-6, as regulated by NRRC-R-15. The designs and activities covered by the NRRC regulations include:

- The design of a special form radioactive material;
- The design of low dispersible radioactive material;
- The design of packages to be used for the transport of 0.1 kg or more of uranium hexafluoride;
- The design of a prescribed type of packages (Design of Type B(U), Type B(M) and Type C packages);
- The design of all packages containing fissile material unless excepted as specified by the NRRC;
- Certain shipments (shipment approval);
- Radiation protection programs for a special use vessel;
- Special arrangements;
- The assignment of A_1 and A_2 values to individual radionuclides which are not prescribed by the NRRC; and
- Any prior approval issued by the competent authority of a foreign country.

The NRRC approves all radioactive material transport in The Kingdom, including shipments of Type A and Industrial Packages, LSA and SCO, and transhipments by any mode. The NRRC has developed guidance on how to apply for shipment approval, and format and content of such applications are directed by the application process in the AMAN system. Shipment approvals involving import or export with foreign Competent Authority-approved packages include evaluation and approval of the foreign Certificate of Compliance for the packages.

While the NRRC has provided guidance to applicants on format and content of applications for shipment approval and for foreign Competent Authority-approved packages, similar guidance for the other transport approval categories (Type B packages, special form material, etc.) need to be developed. This issue is addressed in Suggestion S12 Section 9.5.

5.6. AUTHORIZATION ISSUES FOR OCCUPATIONAL EXPOSURE

The regulatory framework requires that an activity may be authorized only if the occupational exposure is justified. As part of the authorization process, the applicant is required to submit a safety assessment, which includes a demonstration that the safety of exposed workers is ensured in all foreseeable situations. Regulations require authorized parties to maintain an optimal level of protection for workers, to adopt adequate dose constraints as tools for this optimization, and to comply with the specified dose limits for occupational exposure. Dose limits for occupational exposure are established in accordance with IAEA Safety Standards. Authorized parties are required to maintain records of occupational exposure for every worker for whom assessment is required. The authorized party is required to establish an appropriate Radiation Protection Programme (RPP) that ensures the implementation of provisions required to guarantee compliance with the safety requirements. Guidance documents published by NRRC for the authorized parties establish contents for this RPP, including details on the monitoring of individual exposure of workers, its frequency, type of dosimeters, as well as a description of the alternative methods applied to assess occupational exposure when individual monitoring is not used, designation of controlled areas, record-keeping and training.

The authorized party is also required to appoint a Radiation Safety Officer (RSO) who is tasked with overseeing the implementation of the RPP. The qualifications for RSOs are established, and involve specific academic courses, professional experience and a written examination by the NRRC. The NRRC guidance for authorized parties also addresses the criteria to be used for selecting dosimetry service providers that ensure quality and reliability of the measurements. However, the procedure to implement the provisions in NRRC-R-01 that require recognition of dosimetry services has not yet been established by the NRRC. This issue is addressed in Recommendation R10 in section 5.1.

Arrangements for health surveillance of workers are governed by provisions established in the National Policy for Occupational Health and Safety, and in NRRC-R-01. However, there is no guidance on elements of the health surveillance programme for exposed workers.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *There is no guidance on the elements of the health surveillance programmes for exposed workers. (As Addressed in the Action Plan).*	
(1)	**BASIS: GSR Part 3, requirement 21, para 3.76. states that** *"Employers, registrants and licensees shall ensure, for all workers engaged in activities in which they are or could be subject to occupational exposure, that:* *(f) Necessary workers' health surveillance and health services for workers are provided;"*
(3)	**BASIS: GSG-7, para 10.9. states that** "*The main elements of the programme for workers' health surveillance should be:* *(a) Assessment of the health of workers for the purpose of ensuring that they are fit to undertake the tasks assigned to them;* *(b) Establishment and maintenance of confidential medical records;* *(c) Arrangements for dealing with accidental exposures, overexposures and subsequent follow-up;* *(d) Provision of medical advice to management and workers."*
S7	**Suggestion: The NRRC should consider establishing guidance on the elements of the health surveillance programme for exposed workers.**

5.7. AUTHORIZATION ISSUES FOR MEDICAL EXPOSURE

An applicant for an authorization is responsible for demonstrating compliance with justification and optimization of medical exposures. Regulation NRRC-R-01 provides the roles and responsibilities for radiation protection and safety for the relevant parties. Article 69 states that the authorized person shall retain the prime responsibility for protection and safety throughout the lifetime of the practice, and that this responsibility cannot be delegated.

The NRRC has developed application forms for the authorization for the different activities involving medical exposures. These forms are available on the NRRC website and specify the supporting documents that should be submitted along with the form.

Article 212 of the NRRC-R-01 stipulates that the authorized person shall ensure the diagnostic reference levels are appropriately used for the optimization of the medical exposures of patients in diagnostic radiological procedures and image-guided interventional procedures. The NRRC has recognised the importance of establishing National Diagnostic Levels (NDLs) and has initiated a project to establish NDLs. Diagnostic Reference Levels have been established locally in the Riyadh region, but not across The Kingdom.

New radiation sources or technology used for medical exposures require approval from the Saudi Food and Drug Authority (SFDA) for clinical use of the equipment or radioactive source, and authorization of import and export from the NRRC.

The qualifications of health professionals responsible for medical exposure are provided for in the Policy Manual NRRC-PoM-004 which set outs criteria for recognizing such professionals. It specifies that health professionals must possess an active practice licence issued by the Saudi Commission for Health Specialists.

The NRRC has set the requirements for establishing a quality assurance program for medical exposures, which are outlined in the NRRC technical regulations (Application Guidelines and NRRC-R-01), internal guidelines for inspection, and the stakeholders' internal guidelines for medical practices. Article 224 of NRRC-R-01, states that the authorized person, in applying the requirements of this regulation should establish a comprehensive program of quality assurance for medical exposures with the active participation of medical physicists, radiological medical practitioners, medical radiation technologists and, for complex nuclear medicine facilities, radio pharmacists and radio chemists, and in conjunction with other health professionals as appropriate. This process must be captured under a management system. In addition, as required in the Guidelines (NRRC-SG-015, NRRC-SG-016, and NRRC-SG-017), the authorized person must also submit a quality assurance program which shall be reviewed during the review and assessment process (NRRC-IG-024).

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The NRRC has initiated a project to establish the National Diagnostic Reference Level (NDRL), but it has not yet been completed. (As Addressed in the Action Plan).*	
(1)	**BASIS: GSR Part 3, Requirement 34, states that** "*The government shall ensure that relevant parties are authorized to assume their roles and responsibilities, and that diagnostic reference levels, dose constraints, and criteria and guidelines for the release of patients are established*".
R12	**Recommendation: The NRRC should establish national diagnostic reference levels.**

5.8. AUTHORIZATION ISSUES FOR PUBLIC EXPOSURE

The Radiation Safety Regulation (NRRC-R-01) sets out the general safety requirements for ensuring the protection of people and the environment against the harmful effects of ionizing radiation and the safety of radiation sources.

The NRRC is the sole authority which can authorize discharges which have an impact on the public.

On application, the NRRC checks whether the principles of radiation protection (justification, optimization and dose constraints) are met on the basis of the information in the application supplied by the applicant. Dose limits are consistent with the public protection levels under the IAEA Safety Standard. Although the stakeholder guides require operators to optimize doses to the public there is no process for the NRRC to assess optimization of public dose as part of the licencing process i.e. NRRC-PM-031. The NRRC does not apply optimization to the proposed discharge limits but only checks that the dose constraint has not been exceed.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *Optimization has not been used in setting discharge limits. (As Addressed in the Action Plan).*	
(1)	**BASIS: GSR Part 3 Requirement 29, para 3.122 states that** *"Before authorization of a new or modified practice the regulatory body shall require the submission of, and shall review, the safety assessments (para 3.29-3.36) and other design related documents from the responsible parties that address the optimization of protection and safety, the design criteria and the design features relating to the assessment of exposure and potential exposure of members of the public.*
(2)	**BASIS: GSG-9 para. 2.4 states** *"The principle of optimization of protection and safety should be applied when setting discharge limits".*
R13	**Recommendation: The NRRC should review applicants' proposed radioactive discharge limits to ensure they are optimized.**

Regulation NRRC-R-01 details that the authorized person has responsibility for assessing the dose to the public as part of an application and maintaining monitoring records of the activity.

The principle of optimization of the dose to the public has been adopted in The Kingdom. The NRRC has applied the use of dose constraints for occupational and public exposure. (NRRC-R-01, Section 7). However, with the exception of NORM related activities, dose constraints for the public are established by the applicant and then approved by the NRRC (NRRC-R-01, Section 8). Such dose constraints must be below the generic values defined by the NRRC for similar types of practices and the *"prospective annual doses to members of the public, including for people distant from the source and people of future generations, summed over all exposure pathways. This includes contributions from facilities and activities which are unlikely to exceed the dose limits for the public".*

Article 24 of the NRRC-R-01 states the dose limits for public exposure. In some cases, the NRRC reviews the dose assessment made by the applicant to ensure that the methodology is appropriate but does not verify the output.

The NRRC Safety Policy Manual (NRRC-PoM-009) details that exposures due to activities and facilities involving natural radiation sources or natural radioactive materials having concern of radiation protection are justified, optimized, and controlled. At present, NRRC has no comprehensive strategy for control over the NORM generating sector. This is addressed in Recommendation R18 in Section 9.8.

The NRRC-R-01-SR01 provides specific values for exemption and clearance for low volumes (<1 ton) and higher volumes. The NRRC-PM-027 provides guidance on approval of clearance of radioactive material from control.

The NRRC-R-01 places a responsibility on the NRRC for exposures from past practices or sources which were not subject to regulatory control. The responsibilities include identification and assessment of existing exposure situations and determination of the corresponding occupational and public exposures. Based on the principle of justification, the NRRC decides when an existing exposure situation does not require protective or corrective measures to be taken. However, the NRRC does not have a current plan to identify such situations which has been identified in the action plan. This is addressed in Suggestion S6 in section 5.3.

The NRRC uses the relevant references levels for public exposure, established by the NRRC, when planning and implementing remedial and protective actions.

The NRRC has also established a Specific Regulation on Management of Naturally Occurring Radioactive Materials in Non-radiological Industries (NRRC-R-01-SR11) specific regulation establishes the regulatory requirements, based on a graded approach, concerning facilities and activities involving naturally occurring radioactive materials, seeking to ensure the control of the occupational and public exposure.

The NRRC-R-01-SR11 requires that dose limits of NRRC-R-01 are not exceeded and also uses a dose constraint of 0.3mSv/yr to the public. It also contains a radon action level of 300 Bq/m3.

In case the results of the dose assessments performed in accordance with Article 9 indicate that either the annual effective doses to workers exceed 5 mSv/y or the annual effective doses to the representative person exceed 0.3 mSv/y, the working activity shall be licensed in accordance with the Regulation on Notification on and Authorization 15 of Facilities and Activities with Radiation Sources (NRRC-R-02).

The Government has enacted legislation mandating safety-related technical services such as personal dosimetry, radiation equipment calibration, and environmental monitoring must be recognised. However, a clear mechanism to verify the competence of these services is yet to be developed and implemented. This is addressed in Recommendation R10 in Section 5.1.

The NRRC undertakes an environmental monitoring programme although to date this is not undertaken consistently nor does it allow NRRC to assess the retrospective dose to the public from planned exposures. A specific monitoring programme is being developed as part of the action plan. The NRRC has no mechanism to verify that doses to the representative person calculated by the operator are correct, although they can verify the discharges and compare similar practices. This gap has been identified in the action plan.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The NRRC does not have an independent monitoring programme, nor can it assess the dose to the public from planned exposures. (As Addressed in the Action Plan.*	
(1)	**BASIS: GSR Part 3 Requirement 32, para 3.135 states that** *"The regulatory body shall be responsible, as appropriate, for: (a) (ii) Assessing doses from public exposure; (c) making provision for an independent monitoring programme; (d) Assessment of the total public exposure due to authorized sources and practices in the State on the basis of the monitoring data provided by the registrants and licensees and with the use of independent monitoring and assessments; (f) verification of compliance of an authorized practice with the requirements of these standards for the control of public exposure.*
R14	**Recommendation: The NRRC should develops a systematic approach to assess dose to the public including an environmental monitoring programme for planned situation which will allow NRRC to demonstrate compliance with the dose limit.**

Regulation NRRC-R-01-SR08 published in 2023 provides specific concentration reference levels for NORM in construction. NRRC-R-01-SR09 provides similar concentration levels for foodstuffs. NRRC-R-01-SR07 provides concentration levels for treated underground drinking water. The criteria to be used for control of radioactivity in drinking water and food have been established by the NRRC. However, the enforcement mechanism to impose the criteria to the provider of the drinking water has not been established. Cooperation among different competent authorities in The Kingdom. This is addressed in Suggestion S1 in Section 1.5.

Article 287 of the NRRC-R-01 specifies the regulatory scope for existing exposure situations but does not provide reference levels or a framework to ensure that remedial measures are justified and protection of safety is optimized.

5.9. SUMMARY

The IRRS team notes that the authorization of facilities and activities are consistent with the IAEA safety standards. However, some challenges still exist:

- The NRRC should implement the graded approach in authorization by implementing the authorization by registration.
- The NRRC should develop a comprehensive set of specific criteria to guide the authorization process for facilities and activities involving radiation sources, ensuring their safe operation and compliance.
- The NRRC should develop and implement requirements for the recognition of qualified experts.
- The NRRC should formally recognize Technical Service Organizations in The Kingdom that may have significance for safety.

6. REVIEW AND ASSESSMENT

6.1. GENERIC ISSUES

6.1.1. MANAGEMENT OF REVIEW AND ASSESSMENT

The NRRC carries out review and assessment of safety-related elements to verify that facilities and activities comply with the regulatory requirements for authorization.

The review and assessment activities are generally conducted using a graded approach, however, authorization by registration has not yet been implemented. This issue is addressed in Recommendation R7 in section 5.1.

The NRRC has established internal processes for carrying out review and assessment. However, the regulations, internal guidance and stakeholder guidance were recently developed. This has necessitated the need for training of NRRC staff in the application of the regulatory processes. Furthermore, the rapid advancement of radiation-based technology applications as well as the improvement of regulatory approach and measures also highlighted the need for training of the review and assessment team. This is addressed by Recommendation R5 in section 3.3.

The NRRC-R-01 requires that the main findings of the review and assessment process are disseminated to the interested parties, including manufacturers and suppliers of radiation sources and, where relevant, international organizations. However, no process to disseminate this information has been implemented. This issue is addressed by recommendation R4 in section 2.2.

6.1.2. ORGANIZATION AND TECHNICAL RESOURCES FOR REVIEW AND ASSESSMENT

The review and assessment processes are performed by the Review and Assessment Department of the Safety of Radiological Practices General Department (GM-RPGD) of NRRC. This consists of the following:

- General Manager;
- Two (2) managers for radiological practices;
- Sixteen (16) Assigned Reviewers; and
- Consultants.

Some of the staff members of the Review and Assessment Department are also qualified as NRRC inspectors and may carry out inspections.

Depending on the importance and complexity of the review, the assigned staff may request support from other colleagues and from external resources as needed. The IRRS team was informed that, when NRRC resorts to consultants, contracts are designed to ensure that there is no conflict of interest for those experts or organizations that provide the advice or services.

The NRRC technical team members have different backgrounds and specialties (e.g. medical physicists, nuclear engineers, among others) to perform the review and assessment for the diverse types of practices.

6.1.3. BASES FOR REVIEW AND ASSESSMENT

The main references used for review and assessment are the Law of Nuclear and Radiological Control and the NRRC-R-01, as well as other Specific Regulations, Stakeholder Guidelines and internal guidelines published by NRRC. The NRRC's internal guidelines support the review and assessment process and outline the criteria for reviewing the safety assessments submitted by the applicants or the authorized persons. These criteria consider the particularities of the different practices, taking into account a graded approach.

As part of the authorization process, a safety assessment document is required to be submitted to the NRRC to be reviewed and assessed, taking into account a graded approach. The safety assessment documents are required to be consistent with the magnitude of the possible radiation risks arising from the facility or activity, and to be conducted at different stages throughout the lifetime of the facility.

The IRRS team was informed that, to enhance the consistency in the development and documentation of the safety assessment, the NRRC is in the final stages of preparation of a Specific Regulation on Safety Assessment for activities and facilities with radiation sources that elaborates the structure and content for the safety assessment, which is aligned with the IAEA Safety Standards. This Specific Regulation will provide stakeholders with the requirements on how to develop a safety assessment that addresses safety relevant issues, considering defence in depth, quantitative analysis including deterministic safety analysis and probabilistic safety assessment as appropriate, as well as the application of a graded approach.

The review and assessment process is used for the granting or renewing of authorizations, and also initiated at the request of inspectors when issues are identified in an inspection. The process is also applied to other notifications submitted to the NRRC, such as significant event reports.

6.1.4. PERFORMANCE OF REVIEW AND ASSESSMENT

Applications for authorization are received by the NRRC's Regulatory Operations General Department, mainly through the online platform AMAN system. This Department carries out a formal check for completeness to make sure all the necessary documents are submitted. If something is missing, wrong, or unclear, the applicant is requested to supplement or clarify the information at this stage.

Review of the quality and detail of the documents is then performed by the Safety of Radiological Practices General Department of the NRRC, aiming at verifying the availability of the following:

- An RPP that ensures the safety of workers, the public, and the environment;
- Shielding adequacy around the workplaces, storage sites, transport of radioactive sources and equipment, and verification of radiation protection requirements that guarantee the safety of workers, the public, and the environment;
- Verification of the procedures followed during the transportation of mobile radioactive sources from their stores to the workplaces, and monitoring transport vehicles;
- Quality control tests for radiological equipment and radiation measuring devices to ensure that radiation doses remain as low as reasonably achievable (ensuring ALARA principle);
- A security plan corresponding to the category and the security level of the radioactive material; and
- An appropriate plan for responding to emergencies or radiological accidents is in place.

When carrying out the review of safety assessments presented by applicants for authorization, the NRRC staff uses informal processes for identifying the qualifications of the persons who prepared it, taking into account the relevant qualifications in the field of work, the experience or arrangements made for appropriate supervision, as well as demonstrating competency and adequate understanding of radiation safety. This occurs due to the absence of recognized qualified experts in The Kingdom. This informal process for identifying qualified persons to carry out safety assessments is also used by applicants. This issue is addressed in recommendation R9 in Section 5.1.

The review and assessment results in a proposal regarding the validity of the application for the consideration of the General Manager. Findings of the review and assessment process are documented in an internal assessment report. Any non-conformities that may be identified are reported to the Regulatory Operations General Department and in turn communicated with them to the applicant, for correction using the AMAN system. Once the NRRC receives

new information from the applicant, the review and assessment process is again carried out. An inspection can also be requested by the Review and Assessment as part of the review and assessment process.
Once all non-conformities are corrected by the applicant, the revised internal assessment report recommends the issuing of the authorization. If non-compliances are identified during the renewing of an authorization or after inspection findings, the Enforcement Department is notified, and an enforcement process is started.

6.2. REVIEW AND ASSESSMENT FOR WASTE MANAGEMENT FACILITIES

The regulation on Management of Radioactive Waste (NRRC-R-16) defines requirements for the safety assessment of radioactive waste management facilities. This regulation applies to the predisposal management of radioactive waste, NORM waste, and disused sealed radioactive sources declared as radioactive waste. Provisions of Chapter 3 of the Regulation require that the licensee establishes and implements a management system that is commensurate with the risk assessment relating to the predisposal radioactive waste management. To ensure the safety of predisposal radioactive waste management facilities, activities, and the fulfilment of waste acceptance criteria, the management systems are applied to all stages of the facility life cycle and to all activities regarding management of radioactive waste, as well as to the corresponding safety assessment and safety case. It is also required to establish and maintain a strong safety culture by means of an effective management system that demonstrates commitment to safety by senior management. The applicant for an authorization is required to submit a safety case and supporting safety assessment. The safety case is required to address key elements of predisposal management of radioactive waste: waste generation; characterization and categorization; segregation; pre-treatment; treatment; conditioning; storage; control of discharges; clearance and its control; packaging strategies; transport; design and manufacture of containers; handling of waste packages; site evaluation, design, construction, operation, closure and post-closure stages of a waste management facility.

The safety case and safety assessment must cover all stages and safety aspects of the radioactive waste management process, in relation to the workers, the public and the environment, and include the following: description of all the safety aspects of the site; the siting, design, construction, commissioning, operation, shutdown and decommissioning of the facility and/or activity; demonstration of radiological and non-radiological safety under normal operation and an assessment of potential effects of incidents and accidents; considerations for reducing hazards posed to workers, members of the public and the environment during normal operation and in possible accident conditions; definition of the radioactive waste acceptance criteria; and demonstration that the appropriate interdependencies among all steps in the predisposal management are ensured.

More details on safety assessment are provided in NRRC-SG-004. Review of the safety case is performed by the Safety of Radiological Practices General Department in accordance with Internal Guide NRRC-IG-20.

The safety assessment must also be periodically reviewed at predefined intervals in accordance with provisions established by the NRRC for the renewal of authorization. The results of the periodic safety review are reflected in the updated safety case for the facility.

6.3. REVIEW AND ASSESSMENT FOR RADIATION SOURCES FACILITIES AND ACTIVITIES

Review and assessment of applications for authorization is conducted using NRRC internal procedures specific for the activity with radiation sources. Of the fourteen internal guidelines prepared by the NRRC, ten include specific procedures for radiation sources facilities and activities. The process is documented in the AMAN system which may also lead a reviewer how to conduct the review and assessment. The process of review and assessment is well documented. As a rule, before issuing an authorization, the facility is inspected and the findings used to inform the authorization process. Such inspections are led by the reviewer who is most familiar with the application for authorisation.

The AMAN system contains specific check points to assure quality of the review and assessment. Where appropriate, the review is conducted by a team of reviewers e.g. for complex application. If needed, external experts are used to

support the verification of compliance with regulatory requirements. The need for additional technical specifications, i.e. criteria, to be used in review and assessment for specific facilities or activities is provided in Recommendation R8 in Section 5.1.

Graded approach in review and assessment is also not fully implemented as authorisation by registration is not yet implemented. This is addressed in Recommendation R7 in Section 5.1

The IRRS team was informed that periodic reports are not required to be sent for review by the NRRC once the authorization is issued. The oversight of the performance of the authorized parties is only through inspections.

6.4. REVIEW AND ASSESSMENT FOR DECOMMISSIONING ACTIVITIES

The purpose of Stakeholder Guideline on Application for Authorization of Decommissioning of Multi-Stage Facilities (NRRC-SG-003) is to give the applicant and/or the authorized person clear and specific guidance on the submission of an application for of multi-stage authorization of decommissioning facilities. This guideline requires applicants to provide a safety assessment of decommissioning activities including the following aspects: expected occupational exposure doses to be used as safety criteria; operational limits and conditions; hazard analysis of normal decommissioning activities; hazard analysis of abnormal events and incidents; assessment of potential consequences; preventive and mitigating measures such as a radiation protection plan and industrial health and safety plan; risk assessment; and comparison of analysis results with relevant safety criteria. The safety case must also include assessment and verification of in terms of radiological safety (including radiation surveys, contamination wipe tests, etc.) and description of its future use, where applicable.

Details on assessment of the decommissioning plan are provided in the NRRC-SG-004. Review is performed by the Safety of Radiological Practices General Department in accordance with Internal Guide NRRC-IG-20, "Review and Assessment Radioactive Waste Interim Storage Practice." The updated decommissioning plan is required to be periodically reviewed at predefined intervals in accordance with provisions of the individual licensee's oversight program established by the NRRC for the renewal of the issued authorization.

6.5. REVIEW AND ASSESSMENT FOR TRANSPORT

The primary activities related to transport in The Kingdom are import, export, domestic point-to-point shipment, and trans-shipment of sources in Type A packages, industrial packages, excepted packages, or foreign competent-authority-approved Type B packages. The NRRC approves all individual shipments within The Kingdom, and review and assessment activities are focused on shipment approval and approval of foreign competent-authority-approved packages. Other transport package types and activities (Type B packages, assignment of A1 and A2 values, etc.) are not currently used by authorized persons within The Kingdom, but may be used in the future.

The NRRC staff responsible for transport review and assessment follow the guidance available in NRRC Internal Guideline NRRC-IG-026, "Review and Assessment of Transport of Radioactive Materials Practice." This guidance document provides information to NRRC staff on how to evaluate an application for authorization of shipment. Specifically, the guidance addresses the evaluation criteria for the management system, radiation protection, safety, and security aspects of transport of radioactive materials, including storage and transport. NRRC-IG-026 also provides a template for a review and assessment report, which consists of a checklist containing all of the information required to be evaluated by NRRC staff. This checklist requires evaluation of the packaging and its contents, management system, maintenance and operating procedures, package labelling and placarding, shipping papers, radiation protection (including package external dose and transport index), contamination levels, emergency plan, and security for the individual shipment authorization. The checklist also includes areas for the reviewer to summarize regulatory findings, and to identify concerns to be evaluated during inspection. This guidance is comprehensive, and addresses all of the corresponding requirements for shipment approvals and Competent Authority-approved packages in NRRC-R-15-SR01.

Although NRRC-R-15-SR01 states that the NRRC will grant authorizations for all package types and activities, review and assessment guidance needs to be developed for package types and activities other than shipment approvals and foreign Competent Authority-approved packages. Most transport activity types are currently not undertaken, however, The Kingdom has expressed an interest in expanding its use of nuclear and radioactive material in the future, in which case all types of transport reviews and assessments will be required. This issue is addressed in Suggestion S12 in section 9.5.

6.6. REVIEW AND ASSESSMENT FOR OCCUPATIONAL EXPOSURE

The NRRC verifies the compliance with the requirements for occupational exposure through the review and assessment of the documentation presented by applicants for authorization, including its safety assessment and RPP.

The review and assessment of practices addresses several key points related to occupational exposure, such as the designation of controlled areas, expected exposures in normal operations, anticipated operational occurrences and accident conditions, individual and workplace monitoring, arrangements for assessing and recording occupational exposure and health surveillance of workers.

The NRRC has developed and maintains a national database of exposed workers to which authorized parties are required to report the doses received by their workers. Efforts are under way by the NRRC to fully automate the loading of such information to the database.

The NRRC has carried out initial reviews of doses received by workers involved in specific activities during period 2018-2022, in select areas. For the medical area, such initial review considered around 4000 exposed workers in diagnostic radiology, nuclear medicine and radiotherapy facilities. This review identified exposed workers in interventional radiology as having higher average effective doses (ranging from 1.44 mSv to 1.67 mSv per year). For the industrial area, the review covered over 2100 workers in the areas of industrial radiography and uses of nuclear gauges, for the same period. In this case, workers in the industrial radiography area recorded the highest average annual doses (up to around 3 mSv). These reviews also highlighted trends over time.

Currently, there is no strategy for protection against Rn-222 in workplaces, although reference levels have been established for dwellings, schools, and other workplaces. To support the development of a strategy, the NRRC has begun an assessment for Rn-222 in all industries that were identified as relevant for radon exposure, such as: the oil and gas industry, metal mining and smelting, fertilizer (phosphate) industry, building material industry, ground water treatment plants, recycling industries and any other industry related to radon exposure (miners).

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *While NRRC is conducting a campaign to assess the radiological impact of radon in workplaces, a strategy for protection has yet to be developed. (As Addressed in the Action Plan).*	
(1)	**BASIS: GSR Part 3 Requirement 52, para. 5.27 states that "***The regulatory body or other relevant authority shall establish a strategy for protection against exposure due to 222Rn in workplaces (…)"*
S8	**Suggestion: The NRRC should consider completing the development of a strategy for protection against exposure due to 222Rn in workplaces.**

The NRRC-R-01, includes provisions for aircraft companies to ensure monitoring of the effective dose received by their air crews and to maintain the relevant personal dose records. However, the NRRC has yet to establish the methodology that the aircraft companies must use to conduct such assessment and for recording this information.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES
Observation: *The NRRC has not implemented the framework to assess the exposure of aircrew. (As Addressed in*

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
the Action Plan).	
(1)	**BASIS: GSR Part 3, Requirement 52, para 5.31. states that** "*Where such assessment is deemed to be warranted, the regulatory body or other relevant authority shall establish a framework which shall include a reference level of dose and a methodology for the assessment and recording of doses received by aircrew from occupational exposure to cosmic radiation."*
R15	**Recommendation: The NRRC should implement the framework for the assessment and recording of doses received by aircrew from occupational exposure to cosmic radiation.**

6.7. REVIEW AND ASSESSMENT FOR MEDICAL EXPOSURE

The duties and responsibilities of authorised parties with regards to medical exposure to ionizing radiation are defined in Regulation NRRC-R-01. The Internal Guideline on Review and Assessment of Medical Radiological Practices (NRRC-IG-024) gives the basis for the review and assessment of medical practices.

The NRRC verifies, through the review and assessment process, the compliance of the authorized persons with the regulatory requirements including the justification and optimisation of medical exposures.

The NRRC uses a graded approach, commensurate with the radiation risks in the review and assessment of medical exposures.

As part of the optimization of medical exposures, the NRRC has given special attention to quality control programs for medical radiological equipment. The quality control reports are required to be submitted to the NRRC as part of the re-authorisation process to review and assess the quality assurance for medical exposure. The NRRC evaluates the results of the acceptance tests and "status tests" of the radiation sources, according to the Review and Assessment of Medical Radiological Practices internal guide (NRRC IG-024). This assessment is undertaken during the authorization and the inspection of these facilities.

The NRRC reviews and assesses reports of significant radiological events, including unintended medical exposure, those events must be reported at the first instance to the emergency department within the NRRC. Although the legal framework covers the principles of radiation protection and safety regarding unintended and accidental medical exposures, the IRRS team encourages the NRRC to develop guidance to help licensees and registrants to perform internal investigations of the unintended and accidental medical exposures.

As part of the authorization process for new practices and new technologies, referenced in Sections 21 and 22 of NRRC-R-01, the applicant is required to demonstrate to the NRRC that they are justified.

The IRRS team was informed that justification for radiological procedures is performed as part of a health screening programme for asymptomatic populations and is carried out by the Health Authority, and that the applicants are required to inform the NRRC that they have a screening program approved by the Health Authority.

6.8. REVIEW AND ASSESSMENT FOR PUBLIC EXPOSURE

It is detailed in the NRRC self-assessment that the NRRC undertakes a review and assessment of the submitted documentation according to the related internal guidelines which includes the system of protection to protect the public. Although NRRC-PM-31 details a process for reviewing licence applications it does not consider the dose to the public, how it is optimized nor does it provide a framework for the consistent assessment of the dose to the members of the public. These are addressed in Recommendations R12 and R13 in Section 5.8.

The NRRC does not have an established monitoring programme to determine the retrospective doses to the members of the public (see Recommendation R13 in section 5.8). Although it does have a monitoring programme in place to assess the doses from gaseous radiation at a population level.

The NRRC-SG-16 includes provision for assessment of the public although this does not provide detail on how assessments should be undertaken or provide for additional guidance to deal with unforeseen risks which may occur such as changes in the characteristics of the source. However, the other guides NRRC-SG-06 , NRRC-SG-17 and NRRC-SG-10 provides such guidance. The IRRS team encourages the NRRC to review its guides to provide consistent guidance.

The NRRC-PM-34 Review and Assessment of the Safety and Security of a Radiological Practice does not contain any reference to consideration of public doses or review of any dose, discharges or dose constraints suggested by the operator, hence doses have not been optimized. This is addressed in Recommendation R13 in Section 5.8.

The IRRS team were able to visit the NRRC environmental laboratory which will shortly move to the central NRRC building. The laboratory is building capability for radioactive analysis of environmental and potentially effluent samples and working towards accreditation. The laboratory has a range of facilities which includes dosimetry services for the NRRC staff. The environmental laboratory participates in IAEA intercomparison exercises and has recently joined the Analytical Laboratories for the Measurement of Environmental Radioactivity network (ALMERA). The IRRS team encourages the NRRC to complete the move of the laboratory and continue to increase capacity and capability in order to support the implementation of an environmental monitoring programme. This is addressed in Recommendation R14 in Section 5.8.

6.9. SUMMARY

The IRRS team evaluated the review and assessment processes in place at NRRC for the range of facilities and activities in The Kingdom and concluded that they are generally in line with IAEA Safety Standards.

The NRRC has made available and is expanding on an extensive range of regulations, stakeholder guidelines and internal guidelines which will further enhance the review and assessment process. However, the fact that such documents are very recent, and the rapidly expanding types of facilities and activities in The Kingdom highlights the need to continue the efforts for training of staff involved in the review and assessment process.

Some areas for improvement have been identified regarding the review and assessment of activities performed by NRRC:

- completing the development of a strategy for protection against exposure due to 222Rn in workplaces.
- implementing the framework for the assessment and recording of doses received by aircrew from occupational exposure to cosmic radiation.

7. INSPECTION

7.1. GENERIC ISSUES

The Law of Nuclear and Radiological Control has empowered the NRRC to inspect activities and facilities to verify that authorized parties comply with the requirements and with the conditions specified in their authorization.

The legal framework empowers inspectors to access the facilities and also to install and use surveillance and monitoring devices. The IRRS team was informed that to date installation of monitoring devices has not been exercised. The inspectors have the power to stop an activity immediately when needed, but the IRRS team was informed that due to the lack of experience and competences such approach has been never used. When required, enforcement action is started on the basis of an internal procedure within the NRRC. This procedure includes involvement of the NRRC legal department staff.

The NRRC developed a manual specifying all the elements within the inspection programme: reference documents preparation of an inspection; type of an inspection (pre-authorization inspection; oversight inspection; reactive inspection; announced an unannounced); and areas to be inspected depending on the phases of the life cycle of a specific facility or activity. The manual details the frequencies of inspections and provides the criteria to be considered when elaborating the annual plan of inspections considering a graded approach. The manual also clearly states that, as the NRRC is the only responsible organization for conducting inspections of authorized facilities and activities in compliance with its mandate, there are no joint inspections with other competent authorities or any third party. The management of inspection is conducted using AMAN system, e.g. request for an inspection might be given by authorizing staff. As a rule, inspections are conducted by at least two inspectors.

Development of an inspection plan, preparation and conduction of inspections, and development and updating of an oversight plan are provided in specific procedures. Eight internal guidelines to conduct inspections including checklists have been developed for specific relevant practices (radiotherapy, diagnostic radiology, nuclear medicine, industrial radiography, nuclear gauges, geophysical exploration, irradiation/sterilization, transportation). The RSO is normally present at an inspection. The inspection plan includes an exit meeting of inspectors with the representative of authorized party where initial observations made during the inspection are discussed. At this meeting an "acknowledgement document" is signed by the representative of the authorized party and the leading inspector.

After the inspection, the inspector prepares the "inspection report" with an annex including the check list for the inspected area. This report is an internal NRRC document which goes through a checking procedure before it is signed by relevant NRRC staff according to a specific internal procedure. When enforcement is needed the document called "notice" with requirements to be fulfilled by the operator and deadlines for their fulfilment is prepared by the NRRC enforcement unit and sent to the inspected authorized party. The NRRC enforcement unit also follows up the corrective actions to be implemented by the inspected authorized party using a NRRC specific database. The enforcement unit also informs inspectors about fulfilment of corrective actions and inspector's involvement is assured as appropriate, e.g., a follow up inspection might follow.

There is no documented procedure to ensure that inspectors provide feedback from the experience gained in inspection activities in order to identify general trends and root causes, to improve the inspection programmes, and to strengthen inspectors' competences (as addressed in the action plan).

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *There is no formal procedure to ensure that the inspectors provide feedback and observations from the inspection programme to identify trends and root causes, to improve the inspection programmes, and to strengthen inspectors' competence. (As Addressed in the Action Plan).*	
(1)	**BASIS: GSG-13, para. 3.287 states that** *"Inspection reports should be distributed, or made*

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
	available electronically, in accordance with established procedures in order to provide the following: /.../ (c) A basis for identifying major or generic issues that necessitate special inspections, changes to inspection plans or generic regulatory action; (e) A means of sharing information with other inspectors; (f) Information to regulatory staff responsible for the analysis of reportable events; (g) A basis for periodic reviews of inspection findings, including trends and root causes;/.../
S9	**Suggestion: The NRRC should consider establishing a formal procedure to ensure that the inspectors provide feedback and observations from the inspection programme to improve it, to identify trends and root causes and to strengthen inspectors' competence**

In relation to dissemination of the information from the inspections to the public, the NRRC manual states that the findings of the inspections may be made public through the NRRC annual reports or other relevant platforms without disclosing identity and sensitive information about the authorized parties. However, there is no procedure to ensure that findings of inspections and the relevant common safety issues are made publicly available to raise awareness on common safety issues and on the effectiveness of the regulatory body (as addressed in the action plan).

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The findings of inspections and the relevant common safety issues found in facilities and activities are not made publicly available to raise awareness on the effectiveness of the regulatory body. (As Addressed in the Action Plan).*	
(1)	**BASIS: GSG-13 para. 3.292 states that** *"In order to inform the public of the safety of facilities and activities and of the effectiveness of the regulatory body, findings of inspections and the associated regulatory decisions may be made publicly available"*
S10	**Suggestion: The NRRC should consider developing procedures to make the findings of inspections publicly available.**

The NRRC has a programme addressing training and competencies of inspectors which are classified in three groups, i.e. Level I-III. Namely, each level corresponds to the competence of an inspector, e.g. for a Level I one week training followed by exam is required. The inspectors' competencies are further enhanced by on-job training. A need to increase the competences of inspectors is addressed in Recommendation R5 in Section 3.3.

Three sites visits took place, to medical, industrial and radioactive waste facilities. They allowed the IRRS team to observe how inspections are conducted.

The IRRS team noted that the NRRC inspectors were very knowledgeable and conducted the inspections in a professional, systematic manner, implementing the inspection programme as per relevant NRRC procedures. Authorized parties under inspection acknowledged the close and fruitful collaboration with NRRC inspectors and recognized inspections as an opportunity to improve the radiation safety in the facility. It is worth noting that, during the inspections, inspectors gave particular consideration to interviewing the staff in the facility to examine their competencies and to verify their familiarity with the most relevant radiation safety aspects of their working environment.

7.2. INSPECTION OF WASTE MANAGEMENT FACILITIES

Inspection by the NRRC of waste management facilities is conducted using Procedure Manual NRRC-PM-47, "Preparing and Conducting an Inspection on Radiological Practice," and check lists to assist with inspection are given in Internal Guideline NRRC-IG-006, "Inspection of General Other Practices." During preparation for inspection, the

check list is supplemented with questions raised from the review and assessment of the application for authorization by the NRRC staff.

The IRRS team observed an inspection conducted by the NRRC at the King Abdulaziz City for Science and Technology (KACST), which operates storage facilities for its own sources and for recovered orphan sources. The license for the facility and its activities was issued in August 2023. The inspection started with discussion on the findings and corrective actions of the previous inspection that was carried out two months ago. The team leader asked the licensee to provide explanations of activities performed since the last inspection and requested that they provide evidence that they have addressed previous NRRC observations. The inspection was carried out in accordance with the inspection check list and covered all topics related to licensed activities and facilities including: documentation for the management system; surveillance of the working place and environment; appointment of RSO; security; record keeping; staff training; medical surveillance of employees; maintenance and calibration of devices used in operation; and safety culture. During the visit of the storage facility, inspectors checked calibration dates of all devices, made measurements of dose rates of randomly selected sources in the source storage area, and measured the dose rate outside the storage area, including areas where the public could be exposed. After a short meeting of the team, results and observations were presented to representatives of the licensee. Observations were recorded on a prompt report and submitted to the licensee after discussions at the end of the inspection. The IRRS team spoke with the operator separately who said that the NRRC had been very helpful in ensuring that they were aware of information they needed to submit to support their application for a licence.

7.3. INSPECTION OF RADIATION SOURCES FACILITIES AND ACTIVITIES

The NRRC developed three general procedures regarding inspection, i.e., preparation of an inspection plan, preparation and conducting inspection on radiation practice and, on developing and updating of an oversight plan on authorized radiological practices. In addition, eight activity specific internal guidelines are to be used during the inspection and one to be used elsewhere. A full set of inspection procedures needs to be completed, e.g., for inspection of cyclotron facility. This is addressed in Recommendation R6 in Section 4.5.

The IRRS team was informed that in 2022 about 200 inspections were conducted with the majority of these related to authorization procedure. Regular so-called “oversight” inspections were introduced recently. The majority of these 200 inspections were announced. The NRRC has a plan to conduct about 400 inspections per year.

Inspectors are situated at the NRRC office in Riyadh and three additional locations at three main airports. At present, the NRRC has 31 inspectors. All are recruited from the NRRC staff.

Inspectors are also involved in management of orphan sources. In such cases they also lead activities including cooperation between several stakeholders. Orphan sources are sent to the KACARE to be stored in a licensed interim storage facility. The detailed NRRC procedure regarding management of orphan sources is still to be developed. This is addressed in Recommendation R6 in Section 4.5.

The IRRS team observed an inspection conducted by three NRRC inspectors at Sure Beam Middle East, L.L.C. in Riyadh which operates two accelerators for irradiation of food and medical products. The company has about 20 radiation workers. As a rule, NRRC conducts inspections of such type of licensee annually. The IRRS team observed good cooperation between licensee and inspectors, as well as between all three inspectors, as each had a well-defined role. The deputy director, radiation safety officer and the chief engineer of the company participated in the inspection. The inspection started with a short entrance meeting followed by a discussion on non-compliances identified in the previous inspection. Review of documentation based on a prepared NRRC procedure and check list for such type of inspection followed. The check list was developed for irradiators with radioactive sources as well as for those that use electrical generators. The IRRS team was informed that the facility initiated several safety related improvements in the last year, e.g., development of a Radiation Protection Programme and a change of dosimetry service providers to ensure compliance with current NRRC regulations. After the entrance meeting, a visit of selected areas of the facility followed. During the visit inspectors took photos, performed measurements using their own equipment, documented measurements on prepared layout and interviewed workers in the service area. In the interviews, a set

of questions was used by inspectors aimed at assessing the safety culture of workers. After the visit, there was an internal discussion among inspectors. The inspectors prepared the document with a list of findings, so-called "Acknowledgement" for the inspection. This document was signed by a leading inspector and by the deputy director of the company after a short meeting with the where the findings were presented orally to the licensee. Questions regarding the presented findings were resolved on spot. The NRRC inspectors were well prepared and carried out the inspection in a very professional manner and made clear and concise recommendations that were welcomed by the licensee. In a discussion with IRRS team the licensee emphasised the prompt response of the NRRC regarding licensing and inspection processes as well as the professional attitude of the NRRC. The NRRC staff are perceived as very helpful to provide support whenever needed. The operator noted that the symposium organized by the NRRC when new regulations were issued was highly appreciated. The licensee also expressed appreciation for the development of the regulatory framework in The Kingdom since the establishment of the NRRC. The operator noted that guidelines for specific practices, such as industrial irradiators using accelerators which are to be prepared by the NRRC are regarded as a next step toward better implementation of safety standards.

7.4. INSPECTION OF DECOMMISSIONING ACTIVITIES

There are no decommissioning activities in The Kingdom. However, the IRRS team was informed that NRRC inspections for decommissioning would be carried out in accordance with NRRC-PM-47 and the check list would be developed according to NRRC-IG-006 to be used when such activities exist.

7.5. INSPECTION OF TRANSPORT

The Law grants the NRRC the power to conduct inspections and monitor activities and facilities for the purpose of verifying compliance with regulations and license conditions. The NRRC has developed inspection procedures for transport activities, as outlined in the Internal Guideline NRRC-IG-004, "Inspection of Transportation of Radioactive Sources Practice." This document describes transport inspection processes such as confirmation of correct package labelling and placarding, confirmation of package serial numbers, and review of self-certified package information (for Type A, industrial, or excepted packages) or foreign competent authority-approved package Certificates of Compliance. The result of an inspection is documented in an inspection report consisting of the facility information, type and date of inspection, and the inspector's findings and any actions or corrective measures required by the NRRC.

The NRRC performs transport oversight inspections of the authorized parties which engage in transport activities at least every three to five years.

NRRC-IG-004 contains an inspection checklist to ensure that inspectors cover all areas relevant to transport activities by licensees. The checklist includes items required to demonstrate compliance with the NRRC regulations, including verification of the condition of the packaging and transport vehicle, and package labelling and placarding. The checklist also contains items to verify elements of the management system, radiation protection program, emergency plan, training program, and security plan relevant to transport shipment approval.

The NRRC maintains small regional offices at Jeddah, Riyadh, and Dammam International Airports, which are the only three points of entry allowed for imported Class 7 material, barring exceptions which can be approved by the NRRC. The NRRC staff at these locations perform inspections as packages come into the country and assist customs officials and first responders as appropriate. **The IRRS team recognizes this as a good performance.**

Inspection procedures are clearly identified in NRRC-IG-004 for shipment approval (including for Type A, industrial, and excepted packages) and prior approvals issued by the competent authority of a foreign country. For other transport authorization activities (e.g., Type B, fissile, UF_6 package approvals), inspections will require more information, including package maintenance, ageing management, package design, package manufacturing, etc. Inspection activities for transport activities other than shipment approval and foreign Competent Authority-approved package approval are not currently captured in the transport inspection procedures. This is addressed in Recommendation R14 in Section 9.5.

7.6 INSPECTION OF OCCUPATIONAL EXPOSURE

The NRRC performs onsite inspections to check compliance with the regulatory requirements for occupational exposure. The conduct of the inspections is aimed at validating the information provided in the application for authorization, as well as oversight of application of the RPP of the authorized party and the safety provisions for workers. Inspections address, among others, the following aspects:

- Proper implementation and effectiveness of the RPP;
- Regular review and updating of the RPP;
- Appointment policy for the RSO and their organizational hierarchy, aiming at ensuring the necessary authority;
- Delineation of controlled and supervised areas and workplace monitoring;
- Implementation and the effectiveness of the radiation monitoring programme, and review of the doses received by workers;
- Effectiveness and adequacy of arrangements for the health surveillance of workers;
- Recording of occupational exposures and the availability of the related records;
- Conduct of activities in controlled areas only by authorized workers;
- Availability of arrangements for the protection of pregnant and breastfeeding women; and
- Compliance of the workers with the NRRC regulations.

During an NRRC inspection of an industrial facility witnessed by the IRRS team, the IRRS team observed that inspectors reviewed records for worker doses and verified that the requirements for their health surveillance were complied with. The NRRC inspectors also verified records for training and adequacy of work instructions. Additionally, inspectors interviewed workers at the licensee's facility and used a pre-established set of questions to assess the knowledge of workers, thus raising awareness of their safety culture.

7.7. INSPECTION OF MEDICAL EXPOSURE

The NRRC conducts inspections to confirm the compliance with the regulatory requirements for medical exposures. For inspections, internal guidelines are utilized (NRRC-IG-005, NRRC-IG-009 and NRRC-IG-025 for the inspection of diagnostic radiology practices, nuclear medicine practices and radiotherapy practices, respectively). Among the topics addressed in these internal guidelines are the quality assurance program and quality control records for all radiation devices and the use of radiopharmaceuticals, the verification of the provisions for the justification of medical exposure and its optimization, measures for the protection of patients, individual exposure records, the use of diagnostic references levels.

The IRRS team was informed by the department managing inspections that it has 15 inspectors that are trained for performing inspections at medical facilities. These inspectors have the competence for conducting inspections of authorized parties in the different areas of medical exposure and performing the related quality control tests.

There are no joint inspections with other authorities. In the case of lack of competency in any medical area, the NRRC can contract an expert to accompany the NRRC inspection, according to the NRRC-PM-029.

The IRRS team observed a NRRC inspection of a nuclear medicine department in Alhabib Hospital. The IRRS team was informed that prior to the inspection, inspectors review any existing license and license conditions, radiation protection programme and other documents related to safety, together with the previous inspection report. The inspection consisted of an entrance meeting, verification of the documentation, visual observation of the facility, contamination measurements, performed by inspectors, and a closing meeting. For the inspection, the specific

checklist for nuclear medicine was used and inspection report was completed. NRRC inspectors provided the licensee with information on inspection findings, as well as positive findings on good performance of licensee regarding radiation protection.

7.8. INSPECTION OF PUBLIC EXPOSURE

The NRRC has a series of guidelines to support inspectors in their duties which are specific to the practice. For example, inspection guidelines NRRC-IG-24 has specific instructions on public dose review for medical practice; as does inspection guidelines NRRC-IG-13 review and assessment of a industrial radiography practice. However, no specific guidance is available to verify the monitoring programme on "that account is taken of the maintenance of appropriate records of the results of the monitoring program". The NRRC undertakes environmental monitoring at a state level to assess population dose. However, does not undertake its own environmental monitoring to assess doses from planned exposures. This is addressed in Recommendation R14 in Section 5.8.

7.9. SUMMARY

The IRRS team concludes that the NRRC has developed a comprehensive range of manuals to support the implementation of an effective inspection programme to verify compliance with the requirements and conditions specified in the authorization of radiation facilities and activities.

The results of the inspections are communicated to the authorized party and follow up of non-compliances is conducted. However, the IRRS team suggests the establishment of formal procedures to ensure that:

- The inspectors systematically provide feedback and observations from the inspection programme to improve it;
- The NRRC identifies trends and root causes to strengthen inspectors' competences; and
- The findings of inspections are made publicly available.

The NRRC maintains dedicated staff at three airports to support Customs to monitor the import and export of radioactive sources. The IRRS team recognizes this inspection practice as a good performance.

The IRRS team conducted three site visits during inspections at authorized facilities, and it was verified that the inspectors exercise their responsibilities in a professional manner.

8. ENFORCEMENT

8.1. ENFORCEMENT POLICY AND PROCESS

The Law establishes the national enforcement framework that empowers the NRRC to perform the appropriate enforcement actions, as necessary, to ensure the safety, security and safeguards of nuclear and radiation activities, practices, and facilities. This includes granting the NRRC the authority to implement enforcement actions using a graded approach based on safety significance, as well as measures for authorized parties to appeal NRRC enforcement decisions.

There are legislative and procedural provisions in place for the NRRC to use enforcement in a graded manner, including:

- Corrective action requests, notices, and warnings;
- modification, suspension, or revocation of authorizations;
- shutting down a facility; and
- financial penalties;

The enforcement actions are applied by the Enforcement Department, according to the results of inspections and review and assessment of the documents sent by the authorized party, as defined at the Internal Guideline on Execution of Enforcement Action (NRRC-IG-001). The NRRC ensures that the authorized persons effectively implement the requested corrective measures in the agreed time frame and take all the necessary measures to prevent the recurrence of violations through its regulatory oversight procedures.

The Law outlines particular situations in which a legal person can be fined based on the gravity of their violations. These violations are assessed by a committee comprising five specialists who are not affiliated with the NRRC. These specialists are appointed through a Cabinet Resolution, following the nomination of the NRRC's Chief Executive Officer.

In the case that serious unsafe conditions or security-compromised situations are observed during an inspection, which require immediate enforcement, the NRRC senior inspectors are authorized to take the necessary actions on-the spot. Non senior inspectors need prior approval from the inspection team coordinator or from a senior inspector to undertake such actions.

8.2. ENFORCEMENT IMPLEMENTATIONS

The NRRC issues various levels of enforcement and has provided various examples of using their enforcement tools in a manner that is commensurate with the risk of the identified deficiencies. The NRRC inspectors can take enforcement action in the presence of immediate risk during inspections. The NRRC inspectors are tasked with gathering precise details regarding an apparent violation to support informed decisions for enforcement purposes. This information is crucial for documenting enforcement actions, making it imperative that it is both comprehensive and accurate. The NRRC's Internal Guideline NRRC-IG-001 on the Execution of Enforcement Actions offers a comprehensive list of questions that NRRC inspectors can use to ensure they collect all the necessary information required to determine the appropriate enforcement measures.

The NRRC inspectors issue internal inspection reports. This is followed by the official correspondence from the NRRC to the authorized parties to communicate the areas that require corrective actions and defines the timeline for completion of such actions using graded approach. The IRRS team was informed that, if the authorized parties don’t implement the corrective actions, the Enforcement Department is informed, and further enforcement actions may follow.

8.3. SUMMARY

The Kingdom's enforcement legislation and the NRRC's regulations require that authorized parties implement corrective actions and a selection of enforcement tools based on safety significance are available. The NRRC has started the process of implementing financial penalties, but it has yet to be implemented.

Overall, the NRRC demonstrates the availability of enforcement policies and processes, and the effective implementation of enforcement tools.

9. REGULATIONS AND GUIDES

9.1. GENERIC ISSUES

A multi-layered legal framework has been developed in The Kingdom. The highest level consists of National Policies and the Laws which consist of the main principles, approaches and requirements as well as responsibilities of stakeholders. The statutes of institutions and JGoP detail responsibilities, analyse gaps, and ensure implementation of tasks set by National Policies and the Laws. The next level of legal framework is Implementing Regulations approved by Board of NRRC and which prompt procedures to implement statements of the Laws. In accordance with NRRC Establishment Strategy (2021-2023) NRRC has approved 17 regulations including regulations on: radiation safety for facilities and activities that use radiation sources; exposure limits for public and workers; predisposal management of radioactive waste and transportation of radioactive material; exemption and clearance; management of NORM and its waste; and decommissioning of radiation facilities. Those Regulations are supported with specific guides and Policy Manuals that provide additional requirements to be applied by the NRRC and licensees. Procedure manuals provide guidance for NRRC staff in various areas of their activities.

The Cabinet Resolution No 225 dated 9/1/2018 states that NRRC in its first stage of establishment and transition stage is authorised to use the IAEA safety standards as minimal provisions for regulations, guides and procedures, as needed for its scope of activities until NRRC issue its own regulation and guides. IRRS team recognised that providing the Resolution in the early stages of the development of NRRC played positive role in establishment of the current regulatory regime in The Kingdom.

The Kingdom has established an independent authority, National Competitiveness Centre, to oversee the process of development of legal framework. The National Competitiveness Centre monitors the process of drafting documents, the involvement of the necessary stakeholders, and the process of addressing comments. Draft regulations are shared with interested parties via Public Communication platform "*Istitlaa*". When the NRRC develops draft regulations, it identifies which stakeholders, including implementing organisations, must provide comments or conclusion on the draft.

Approved NRRC regulations are available on its official website. To support implementation of regulations and to gain better understanding of provisions of regulations by applicants and authorized parties, the NRRC undertakes consultations with stakeholders on an going basis. It also arranges awareness campaigns, workshops, stands at malls and conferences, for licensees and for the general public, to maximize the understanding of the NRRC's critical role in nuclear safety and radiation safety. Results of sessions are publicly available on the NRRC website and social media. The IRRS team considers this approach as a **good performance.**

9.2. REGULATIONS AND GUIDES FOR WASTE MANAGEMENT FACILITIES

The Law sets general principals for the management of radioactive waste and spent nuclear fuel. The Law requires: keeping the generated radioactive waste at the minimum practical level; considering the interdependence among the steps of radioactive waste and spent fuel management and biological, chemical and other hazards that may be associated with radioactive waste management; establishing adequate protection for criticality safety and removal of residual heat generated during radioactive waste management; implementing measures that reasonably minimize predictable impacts on future generations that might exceed those permitted for the current generation; and avoiding placing any costly additional burdens on future generations. The national strategy to implement provisions of National Policy has yet to be established. This is addressed in Recommendation R1 in Section 1.7.

Detailed requirements on predisposal management and interim storage of radioactive waste including waste characterisation and classification, derivation of waste acceptance criteria, radioactive waste packages, exemption and clearance have been established in the following regulations and guidelines:

- NRRC-R-01-SR01 Exemption and Clearance levels;
- NRRC-R-16 Management of Radioactive Waste; and
- NRRC-SG-004 Application for Authorization of Interim Storage.

Discharges are regulated in accordance with the provisions of NRRC-R-01.

The NRRC has not yet defined safety requirements and guides for the disposal of radioactive waste setting provisions for siting, design, operation, closure and post closure surveillance as well as conditions to meet requirements for long term safety.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *Requirements for disposal of radioactive waste have yet to be established.*	
(1)	**BASIS: SSR Part 5 Requirement 2 states that** *"The regulatory body shall establish regulatory Requirements for the development of different types of disposal facility for radioactive waste and shall set out the procedures for meeting the Requirements for the various stages of the licensing process. It shall also set conditions for the development, operation and closure of each individual disposal facility and shall carry out such activities as are necessary to ensure that the conditions are met."*
R16	**Recommendation: The NRRC should establish requirements for development of different types of disposal facilities for radioactive waste and set out the procedures (guidance) for meeting the Requirements for the various stages of the licensing process.**

9.3. REGULATIONS AND GUIDES FOR RADIATION SOURCES FACILITIES AND ACTIVITIES

The NRRC published four specific regulations related to radiation sources facilities and activities, i.e., on radiation safety, notification and authorization, source registration and on security of radioactive material. In addition, some specific regulations to be used by specific facilities and activities with sources were prepared, e.g., on integrated management system and on non-medical human imaging for security purpose.

The NRRC has published a comprehensive list of guides for application for authorization for specific practices and few additional guides to be used by the authorized party, e.g., appointment of radiation safety officer and on development of radiation protection program. The regulations and guides are based on IAEA safety standards and guides.

The NRRC informed the IRRS team that several specific technical guides are drafted in order to guide the authorized parties how to conduct specific practice safely, i.e., for industrial irradiator facilities and industrial radiography. The detailed technical guides are also going to facilitate authorization process This is addressed in Recommendation R8 in Section 5.1.

9.4. REGULATIONS AND GUIDES FOR DECOMMISSIONING ACTIVITIES

In accordance with provisions of NRRC-R-02, "Notification on and Authorization of Facilities and Activities with Radiation Sources," the strategy and initial plan of decommissioning is developed and provided to the NRRC as part of an application for authorization of facilities. The licensee is required to update and submit for review a decommissioning plan for renewal of an authorization, in cases where: a change of regulations; modification of technology; or accidents have occurred. Detailed requirements for preparation of decommissioning plan, including

the management system, radiation protection, safety and security aspects, decommissioning activities, as well as radioactive waste management and transport, are set out in NRRC-SG-003, "Application for Authorization of Decommissioning of Multi-Stage Facilities".

9.5. REGULATIONS AND GUIDES FOR TRANSPORT

The Law establishes the NRRC as the sole Competent Authority in charge of regulating transportation of radioactive material in The Kingdom. The NRRC developed transport regulations based on IAEA SSR-6, "Regulations for the Safe Transport of Radioactive Material" Rev. 1 (2018), in NRRC-R-15 "Safe Transport of Radioactive Materials" and NRRC-R-15-SR01 "Packaging and Transport of Radioactive Material." The radioactive material transport regulations were developed in coordination with other relevant authorities, including the General Authority of Civil Aviation, the Saudi Ports Authority, the Economic Cities and Special Zones Authority, and the Transport General Authority.

Both the NRRC-R-15 and NRRC-R-15-SR01 capture almost all of the transport requirements in SSR-6. The NRRC reorganized the requirements from SSR-6 to better facilitate understanding by its staff, and many of the specific requirements are captured in "Schedules" containing all requirements for specific transport areas. For example, the First Schedule contains package design requirements for excepted packages, the Second Schedule package design requirements for Type A packages, the Third Schedule package design requirements for Type B packages, and so forth.

Both the NRRC-R-15 and NRRC-R-15-SR01 are largely consistent with the requirements in SSR-6. The one exception is under the Twentieth Schedule, "Exceptions from the Requirements for Packages Containing Fissile Material." In this Schedule, NRRC regulations in Article (1)(a) and (b) are from an earlier version of SSR-6, which were removed in the 2018 version and replaced with other paragraphs. The IRRS team suggests that NRRC update its regulations to be consistent with the most recent version of SSR-6.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The Twentieth Schedule of NRRC-R-15-SR01, "Exceptions from the Requirements for Packages Containing Fissile Material," contains fissile exceptions that are not in the current version of SSR-6. The NRRC has already recognized this and developed a draft revision to Twentieth Schedule.*	
(1)	**BASIS: SSR-6, para. 417 states:** *"Fissile material and packages containing fissile material shall be classified under the relevant entry as "FISSILE" in accordance with Table 1 unless excepted by one of the provisions of subparagraphs (a)–(f) of this paragraph and transported subject to the requirements of para. 570."*
S11	**Suggestion: The NRRC should consider completing its revision to Twentieth Schedule of NRRC-R-15-SR01.**

The NRRC has developed several guidelines related to transport of radioactive material (NRRC-IG-004, NRRC-IG-026, NRRC-PM-004). These guidelines include application format and content guidance, staff review and assessment guidance, inspection guidance, and guidance on regulatory acceptance criteria. All of the guidelines developed related to transport are for shipment approval or approval of foreign Competent Authority-approved packages, as these are the primary transport activities currently taking place in The Kingdom. However, The Kingdom has expressed an interest in expanding its use of nuclear and radioactive material in the future, in which case all types of transport guidance could potentially be required. Guidance for transport package designs and activities other than shipment approval and approval of foreign Competent Authority-approved packages needs to be developed in the areas of: 1) format and content of applications; 2) staff review and assessment; 3) inspections; and 4) acceptance criteria for meeting transport regulatory requirements.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *Although authorizations are granted for all activities covered by SSR-6, other than for shipment approval and approval of foreign competent authority-approved packages, the NRRC needs to develop, guidance and procedures on transport package types and activities in the following areas :1) the format and content of applications; 2) review and assessment; 3) inspections; and 4) acceptance criteria for meeting transport regulatory requirements.*	
(1)	**BASIS: GSR Part 1 Requirement 24, para. 4.34 (X) states that** *"The regulatory body shall issue guidance on the format and content of the documents to be submitted by the applicant in support of an application for an authorization."*
(2)	**BASIS: GSR Part 1 Requirement 24, para. 4.33 states that** *"Prior to the granting of an authorization, the applicant shall be required to submit a safety assessment [9], which shall be reviewed and assessed by the regulatory body in accordance with clearly specified procedures."*
(3)	**BASIS: GSR Part 1 Requirement 27 states that** *"The regulatory body shall carry out inspections of facilities and activities to verify that the authorized party is in compliance with the regulatory requirements and with the conditions specified in the authorization.*
S12	**Suggestion: The NRRC should consider developing the guidance and inspection procedures for transport packages and activities other than shipment approval and foreign competent authority approved packages.**

9.6. REGULATIONS AND GUIDES FOR OCCUPATIONAL EXPOSURE

The NRRC-R-01 establishes the legal framework for radiation protection, including the responsibilities of the authorized parties regarding occupational exposure. The NRRC-R-01 addresses the basis for the optimization of protection and safety, including the application of dose constraints and assigns responsibilities for authorized parties to maintain adequate records; requires the authorized party to protect female workers, embryo or fetus or the breastfed infant; determine explicitly that special compensatory arrangements or preferential consideration with respect to salary, special insurance coverage, working hours, length of vacation, additional holidays or retirement benefits shall neither be granted nor be used.

The NRRC-R-01 specifies the dose limits for the different types of exposed workers in accordance with the dose limits specified in IAEA Safety Standards for occupational exposure in planned exposure situations.

The NRRC has developed several stakeholder guidelines that, based on a graded approach, provide authorized parties and any other responsible person with the specific information on the authorization, and compliance with the regulatory requirements for occupational exposure. The IRRS team was informed during site visits that these guides were considered very useful by licensees, and that they were available to them in both digital and hard copy, and had been disseminated in workshops carried out by NRRC to promote the new regulations.

Currently, there is no strategy for protection against Rn-222 in workplaces, although reference levels have been established for dwellings, schools, and other workplaces. This is addressed in Suggestion S8 in Section 6.6.

The NRRC-R-01 includes provisions for aircraft companies to ensure monitoring of the effective dose received by their air crews and to maintain the relevant personal dose records. However, the methodology to be used for such assessment and recording has yet to be established. This is addressed in Recommendation R15in Section 6.6.

9.7. REGULATIONS AND GUIDES FOR MEDICAL EXPOSURE

The NRRC-R-01 establishes the legal framework for radiation protection for medical exposures, including the roles and responsibilities for radiation protection and safety for the relevant parties. It is also stated that the radiological

medical practitioner performing or overseeing the radiation procedure is responsible for ensuring overall protection and safety for patients in the planning and delivery of the medical exposure in cooperation with the medical physicist and the medical radiation technologist.

The NRRC-R-01 establishes criteria for the release of patients after radionuclide therapy and defines that the authorized person shall ensure that all practicable measures are taken to minimize the likelihood and magnitude of unintended or accidental medical exposures.

The NRRC verifies during the review and assessment process and during inspection that the appropriate arrangements for pregnant and breastfeeding patients, stated in the regulations NRRC-R-01 are in place, which includes the availability of understandable signs for pregnant and breast-feeding patients.

The NRRC has issued several guides on the implementation of the requirements of the legal framework for radiation protection, which are available on the NRRC website. These guides are frequently reviewed for compliance with the regulations, national and international standards, and updated to account for new requirements and new best practices. The NRRC has conducted a study to evaluate the status of the quality control programs implemented in medical facilities. As an outcome, the NRRC has developed specific regulations for the establishment and implementation of quality control programs in diagnostic radiology and nuclear medicine.

The NRRC has not yet defined dose constraints for exposures of carers and comforters, and for volunteers participating in biomedical research.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The NRRC has not defined dose constraints for exposures of carers and comforters, and for volunteers participating in biomedical research. (As Addressed in the Action Plan).*	
(1)	**BASIS: GSR Part 3 Requirement 34, para. 3.149 states that:** *The government shall ensure that, as a result of consultation between the health authority, relevant professional bodies and the regulatory body, the following are established: Dose constraints to be fulfilled for: (i) Exposures of carers and comforters;* and (ii) *Exposures due to diagnostic investigations of volunteers participating in a programme of biomedical research."*
R17	**Recommendation: The NRRC should ensure that dose constraints for exposures of carers and for volunteers participating in biomedical research comforters are established.**

9.8. REGULATIONS AND GUIDES FOR PUBLIC EXPOSURE

Regulatory responsibilities for public exposure are clearly defined in NRRC-R-01 which places the responsibility on the operator to justify the dose constraint. It also requires the operator to assess that the retrospective dose complies with the dose limit, and makes no accounts of the requirement for applicants proposed radioactive discharge limits optimization. This is addressed Recommendation R13 Section 5.8. For activities involving NORM the NRRC specifies the dose constraint to be used.

Although stakeholder guides are available to support authorization process e.g. NRRC-SG-16 Application for authorization for nuclear medicine, there is no information to support the determination of discharge limits nor the impact on the public or systems to allow that to be assessed. The NRRC-R-01 states that planned discharges shall be the subject of authorization by the NRRC, however, the authorization process and associated guides provides no framework for applicants to assess that the discharges have been optimized. The internal guides available to the NRRC staff address optimization This is addressed in Recommendation R13 in Section 5.8.

Radon in buildings is addressed in NRRC-R-01-SR10 and radon in drinking water is addressed in NRRC-R-01-SR07 which has an action level of 300 Bq/m^3. Specific regulations for NORM have been enacted NORM generated by the

oil and gas sector are regulated by the NRRC under NRRC-R-01-SR11. This issue was addressed as part of the policy discussions. The NRRC needs to consider the regulations already enacted in order to develop a systematic approach for management of NORM situations in The Kingdom. This will include a methodology and criteria for review and assessment of NORM arising in The Kingdom which will deliver a protection strategy.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The NRRC has yet to implement some regulations for NORM, as a result it does not have a complete protection strategy. (As Addressed in the Action Plan).*	
(1)	**BASIS: GSR Part 3 Requirement 1 states "***parties with responsibilities for protection and safety shall ensure that the principles of radiation protection are applied for all exposure situations***."**
(2)	**BASIS: GSR Part 3 Requirement 47 para. 5.4 states** *"The regulatory body or other authority assigned to establish a protection strategy for an existing exposure situation shall ensure that it specifies: (a) the objectives to be achieved by means of the protection strategy and (b) appropriate reference levels."*
R18	**Recommendation: The NRRC should complete and implement a protection strategy for NORM exposure situations in oil and gas industry and other industries.**

9.9. SUMMARY

A high-level legal framework consisting of National Policies and laws has been established in The Kingdom.

The NRRC has already developed regulations and guides as well as policy manuals to support implementation of safety measures for practices, activities, and facilities. Nevertheless, the IRRS team consider that there are still some necessary regulations and guides which need to be developed and encourage the NRRC to progress with these.

10. EMERGENCY PREPAREDNESS AND RESPONSE – REGULATORY ASPECTS

10.1. AUTHORITY AND RESPONSIBILITIES FOR REGULATING ON-SITE EPR OF OPERATING ORGANIZATIONS

An emergency management system for preparedness and response to a nuclear or radiological emergency has been established in The Kingdom.

The Government has adopted necessary legislation and empowered the NRRC to establish regulations. The Law gives authority to the NRRC to establish requirements for emergency preparedness and response plans (EPR plans) for facilities and activities. These EPR plans constitute part of the requirements for obtaining a license or its renewal. The NRRC Statute gives the NRRC the power to set requirements for nuclear and radiological emergency preparedness, and control and inspect activities, practices, and facilities within its jurisdiction.

Responsibilities for operating organisation's EPR are prescribed in the Law. It states that *"the licensee shall set an emergency preparedness and response plan for the facility he operates and shall review, update, and test said plan on a regular basis"*. The NRRC is required to approve such plan and any updates. The NRRC-R-01 prescribes that the authorized party should prepare an Emergency Plan for the protection of people and the environment reflecting findings from the safety assessment taking into consideration the likelihood of an emergency affecting either workers or members of the public as part of emergency preparedness and response.

In The Kingdom, the mechanism for preparing for and responding to any nuclear or radiological emergency is the National Nuclear and Radiological Emergency Response System. This system consists of two parts, the Permanent National Committee for Radiological and Nuclear Emergency Response (Permanent Committee), which ensures all necessary arrangements are in place in the preparedness phase, and the National Plan for Response to Nuclear and Radiological Emergencies (National Plan), which is activated when off-site consequences are possible.

The Government, through establishment of the Permanent Committee, has established a national coordinating mechanism consistent with its emergency management system. Similarly, it has ensured that the response organizations, operating organizations, and the regulatory body have sufficient human, financial and other resources.

The National Plan, formed by Council of Ministers Resolution No. 263 dated 1st of September 2008, describes the roles of government organizations in response to nuclear and radiological emergencies. The Plan, when activated, can be applied partially or fully, to respond in the cases of nuclear accidents, radiological emergencies, and transportation accidents of nuclear and radioactive materials which have consequences that are outside any nuclear or radiological facility. The Plan emphasizes harmonization and integration of roles of government agencies during off-site emergencies but does not include regulating EPR arrangements of operating organizations.

The NRRC guideline Development of Emergency Plan for Radiological Facilities (NRRC-SG-018) provides detailed instructions on how to perform hazard assessment of a facility or activity. The assessment needs to be conducted prior to the preparation of an emergency plan and should identify all sources of exposures including on-site and off-site locations for which a radiation emergency may warrant protective and response actions. The assessment also needs to take into account other conventional hazards capable of compounding the radiation emergency situation (such as fire, flood, earthquake, technology failures, bomb

threat etc.) Example methods for performing a risk assessment including impact analysis are contained in Annex-II of the NRRC-SG-018. Once hazard is assessed by the operating organization, the NRRC determines the emergency preparedness category of the facility/activity.

The regulation: Nuclear Facilities Emergency Preparedness and Response (NRRC-R-14) does not contain similar instruction on hazard assessment. The IRRS team was informed that it had not been considered a priority due to the fact that there are no current nuclear facilities in The Kingdom, nevertheless, taking into account future plans for nuclear facilities, such guidance could be considered in the next update of the Regulation.

The regulation Nuclear Facilities Emergency Preparedness and Response (NRRC-R-14), require the operating organization to develop, justify and optimize protection strategies at the planning stage by using scenarios based on the hazard assessment for avoiding or minimizing severe deterministic effects and reducing the likelihood of stochastic effects due to radiation exposure. Likewise, the Law prescribes that any person that is involved in any activity concerning emergency or existing exposure situations shall use the relevant References Levels, established by the NRRC, as a boundary condition in identifying the range of options for optimization in implementing protective actions. The National Reference Levels for Nuclear and Radiological Emergency Response (NRRC-PoM-010) provides a comprehensive set of national criteria for initiating the different parts of an emergency plan and for taking protective actions and other response actions, description of emergency classes, protective actions, emergency zones and distances and operational intervention levels. This document is to be used as a basis for the development, justification, and optimization of protection strategies.

10.2. REGULATIONS AND GUIDES ON ON-SITE EPR OF OPERATING ORGANIZATIONS

The government of The Kingdom has enacted legislation for emergency preparedness and response to nuclear and radiological emergencies.

The Law gives authority to the NRRC to set requirements for EPR plans for facilities and activities. These EPR plans constitute part of the requirements for obtaining a authorization or its renewal. Furthermore, the NRRC sets requirements for nuclear and radiological emergency preparedness, and controls and inspects activities and facilities within its jurisdiction, as mandated by its Statute.

Responsibilities for operating organisation's EPR are prescribed by the Law. The authorized parties is required to set an EPR plan for the facility they operate and to *review, update and test* that plan on a regular basis.

The Law describes the actions that should be taken by the main entities in the event of a nuclear or radiological emergency. The licensee is responsible to implement its nuclear or radiological emergency plan as approved by the NRRC. If the situation escalates and radioactive contamination is expected to spread beyond the boundaries of the facility, the National Plan for Response to Nuclear or Radiological Emergency is activated. If the spread of radioactive contamination beyond the boundaries of The Kingdom is probable, the NRRC is required to immediately notify IAEA and provide any information or assistance under relevant international agreements.

The NRRC-R-01 prescribes duties for emergency planning and requires the authorized person to establish organizational arrangements consistent with its Management System, prepare an Emergency Plan for the protection of people and the environment, and prepare this plan for approval by the NRRC as part of the authorization process. The Emergency Plan must include provision for individual monitoring, area

monitoring, arrangements for medical treatment and arrangements for assessing and mitigating any consequences of an emergency.

The authorized person needs to ensure periodic review and updating of the emergency plan to ensure that resources, arrangements, and procedures are consistent with any change within the facility or at external organizations supporting the plan.

To prevent the occurrence of conditions that could lead to a loss of control over a source or to the escalation of such conditions, the authorized person is required to: develop, maintain and implement procedures to provide the means for preventing loss of control over the source and for regaining control over the source; to make available equipment, instrumentation and diagnostic aids that may be needed; and to train and periodically retrain personnel in the procedures to be followed and exercise the procedures.

In the event of an emergency situation the authorized person is required to immediately notify the NRRC of any declaration of an emergency situation and the classification of the emergency situation.

Detailed instructions of which emergency arrangements are required to be in place are provided in: Development of Emergency Plan for Radiological Facilities (NRRC-SG-018) and Nuclear Facilities Emergency Preparedness and Response (NRRC-R-14).

The Regulatory Inspection of Radiation Activities and Facilities (NRRC-PoM-002) provides an approach and technique for conducting effective and efficient regulatory inspections for radiation activities and facilities for all types of radiation activities and facilities. In conducting the inspection and preparing the report, the emergency preparedness and response plans should also be considered.

The Regulation Management of Radioactive Waste (NRRC-R-16) requires that authorized persons shall ensure that their emergency plans include arrangements for the generated radioactive waste during normal operation as well as for the radioactive waste potentially generated in an emergency situation.

The internal guide: Management and Control over Radioactive Material Out of Regulatory Control (NRRC-IG-027) provides guidance on how to develop a nationwide program for gaining control of materials out of regulatory control (MORC). The program aims to prevent the occurrence of MORC that could lead to orphan source scenarios.

10.3. VERIFYING THE ADEQUACY OF ON-SITE EPR OF OPERATING ORGANIZATIONS

Under Statute, the NRRC has been assigned the authority to review, assess, approve, and inspect emergency plans for controlled facilities and activities. The NRRC is empowered to verify compliance of the on-site emergency arrangements of operating organizations before commencement of operation of the facility/activity, and during the lifetime of the facility/activity through:

1. Review and assessment of the documentation elaborating operator’s emergency arrangements during the authorization process.
2. Approval of the operator’s emergency preparedness and response plan.
3. Inspections of operators' emergency preparedness and response arrangements through document review or through testing of the approved plan.
4. Ensuring that the operator’s emergency arrangements are coordinated with those of other organizations and integrated with contingency plans and security plans established for nuclear security purposes.

The Law empowers the NRRC to carry out inspection and enforcement tasks and supports the carrying out inspection and enforcement tasks.

The internal guidance for the review and assessment for each practice established internal NRRC process to ensure adequate regulatory oversight through graded approach consistent with the level of risk.

The authorization process warrants that applications include the requirements of the Stakeholder Guideline on Development of Emergency Plan for Radiological Facilities (NRRC-SG-018) which provide details on the preparation of emergency plans.

The Law is complemented with NRRC Policy Manual Regulatory Inspection of Radiation Activities and Facilities (NRRC-PoM-002) which provides an approach and technique for conducting effective and efficient regulatory inspections for all radiation activities and facilities. It prescribes the range of areas that that regulatory inspections should cover, including: *emergency response plans and preparedness (EPP).*

The regulatory inspection program referred to in the NRRC-PoM-002 defines the requirement to evaluate the exercises carried out by the authorized person to test their EPR arrangements. The guidelines for performing inspections to examine the effectiveness of the emergency plan including criteria for evaluating exercises are yet to be developed and implemented by the NRRC. IRRS team recommends that the NRRC should develop and implement a methodology for evaluation of exercises on EPR arrangements carried out by the authorized person which includes:

a. The integration of exercises on EPR arrangements in the inspection plans for operating organizations;
b. Criteria and checklists for evaluation of exercises on EPR arrangements; and
c. Report templates to govern the documentation of the findings.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *Internal NRRC methodology and criteria for evaluating emergency exercises conducted by operating organizations are yet to be developed and implemented. (As Addressed in the Action Plan).*	
(1)	**BASIS: GSR Part 7 Requirement 2** **Para 4.10.** The government shall establish a national coordinating mechanism to be functional at the preparedness stage, consistent with its emergency management system, with the following functions: (h) To ensure that appropriate and coordinated programmes of training and exercises are in place and implemented, and that training and exercises are systematically evaluated;
	BASIS: GSR Part 1 Requirement 8. **Para 2.24A.** The government shall ensure that adequate training, drills and exercises, involving authorized parties and response organizations, including decision makers, are carried out regularly to contribute to an effective emergency response [5]. The training, drills and exercises shall cover a full range of postulated emergencies (e.g. events affecting several facilities on the same site, emergency exercises of long duration and emergencies with transboundary consequences).
(2)	**BASIS: GSR Part 7 Requirement 25** **Para 6.30.** Exercise programmes shall be developed and implemented to ensure that all specified functions required to be performed for emergency response, all organizational interfaces for facilities in category I, II or III, and the national level programmes for category IV or V are tested at suitable intervals. …. The exercises shall be systematically evaluated (see para. 4.10(h)) and some exercises shall be evaluated by the regulatory body. ….

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
R19	**Recommendation: The NRRC should develop and implement a methodology for evaluation of exercises on Emergency Preparedness and Response (EPR) arrangements.**

10.4. ROLES OF THE RB IN A NUCLEAR OR RADIOLOGICAL EMERGENCY

The NRRC's responsibilities in a nuclear or radiological emergency are defined in the National Plan for Response to Radiological and Nuclear Emergencies. They include radiation monitoring, radiological assessment and risk assessment of nuclear and radiological emergencies to estimate health, environmental, economic and social effects of the consequences. The NRRC also provides recommendation on protective actions that are to be implemented.

The NRRC has its own emergency plan which provides details on the activation of the Emergency Operation Centre and initial actions to be taken in an emergency.

The two organizational units within NRRC relevant to emergency preparedness response are the Radiation Control Sector, and the Risk, Emergency and Business Continuity Sector.

For practices subject to authorization, the applicant’s Emergency Plan must be approved by the Radiation Control Sector before the authorization is issued. When an application is received, the Sector makes a preliminary assessment of the content of the Emergency Plan against a check list of required arrangements. The level of detail required in the plan is decided on a case-by-case basis using a graded approach.

The Risk, Emergency and Business Continuity Sector's role is to ensure effective preparedness for and response to nuclear and radiological emergencies. This includes analysis of nuclear and radiological risks to The Kingdom, assessment of potential or actual consequences of nuclear and radiological emergencies and related preparedness and response arrangements and ensuring the NRRC’s readiness to perform its role to respond to a nuclear and radiological emergency when the National Plan is activated.

The IRRS team found that continuous cooperation between Radiation Control Sector and the Risk, Emergency and Business Continuity Sector may be beneficial in the context of knowledge and experience sharing of the EPR arrangements.

The NRRC has developed technical and regulatory means to limit the illicit trafficking of nuclear materials, radioactive materials, and goods that may be contaminated. The tasks of the personnel at the airports in Riyadh, Jeddah and Dammam include the on-site inspection of the import and export of the radioactive material shipments, and controlled items, the support of customs officers during the customs inspection process, and the provision of initial assistance in a case of an emergency. **The IRRS team considers this a good performance is noted in section 7.5.**

Responsibilities of the Risk, Emergency and Business Continuity Sector also include implementation of The Kingdom’s international obligations and collaborating with national and international organizations.
In its efforts to build its capabilities and infrastructure to respond to nuclear and radiological emergencies, The Kingdom, the NRRC, has established its first emergency operations centre specializing in nuclear and radiological emergencies. The Nuclear Emergency Operation Centre (NEOC) at the NRRC is equipped with codes to evaluate short and long-term radiological consequences of nuclear or radiological emergencies.

The Kingdom has agreements on information exchange and cooperation in the field of nuclear and radiation safety with several states.

In regard to the emergency conventions (the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency), the NRRC acts as National Warning Point (NWP) and as the Competent Authority (CA). The NRRC has a duty office available 24/7.

The NRRC also undertakes internal exercises based on scenarios that test the readiness of its staff and infrastructure. Based on its role in the National Plan, the NRRC in cooperation with the Civil Defence, develops exercises to test and evaluate the response of national organizations to nuclear or radiological emergencies. The NRRC also regularly participates in the international exercises (ConvEx) conducted by the IAEA.

In fulfilling its obligations under the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, The Kingdom has developed its capabilities to respond to nuclear emergencies on a national level and to help other countries that may require assistance to mitigate potential radiological consequences. In September 2021, The Kingdom, joined IAEA's Response and Assistance Network (RANET) with functional areas in Radiation Survey as Field Assistance Team A (FAT A), and Sampling and Analysis (SA) as Field Assistance Team (FAT) and External Based Support (EBS) for Gamma spectrometry.

The NRRC operates the National Network for Continuous Environmental Radiation Monitoring and Early Warning which consists of 240 radiation monitoring stations distributed around The Kingdom. In its efforts to promote regional cooperation and support the implementation of the Convention on Early Notification of a Nuclear Accident, the NRRC shares its monitoring information from the national network with the IAEA and all Member States on the International Radiation Monitoring Information System (IRMIS).

The NRRC has established The National Nuclear Security Incident Network which consists of portal monitors deployed in different locations around The Kingdom such as checkpoints between cities, scrap yards, airports, and customs ports. All data collected by the system are transferred to the NEOC in real-time. The on-duty officers follow standard operating procedures to continuously monitor the system. When alarms are triggered, the NEOC verifies and assesses the information received to respond to the event.

10.5. SUMMARY

The NRRC has arrangements in place to fulfil its role in a preparedness and response to a nuclear or radiological emergency and to effectively cooperate with national authorities and international organisations.

The existing regulatory framework uses a graded approach in establishing EPR arrangements and for implementing the IAEA requirements.

Nevertheless, some emergency preparedness and response aspects require further development to ensure compliance with the IAEA safety standards.

The NRRC should develop and implement a methodology for evaluation of exercises on EPR arrangements.

11. REGULATORY IMPLICATIONS OF PANDEMIC SITUATIONS

The COVID-19 pandemic started shortly after the establishment of the NRRC in 2018. It presented a challenge to the staff of the NRRC due to their limited operational experience and the need for adjustment to work remotely as per the Saudi Ministry of Human Resources and Social Development.

Following the guideline, like any other governmental organizations, the NRRC complied with the health instructions, which allowed NRRC staff to join their offices according to a specific quota, depending on the improvement of COVID-19 situation.

The team was informed that certain types of medical practices were significantly burdened by the impact of the pandemic. Such a situation induced challenging and unique difficulties in exercising regulatory obligations, while dealing with the effect of the pandemic.

Online meetings for the performance of basic activities and processes were implemented including virtual inspections for some facilities.

The pandemic lockdown period was a time used for building the regulatory framework, together with developing the NRRC strategy.

As lesson learned and to be prepared for special circumstances beyond pandemics in the future, the NRRC started processes of acquiring ISO 22301 “Business continuity management systems” which it now secured. This management system provides a resilience against future disruptive events. **see good practice GP2 in session 3.6.**

12. POLICY ISSUES

Policy on maintaining and sustaining the effective independence in the performance of the NRRC's regulatory functions

The CEO of the NRRC, Mr Khalid Aleissa, explained in his opening remarks that the NRRC as a new regulatory body faces challenges related to efficient joint working arrangements with other relevant government agencies. In addition, the NRRC is strengthening the awareness related to radiation and nuclear safety, however there is a need to raise awareness of its role and remit within The Kingdom. As an example, he pointed out that the transport of material through The Kingdom where radioactive material had been detected at the border needed to be coordinated with a number of government agencies. He also noted that there is a plan to develop Joint Governmental Organization Policies for relevant governmental entities. In a discussion it was noted that Memoranda of Understanding did not seem to be a sufficient tool to achieve the desired coordination and joint working arrangements, hence in The Kingdom there is a need for a clear division for labour. The experts shared their experiences:

- Good cooperation between governmental entities is a long term goal and there is no one model assuring good cooperation, e.g. specific cooperation is needed at the state borders.
- Regular meetings, e.g. twice per year, of a state committee for radiation and nuclear safety with all main stakeholders in the state, in particular governmental entities seems to facilitate coordination between governmental entities. Such meetings promote independence of the regulatory body which is not challenged when a particular regulatory issue might jeopardise its independence.

Regarding specific case related to above mentioned material originated from China the experts shared the experiences.

- The integrated border management which enhances cooperation between a number of regulators with responsibility at the border including the control of import and export of radioactive sources was described. It took about 5 years to fully implement such management arrangements.
- The NRRC was advised to develop a database of all such incidents as a tool to assure lessons learned to be used in the country. This would allow management of each case to be analysed. The cooperation with neighbouring country and country of origin of such material is vital. All such cases should be promoted to stakeholders such as customs to facilitate understanding of management of such cases. It is also important that lessons from previous occurrences are learned in order to enable a fast response between all the competent agencies. A 24/7 office of the regulatory body encourages customs and police to efficiently cooperate when managing such incidents.
- Policy on control of NORM generating activities in The Kingdom

The second policy item related to the control of NORM.

The IRRS team noted that there was a need for NRRC to consider the regulatory framework in which activities generating NORM should be controlled. Regarding the NORM generating activities such as activities in oil and gas sectors there are two primary approaches which The Kingdom could consider;

- the generation of NORM as a planned exposure situation with existing NORM contamination as existing exposure situation; or
- the entire NORM generating sector as existing exposures.

The IRRS team noted that both approaches are consistent with the IAEA Basic Safety Standards although with the first approach being consistent with both the IAEA and European Commission (EC) Basic Safety Standards. Following a question about the advantages and drawbacks of each approach, the IRRS team noted that treating the current NORM industries as a planned exposure situation would allow The Kingdom to use its existing regulatory framework for regulation with potential considerations for dose constraints etc. whilst adopting an existing exposure

approach for current activities would mean that each activity would need to be considered individually the objective would be to do more good than harm for each situation.

The NRRC staff asked the IRRS team about potential disposal options for NORM waste. The IRRS team noted that there were three broad approaches to NORM waste management around the world, namely, dilute and disperse; concentrate and contain; or disposal. Current disposal options were into facilities with appropriate waste acceptance criteria, and this could mean incineration or direct disposal such as reinjection of NORM into empty fields. The NRRC staff noted that they had a particular issue with sand filters for brackish ground water treatment plants, following a change in the treatment process NORM had been generated which now needed to be managed. The IRRS team noted that the NRRC could engage with the operator to discuss the potential financial costs to The Kingdom of management of NORM which may change the economic case for the use of a method which generates NORM.

Both the IRRS team and the NRRC teams noted that management of NORM from current activities and past practices was problematic and required engagement with the industry in order to progress radiological safety in this area.

APPENDIX I – LIST OF PARTICIPANTS

INTERNATIONAL EXPERTS:		
DALE Paul	Scottish Environment Protection Agency, Stirling, UK.	paul.dale@sepa.org.uk
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BREJZA Paul	Commission for the Protection From Ionising and Non-Ionising Radiation	Paul.brejza@gov.mt
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BARTO Andrew	United Stats Nuclear Regulatory Commission	Andrew.Barto@nrc.gov
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BELAMARIC Nera	Spice Consulting Company, Croatia	nera.belamaric@gmail.com
IAEA STAFF		
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ALJEBALI Nawaf	Nuclear and Radiological Regulatory Commission	naljebali@nrrc.gov.sa

GROUP PHOTO


هيئة الرقابة النووية والإشعاعية
Nuclear and Radiological Regulatory Commission
INTEGRATED REGULATORY REVIEW SERVICE (IRRS)
1 - 10 October 2023
IAEA
@saudinrrc

APPENDIX II – MISSION PROGRAMME

Day	Saturday	Sunday	Monday	Tuesday		Wednesday	Thursday	Friday	Saturday		Sunday	Monday	Tuesday
	30-Sep	01-Oct	02-Oct	03-Oct		04-Oct	05-Oct	06-Oct	07-Oct		08-Oct	09-Oct	10-Oct
08:15		Transport	Transport	Transport	Transport	Transport	Transport				Transport	Transport	Transport
08:30													
09:00			Interviews with Counterparts 2	Interviews with Counterparts 4	Site visit - Medical / Industrial / Waste	Follow-up interviews	Report Cross Reading (team)	Finalization of the First Draft of the Report		Draft Report and Review and commenting (NRRC)	TL & TC drafts Executive Summary and Presentation	Team Meeting for Report Finalization (NRRC-IRRS-TEAM)	
09:30		Entrance Meeting											
10:00						Recommendations and suggestions finalization			Transport				Exit Meeting
10:30									Social event				
11:00													
11:30		Group photo											
12:00		Lunch	Lunch	Lunch		Lunch	Lunch				Lunch	Lunch	Lunch
12:30													
13:00													Transport
13:30	Initial Team Meeting	Interviews with Counterparts 1	Interviews with Counterparts 3	Interviews with Counterparts 5		Policy Discussions	Individual Review of the full Report (Team)				NRRC finalize review and submits comments	Team Meeting for Report Finalization	
14:00													
14:30													
15:00						Report Writing (Team)			Transport				
15:30													
16:00											Team Reviews Host Comments and finalizes report	Report submission and press release finalization	
16:30													
17:00		Daily Team Meeting	Daily Team Meeting	Daily Team Meeting		Daily Team Meeting						Transport	
17:30													
18:00		Transport	Transport	Transport		Transport	Transport						
18:30	Team Dinner	Writing the report (Team)	Writing the report (Team)	Draft of Preliminary Findings - Finalization (Team)				TL & TC Draft Report Edit					
19:00											Transport	Transport	
19:30						Report Writing (Team)			FREE TIME		TL & TC Finalize draft report editing	Farewell Dinner	
20:00													
20:30						Finalization of First Draft of the Report	Individual Review of the full Report (Team)						
21:00													
21:30								Draft report submitted to counterparts					
22:00													
22:30													
23:00													

APPENDIX III – SITE VISITS

King Abdulaziz City for Science and Technology (KACST)

Alhabib Hospital

Sure Beam Middle East, L.L.C. in Riyadh

APPENDIX IV – LIST OF COUNTERPARTS

	IRRS EXPERTS	Lead Counterpart	Support Staff
1.	**LEGISLATIVE AND GOVERNMENTAL RESPONSIBILITIES**		
	Uma Rajapa	Saeed Alamoudi	Faisal Alrumayan Shahd Noli Nawaf Aljebali
2.	**GLOBAL NUCLEAR SAFETY REGIME R SAFETY REGIME**		
	Uma Rajapa Andrea Luciani	Saeed Alamoudi	Mohammed Farran Shahd Noli Razaz bin Mahfouz
3.	RESPONSIBILITIES AND FUNCTIONS OF THE REGULATORY BODY NSIBILITIES AND FUNCTIONS OF THE REGULATORY BODY		
	Faradally A. Ollite	Mohammad Farran	Abdulrahman Abuobayd Samer Al-Rehaili Abeer Almufarrij
4.	MANAGEMENT SYSTEM OF THE REGULATORY BODY MANAGEMENT SYSTEM OF THE REGULATORY BODY		
	Paul Brejza	Khalid Alassaf	Abdulrahman Althuwayb Muayad Kaki Amirah Almasrouhi Mohammad Binzagr
5.	AUTHORIZATION		
	Helena Janzekovic Paul Dale Andrew Barto	Fahad Alzakari Abdulrahman Abuobayd Baraa Shah Bahai Mashal Alshammari	Ali Alshogeathri Muqrin Al Alshayk Jehad Al Saif Abdalrahman Zeinalabdien Nawaf Alsehli Ibraheem Barefah
6.	REVIEW AND ASSESSMENT		
	Pedro Rosairo Andrew Barto	Faisal Alrumayan Abdulrahman Abuobayd	Khulud Alsaraj Mohammad Alharbi

	IRRS EXPERTS	Lead Counterpart	Support Staff
	Paul Dale	Ammar Al-Ghamdi Mashal Alshammari	Fadwa Saeed Aldosari Yasmin Rajhi. Jehad Al Saif Abdalrahman Zeinalabdien Nawaf Alsehli Ibraheem Barefah
7.	INSPECTION		
	Andrea Luciani	Muqrin Al Alshayk	Abdulrahman Alfahmi
8.	ENFORCEMENT		
	Camila Salata	Saud Alsultan Khulud Alsiraj	Fahad Alzakari Nawaf Aljebali Abdulaziz Dakhilallah Abdullah Aldokhail Ohoud Alghanmi Shahd Noli
9.	REGULATIONS AND GUIDES		
	Pedro Rosairo Paul Dale Andrew Barto	Nawaf Aljebali Ahmed Alenezi Fahad Alzakari Abdulrahman Abuobayd Mashal Alshammari	Abdulrahman Alfahmi Yasmin Rajhi Baraa Abdulmajid Bahai Misfer Aldrees Jehad Al Saif Abdalrahman Zeinalabdien Nawaf Alsehli Ibraheem Barefah
10.	EMERGENCY PREPAREDNESS AND RESPONSE		
	Nera Belamaric	Faisal Alghamdi	Bassam Alqahtani Mashal Alshammari Sama Alhamdan

APPENDIX V – RECOMMENDATIONS (R), SUGGESTIONS (S) AND GOOD PRACTICES (GP)

AREA	R: Recommendations S: Suggestions G: Good Practices	Recommendations, Suggestions or Good Practices
1. LEGISLATIVE AND GOVERNMENTAL RESPONSIBILITIES	GP1	Establishment of JGoPs as a legally binding mechanism for ensuring legal division of labour to deliver effective joint working arrangements and coordination between the NRRC and other relevant Government agencies for the tasks and responsibilities to be clearly assigned to avoid any omissions or undue duplication and to avoid conflicting requirements.
	S1	The Government should consider undertaking a systematic review to identify and establish JGoPs between NRRC and all relevant national agencies with responsibilities for safety including finalising JGoPs under development.
	R1	The Government should establish a national strategy for radioactive waste management to outline arrangements for ensuring the implementation of the national policy.
	S2	The Government should consider establishing long-term storage for disused radioactive sources in the Kingdom.
	R2	The Government should within its National Strategy establish requirements for interim targets and end states to enable effective management in the safe disposal of radioactive waste.
	S3	The Government should consider establishing the competence framework led by the NRRC for building and maintaining competence in safety.
	R3	The Government should develop a strategy to ensure availability of technical services in the country.
2. THE GLOBAL SAFETY REGIME	R4	The NRRC should develop and maintain a mechanism for systematically collecting, analysing, and providing feedback (at both national and international level) on measures taken in response to information from the operating and regulatory experience.

AREA	R: Recommendations S: Suggestions G: Good Practices	Recommendations, Suggestions or Good Practices
3. RESPONSIBILITIES AND FUNCTIONS OF THE REGULATORY BODY	S4	The NRRC should consider completing the recruitment of its staff to ensure that it has a sufficient number of staff to effectively carry out all its regulatory functions.
	R5	The NRRC should finalize the competency needs assessment and the training operational plan as provided in the policy on human capacity development to ensure adequate competence within the organization.
	GP2	The establishment of a certified Business Continuity Management System by the NRRC for maintaining the regulatory oversight of facilities and activities continuity of its critical regulatory functions in any disruptive or emergency situation.
	S5	The NRRC should consider completing and then maintaining its National Registry System.
4. MANAGEMENT SYSTEM OF THE REGULATORY BODY	R6	The NRRC should produce any remaining supporting documents and incorporate them in its management system in particular to ensure that the statutory and international obligations are being fulfilled, with emphasis on regulatory requirements to help preventing safety from being compromised.
5. AUTHORIZATION	R7	The NRRC should broaden the implementation of the graded approach in authorization by implementing authorization by registration.
	R8	The NRRC should develop full set of detailed and specific criteria to be used in authorization process for specific facilities or activities with radiation sources.
	R9	The NRRC should develop requirements for recognition of qualified experts and implement them.
	R10	The NRRC should formally recognize Technical Service Organizations in The Kingdom that may have significance for safety.
	R11	The NRRC should expand the enforcement of the requirements that all facilities and activities using X-ray generators in radiodiagnostic examinations are authorized

AREA	R: Recommendations S: Suggestions G: Good Practices	Recommendations, Suggestions or Good Practices
	S6	**The NRRC should consider developing and implementing national comprehensive arrangements, with clear role of other relevant organization, to search and regain control over legacy sources including orphan sources.**
	S7	**The NRRC should consider establishing guidance on the elements of the health surveillance programme for exposed workers.**
	R12	**The NRRC should establish national diagnostic reference levels.**
	R13	**The NRRC should review applicants' proposed radioactive discharge limits to ensure they are optimized**
	R14	**The NRRC should develops a systematic approach to assess dose to the public including an environmental monitoring programme for planned situation which will allow NRRC to demonstrate compliance with the dose limit.**
6. REVIEW AND ASSESSMENT	**S8**	**The NRRC should consider completing the development of a strategy for protection against exposure due to 222Rn in workplaces.**
	R15	**The NRRC should implement the framework for the assessment and recording of doses received by aircrew from occupational exposure to cosmic radiation.**
7. INSPECTION	**S9**	**The NRRC should consider establishing a formal procedure to ensure that the inspectors provide feedback and observations from the inspection programme to improve it, to identify trends and root causes and to strengthen inspectors' competence.**
	S10	**The NRRC should consider developing procedures to make the findings of inspections publicly available.**
8. ENFORCEMENT		

AREA	R: Recommendations S: Suggestions G: Good Practices	Recommendations, Suggestions or Good Practices
9. REGULATIONS AND GUIDES		
	R16	The NRRC should establish requirements for development of different types of disposal facilities for radioactive waste and set out the procedures (guidance) for meeting the Requirements for the various stages of the licensing process.
	S11	The NRRC should consider completing its revision to Twentieth Schedule of NRRC-R-15-SR01.
	S12	The NRRC should consider developing the guidance and inspection procedures for transport packages and activities other than shipment approval and foreign competent authority approved packages.
	R17	The NRRC should ensure that dose constraints for exposures of carers and for volunteers participating in biomedical research comforters are established.
	R18	The NRRC should complete and implement a protection strategy for NORM exposure situations in oil and gas industry and other industries.
10. EMERGENCY PREPAREDNESS AND RESPONSE – REGULATORY ASPECTS	R19	The NRRC should develop and implement a methodology for evaluation of exercises on Emergency Preparedness and Response (EPR) arrangements.

APPENDIX VI – COUNTERPART'S REFERENCE MATERIAL USED FOR THE REVIEW

National Policies

National Policy for the Atomic Energy Program
National Policy for Radioactive Waste Management
National Policy for Occupational Safety and Health

NRRC Laws

Law of Nuclear and Radiological Control
Statute of the Nuclear and Radiological Regulatory Commission (NRRC)
Law of Civil Liability for Nuclear Damage

NRRC Regulations

Radiation Safety Regulation	(NRRC-R-01)
Notification on and Authorization of Activities and Facilities with Radi-ation Sources Regulation	(NRRC-R-02)
Safe Transport of Radioactive Materials Regulation	(NRRC-R-15)
Management of Radioactive Waste Regulation	(NRRC-R-16)
Security of Radioactive Materials Regulation	(NRRC-R-17)

NRRC Specific Regulations

Exemption and Clearance Levels	(NRRC-R-01-SR01)
Compliance with Dose Limits	(NRRC-R-01-SR02)
Management of Naturally Occurring Radioactive Materials in Non-radiological Industries	(NRRC-R-01-SR11)
Establishment and Implementation of Quality Control (QC) Programs in Diagnostic Radiology Facilities	NRRC-R-01-SR03
Pre-Established Dose Constraints for the Members of the Public.	NRRC-R-01-SR04
Decommissioning of Radiation Facility	(NRRC-R-01-SR15)
Non-Medical Human Imaging for Security Purpose	NRRC-R-01-SR05

NRRC Policy Manual

NRRC Safety Policy Manual	(NRRC-PoM-009)
Regulatory Inspection of Radiation Activities and Facilities	(NRRC-PoM-002)
Regulatory Enforcement of Radiation Activities and Facilities	(NRRC-PoM-006)

Policy Manual on Human Capability Development Program to Perform an Effective Regulatory Functions	(NRRC-PoM-001)
Policy Manual on Recognition of Dosimetric Service Providers	(NRRC-PoM-005)
Management Policy Manual	(NRRC-PoM-008)
Management of Radioactive Waste and Disused Sealed Radiation Sources	(NRRC-PoM-003)

NRRC Procedure Manuals

Notification From Interested Parties to Conduct Radiation Activity or Practice	(NRRC-PM-005)
Pre-authorization Engagement with Stakeholders	(NRRC-PM-032)
Authorization by Registration of a Radiological Practice	(NRRC-PM-028)
Licensing a Radiological Practice	(NRRC-PM-031)
Conditional Exemption of a Radiological Practice or Radiation Source	(NRRC-PM-030)
Approval of Clearance of a Radioactive Material Within an Authorized Radiological Practice	(NRRC-PM-027)
Permits for Import, Export and Transfer of Possession of Radiation Source	(NRRC-PM-046)
Suspending and Revoking of a Radiological Authorization	(NRRC-PM-035)
Amendment of a License or Registration of a Radiological Practice	(NRRC-PM-025)
Termination of a Radiological Authorization	(NRRC-PM-036)
Responding to an Appeal Request on NRRC Decision	(NRRC-PM-026)
Review and Assessment of the Safety and Security of a Radiological Practice	(NRRC-PM-034)
Developing and Updating of an Oversight Plan on Authorized Radiolog-ical Practices	(NRRC-PM-048)
Development of Inspection Plan	(NRRC-PM-029)
Preparing and Conducting an Inspection on Radiological Practice	(NRRC-PM-047)
NRRC Procedure Manual on Regulations Development	(NRRC-PM-049)
NRRC Procedure Manual on Policies and Laws Development	(NRRC-PM-050)
Procedure Manual on Responding to an Appeal Request on NRRC Deci-sion	(NRRC-PM-026)
NRRC Procedure Manual on Preparing and Conducting an Inspection on Radiation Practice	(NRRC-PM-047)
Review and Assessment of the Safety and Security of a Radiological Practice	(NRRC-PM-034)

Stakeholder Guidelines Development	(NRRC-PM-060)

NRRC Internal Guidelines

Execution of Enforcement Action	(NRRC-IG-001)
Management of Capacity Building Program Nomination	(NRRC-IG-003)
Appointment of Assessor and Inspector	(NRRC-IG-002)
Review and Assessment of Medical Radiological Practices	(NRRC-IG-024)
Review and Assessment of Industrial Radiography Practice	(NRRC-IG-013)
Review and Assessment of Decommissioning of Multi-Stage Facilities Practice	(NRRC-IG-014)
Review and Assessment of Product Irradiation/Sterilization Using Radi-ation Sources Practice	(NRRC-IG-015)
Review and Assessment of Use of Radiation Sources in Geophysical Ex- ploration Practice	(NRRC-IG-016)
Review and Assessment of Use of Ionizing Radiation in Research and Education Practice	(NRRC-IG-017)
Inspection of General Practices	(NRRC-IG-006)
Inspection of Transportation of Radioactive Sources Practice	(NRRC-IG-004)
Inspection Diagnostic Radiology Practice	(NRRC-IG-005)
Inspection of Nuclear Medicine Practice	(NRRC-IG-009)
Review and Assessment of Radiation Calibration Practice	(NRRC-IG-018)
Review and Assessment of X-ray System for Cargo/Container Screening of Objects Practice	(NRRC-IG-019)
Review and Assessment of Radioactive Waste Interim Storage Practice	(NRRC-IG-020)
Review and Assessment of Radioisotope Production in a Cyclotron Practice	(NRRC-IG-021)
Review and Assessment of Trade / Distribution of Radioactive Material Practice	(NRRC-IG-022)
Review and Assessment of Use of Radiation Sources in Gauges and Ex-ploration Practice	(NRRC-IG-023)
Review and Assessment of Medical Radiological Practices	(NRRC-IG-024)
Inspection of Radiotherapy	(NRRC-IG-025)
Review and Assessment of Transport of Radioactive Materials Practice	(NRRC-IG-026)

NRRC Stakeholder Guidelines

Appointment of Radiation Safety Officer (RSO)	(NRRC-SG-019)
Application for Authorization of Interim Storage for	(NRRC-SG-004)

Radioactive Waste	
Development of Radiation Protection Program	(NRRC-SG-020)
Application for Authorizing Containers Security Inspection by Using X-Ray Systems Practice	(NRRC-SG-012)
Application for Authorization of Decommissioning of Multi-Stage Facil-ities	(NRRC-SG-003)
Application for Authorization of Industrial Radiography Practice	(NRRC-SG-002)
Application for Authorization of Use of radiation sources in gauges and exploration Practices	(NRRC-SG-005)
Application for Authorization of Using Radiation Sources in Research and Education Practice	(NRRC-SG-010)
Application for Authorization of Radioisotope Production Using Accel-erators Practice	(NRRC-SG-007)
Application for Authorization of Trade of Radioactive Material Practice	(NRRC-SG-009)
Application for Authorization of Use of radiation sources in geophysical exploration Practice	(NRRC-SG-011)
Application for Authorization of Product Irradiation/Sterilization Using High Activity Sealed Sources Practice	(NRRC-SG-006)
Application for Authorization of Nuclear Medicine	(NRRC-SG-016)
Application for Authorization of Radiotherapy	(NRRC-SG-015)
Application for Authorization of Diagnostic Radiology	(NRRC-SG-017)
Application for Authorization of Dental Radiology	(NRRC-SG-014)
Application for Authorization of Human non-medical radiation imaging	(NRRC-SG-013)
Application for Authorization of Radiation Dosimetry Calibration	(NRRC-SG-008)
Development of Radiation Emergency Plan for Radiation Activi-ties/Facilities	(NRRC-SG-018)

Others

Cabinet Resolution No. (225)
Basic Law of Governance
Law of the Council of Ministers
Shura Council Law
Code of Conduct of professional job and ethics of NRRC employees
NRRC Regulatory Glossary

APPENDIX VII – IAEA REFERENCE MATERIAL USED FOR THE REVIEW

This list has to be verified for each mission and adjusted according to scope of the mission.

1.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Fundamental Safety Principles, No SF-1, IAEA, Vienna (2006)
2.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Governmental, Legal and Regulatory Framework for Safety, General Safety Requirements Part 1, No. GSR Part 1 (Rev. 1), IAEA, Vienna (2016)
3.	**INTERNATIONAL ATOMIC ENERGY AGENCY –** Leadership and Management for Safety, General Safety Requirements Part 2, No. GSR Part 2, IAEA, Vienna (2016)
4.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, General Safety Requirements Part 3, No. GSR Part 3, IAEA, Vienna (2014).
5.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Safety assessment for facilities and activities, General Safety Requirements Part 4, No. GSR Part 4 (Rev. 1), IAEA, Vienna (2016)
6.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Predisposal Management of Radioactive Waste, General Safety Requirement Series Part 5, No. GSR Part 5, IAEA, Vienna (2009)
7.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Decommissioning of Facilities, General Safety Requirement Series No. GSR Part 6, IAEA, Vienna (2014)
8.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Preparedness and Response for Nuclear or Radiological Emergency, General Safety Requirement Series No. GSR Part 7, IAEA, Vienna (2015)
9.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Site Evaluation for Nuclear Installations, Specific Safety Requirement Series No. SSR-1, IAEA, Vienna (2003)
10.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Safety of Nuclear Power Plants: Design, Specific Safety Requirements Series No. SSR-2/1 (Rev. 1), IAEA, Vienna (2016)
11.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Safety of Nuclear Power Plants: Commissioning and Operation, Specific Safety Requirements Series No. SSR-2/2 (Rev. 1), IAEA, Vienna (2016)
12.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Safety of Research Reactors, Specific Safety Requirements Series No. SSR-3, IAEA, Vienna (2016)
13.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Safety of Nuclear Fuel Cycle Facilities, Specific Safety Requirements Series No. SSR-4, IAEA, Vienna (2017)
14.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Disposal of Radioactive Waste, Specific Safety Requirements Series No. SSR-5, IAEA, Vienna (2011)
15.	**INTERNATIONAL ATOMIC ENERGY AGENCY** – Regulations for the Safe Transport of Radioactive Material, Specific Safety Requirements Series No. SSR-6, IAEA, Vienna (2012)
16.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Regulations for the Safe Transport of Radioactive Material, 2018 Edition, Specific Safety Requirements Series No. SSR-6 (Rev. 1), IAEA, Vienna (2018)
17.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Classification of Radioactive Waste, General Safety Guide No. GSG-1, IAEA, Vienna (2009)
18.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency, Safety Guide Series No GSG-2, IAEA, Vienna (2012)

19.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Communication and Consultation with Interested Parties by the Regulatory Body, General Safety Guide Series No. GSG-6, IAEA, Vienna (2017).
20.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Occupational Radiation Protection, Safety Guide Series No. GSG-7 , IAEA, Vienna (2018)
21.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Regulatory Control of Radioactive Discharges to the Environment, Safety Guide Series No GSG-9, IAEA, Vienna (2018)
22.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Organization, Management and Staffing of the Regulatory Body for Safety, General Safety Guide Series No. GSG-12, IAEA, Vienna (2018).
23.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Functions and Processes of the Regulatory Body for Safety, General Safety Guide Series No. GSG-13, IAEA, Vienna (2018).
24.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Arrangements for Preparedness for a Nuclear or Radiological Emergency, Safety Guide Series No. GS-G-2.1, IAEA, Vienna (2007)
25.	**INTERNATIONAL ATOMIC ENERGY AGENCY** Leadership, Management and Culture for Safety in Radioactive Waste Management, Safety Guide Series No GSG-16, IAEA, Vienna (2022)
26.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Criteria for use in Preparedness and Response for a Nuclear or Radiological Emergency, General Safety Guide Series No. GSG-2, IAEA, Vienna 2011)
27.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Operating Experience Feedback for Nuclear Installations, Safety Guide Series No. SSG-50, IAEA, Vienna (2018)
28.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Modifications to Nuclear Power Plants, Safety Guide Series No SSG-71, IAEA, Vienna (2022)
29.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Recruitment, Qualification and Training of Personnel for Nuclear Power Plants, Safety Guide Series No NS-G-2.8, IAEA, Vienna (2002)
30.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Environmental and Source Monitoring for Purposes of Radiation Protection, Safety Guide Series No. RS-G-1.8, IAEA, Vienna (2005)
31.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Safety of Radiation Generators and Sealed Radioactive Sources, Safety Guide Series No. RS-G-1.10, IAEA, Vienna (2008)
32.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Borehole Disposal Facilities for Radioactive Waste, Safety Guide Series No SSG-1, IAEA, Vienna (2009)
33.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Deterministic Safety Analysis for Nuclear Power Plants, Specific Safety Guides Series No. SSG-2, IAEA, Vienna (2010)
34.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Development and Application of Level 1 Probabilistic Safety Assessment for Nuclear Power Plants, Specific Safety Guide Series No. SSG-3, IAEA, Vienna (2010)
35.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Development and Application of Level 2 Probabilistic Safety Assessment for Nuclear Power Plants, Specific Safety Guide Series No. SSG-4, IAEA, Vienna (2010)
36.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Safety of Conversion Facilities and Uranium Enrichment Facilities, Specific Safety Guide Series No. SSG-5, IAEA, Vienna (2010)

37.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Safety of Uranium Fuel Fabrication Facilities Specific Safety Guide Series No. SSG-6, IAEA, Vienna (2010)
38.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Safety of Uranium and Plutonium Mixed Oxide Fuel Fabrication Facilities, Specific Safety Guide Series No. SSG-7, IAEA, Vienna (2010)
39.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Licensing Process for Nuclear Installations, Specific Safety Guide Series No. SSG-12, IAEA, Vienna (2010)
40.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Geological Disposal Facilities for Radioactive Waste Specific Safety Guide Series No. SSG-14, IAEA, Vienna (2011)
41.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Storage of Spent Nuclear Fuel, Safety Guide Series No SSG-15 (Rev. 1), IAEA, Vienna (2020)
42.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Periodic Safety Review for Nuclear Power Plants, Safety Guide Series No SSG-25, IAEA, Vienna (2013)
43.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material, Specific Safety Guide No SSG-26, IAEA, Vienna, (2014)
44.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Commissioning for Nuclear Power Plants, Safety Guide Series No. SSG-28, IAEA, Vienna (2014)
45.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Predisposal Management of Radioactive Waste from Nuclear Power Plants and Research Reactors, Safety Guide Series No SSG-40, IAEA, Vienna (2016)
46.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Predisposal Management of Radioactive Waste from Nuclear Fuel Cycle Facilities, Safety Guide Series No SSG-41, IAEA, Vienna (2016)
47.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Management of Waste from the Use of Radioactive Material in Medicine, Industry, Agriculture, Research and Education, Safety Guide Series No SSG-45, IAEA, Vienna (2019)
48.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Radiation Protection and Safety in Medical Uses of Ionizing Radiation, Safety Guide Series No SSG-46, IAEA, Vienna (2018)
49.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Decommissioning of Nuclear Power Plants, Research Reactors and Other Nuclear Fuel Cycle Facilities, Safety Guide Series No SSG-47, IAEA, Vienna (2018)
50.	**INTERNATIONAL ATOMIC ENERGY AGENCY** – Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants, Safety Guide Series No SSG-48, IAEA, Vienna (2018)
51.	**INTERNATIONAL ATOMIC ENERGY AGENCY** –Decommissioning of Medical, Industrial and Research Facilities, Safety Guide Series No SSG-49, IAEA, Vienna (2019)
52.	**INTERNATIONAL ATOMIC ENERGY AGENCY** – Operating Experience Feedback for Nuclear Installations, Safety Guide Series No SSG-50, IAEA, Vienna (2019)
53.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Accident Management Programmes for Nuclear Power Plants, Safety Guide Series No SSG-54, IAEA, Vienna (2019)
54.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Preparedness and Response for a Nuclear or Radiological Emergency Involving the Transport of Radioactive Material, Safety Guide No SSG-65, IAEA, Vienna (2022)
55.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Radiation Protection Programmes for

	the Transport of Radioactive Material, Safety Guide No TS-G-1.3, IAEA, Vienna, (2007)
56.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - The Management System for the Safe Transport of Radioactive Material Safety Guide No TS-G-1.4, IAEA, Vienna, (2008)
57.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Compliance Assurance for the Safe Transport of Radioactive Material, Safety Guide No TS-G-1.5, IAEA, Vienna, (2009)
58.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Schedules of Provisions of the IAEA Regulations for the Safe Transport of Radioactive Material (2009 Edition), Safety Guide No TS-G-1.6 (Rev.1), IAEA, Vienna, (2014)
59.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Storage of Radioactive Waste, Safety Guide Series No WS-G-6.1, IAEA, Vienna (2006)
60.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Safety Assessment for the Decommissioning of Facilities Using Radioactive Material, Safety Guide Series No.WS-G-5.2, IAEA, Vienna (2009)
61.	**INTERNATIONAL ATOMIC ENERGY AGENCY** - Storage of Radioactive Waste, Safety Guide Series No. WS-G-6.1, IAEA, Vienna (2006)

APPENDIX VIII – ORGANIZATIONAL CHART

NRRC Organizational Chart