NRRC Stakeholders Guidelines

Kingdom of Saudi Arabia

Application for Authorization of Interim Storage for Radioactive Waste

NRRC-SG-004

2023

هيئة الرقابة النووية والإشعاعية
Nuclear and Radiological Regulatory Commission

Stakeholder Guideline

Application for Authorization of Interim Storage for Radioactive Waste

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Preamble

In accordance with the provisions of the NRRC's approved Regulations, this stakeholder guideline describes criteria and/or techniques that are considered appropriate for satisfying the requirements stipulated in the NRRC's regulations.

This stakeholder guideline has been prepared on the basis of International Atomic Energy Agency (IAEA) standards, as well as the and the international best practices and the experiences of similar international regulatory bodies, and in accordance with the Kingdom's international commitments, and it has been approved by the NRRC's CEO resolution No. 1405, dated 23/07/2023.

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1. Purpose

Nuclear and Radiological Regulatory Commission (NRRC) has developed an effective regulatory framework for the safe and secure authorization of Interim-storge of radioactive waste practice throughout its life cycle. Under the regulatory framework, the prime responsibility for safety and security within Interim-storge of radioactive waste practice lies with the authorized person.

The purpose of this guideline document is to give the applicant and/or the authorized person clear and specific guidance on the submission for the purpose of authorization of Interim-storge of radioactive waste practice that include the following:

- NORM waste management.
- Radioactive waste management.

2. Scope

This guideline is addressed to radioactive waste interim-storge facilities and activities, in particular, will address the management system, radiation protection, safety and security aspects of radioactive waste interim-storge practice. However, it is considered appropriate that a graded approach in the application of the requirements will be taken into account and should be adapted to the risks inherent to each facility.

This guideline includes the required information relating to radiation safety and security by the NRRC in order to verify the adequacy of the proposed safety and security measures as part of the authorization process.

This guideline includes the required information relating to

authorization of new license, renewal as well as amendment of license.

3. Definitions

Authorized person

Person granted authorization under this regulation and/or the relevant Commission Laws.

Categorization (radioactive wastes)

The system of categorization of the radioactive waste developed by the facility which is designed to take into account operational needs in the management. It should consider the acceptance criteria established for the subsequent handling, processing, transport, storage and disposal steps, within the overall waste management process.

Characterization of waste

Determination of the physical, mechanical, chemical, radiological and biological properties of radioactive waste to establish the need for further adjustment, treatment or conditioning, or its suitability for further handling, processing, storage or disposal.

Classification (radioactive waste)

System of classification of radioactive waste aligned with the national policy and strategy which is organized to take into account matters considered of prime importance for the safety of disposal of radioactive waste.

Clearance

Removal of regulatory control by the Nuclear and Radiological Regulatory Commission (NRRC) from radioactive material or

radioactive objects within notified or authorized facilities and activities.

Conditioning

Those operations that produce a waste package suitable for handling, transport, storage and/or disposal. Conditioning may include the conversion of the waste to a solid waste form, enclosure of the waste in containers and, if necessary, provision of an overpack.

Disused sealed radioactive source

A radioactive source, comprising radioactive material that is permanently sealed in a capsule or closely bonded and in a solid form (excluding reactor fuel elements), that is no longer used, and is not intended to be used, for the practice for which an authorization was granted.

National policy on radioactive waste management

Is a set of established goals or requirements at the national level for the safe management of radioactive waste; it normally defines national roles and responsibilities.

Processing: Any operation that changes the characteristics of radioactive waste, including pretreatment, treatment and conditioning.

Radioactive waste

For legal and regulatory purposes, material for which no further use is foreseen that contains, or is contaminated with, radionuclides at activity concentrations greater than clearance levels presented in the relevant regulation.

Radioactive Waste Acceptance Criteria

Quantitative or qualitative criteria specified by the NRRC, or

specified by an applicant in the authorization process and approved by the NRRC, for the waste form and waste package to be accepted in any step of a radioactive waste management process.

Radioactive Waste Management

All administrative and operational activities involved in the handling, pretreatment, treatment, conditioning, transport, storage and disposal of radioactive waste.

Radioactive Waste Management Program

Is a program to assist the authorized person to ensure the safe management of radioactive waste through the adoption of management structures, facilities, activities, processes, technical options for the management of radioactive wastes, procedures, and organizational arrangements that are commensurate with the nature and extent of the risks.

Safety assessment

Is the assessment of all aspects of predisposal radioactive waste management facilities and activities that are relevant to protection and safety. For an authorized facility, this includes siting, design and operation of the facility. It includes analysis to predict the performance of an overall system and its impact, where the performance measure is the radiological impact or some other global measure of the impact on safety.

Safety case

A collection of arguments and evidence in support of the safety of a radioactive waste predisposal management facility or activity, including the findings of a safety assessment and a statement of confidence in these findings and how they should be implemented.

Segregation

An activity where types of waste or material (radioactive or exempt) are separated or are kept separate based on radiological, chemical and/or physical properties to facilitate waste handling and/or processing.

Storage

The holding of radioactive sources, radioactive material, or radioactive waste in a facility that provides for their/its containment, with the intention of retrieval.

Interim storage facility

A facility where waste is temporary safely emplaced for storage.

Treatment

Operations intended to benefit safety and/or economy by changing the characteristics of the radioactive waste.

Controlled area

A defined area in which specific protection measures and safety provisions are or could be required for controlling exposures or preventing the spread of contamination in normal working conditions, and preventing or limiting the extent of potential exposures.

Supervised area

A defined area not designated as a controlled area but for which occupational exposure conditions are kept under review, even though specific protection measures or safety provisions are not normally needed.

4. Abbreviations

ABBREVIATION	DEFINITION
NRRC	Nuclear and Radiological Regulatory Commission.
RPP	Radiation Protection Program.
RSO	Radiation Safety Officer.
QS	Quality Control.
SP	Security Plan.

5. General and Administrative Information

- The applicant should fill and sign the application form.

6. Location and Design

- Criteria that should be considered when selecting or locating a storage facility include the following:
  - The area outside the storage facility should have a low public occupancy factor and should be a low traffic area.
  - The location should provide for an appropriate level of physical security (e.g. single point entry, with preferable no windows, and robust construction).
  - The location should be remote from other hazardous storage areas (e.g. stores for explosive and flammable materials) and should not be liable to flooding.
  - The location should be suitable for the safe transfer of material into and out of the facility (e.g. there should be an adequate loading and unloading area outside the facility, lift transfer is preferred to staircase transfer).
  - Handling of radioactive sources/containers inside the storage

facility to improve the flexibility of operations and the optimization of radiation protection.

- In designing an interim storage facility, the authorized person should take in to account the following factors:
  - In case of a small waste storage facility within a large installation the area outside should have a low public occupancy factor and should be a low traffic area;
  - Separation of the radioactive waste processing systems from other systems, as well as from the premises and facilities, where other potentially hazardous materials are stored (e.g radioactive materials should not be store with explosive materials);
  - Providing auxiliary systems (e.g. For air sampling, radiation alarms or decontamination);
  - Compartments, in order to separate different kinds of waste that may be stored (e.g. To facilitate the safe storage of especially hazardous materials, such as volatile, pathogenic and putrescible materials, chemically reactive materials);
  - Providing radiological control at all stages including control over the receipt of radioactive waste and elements affecting personnel protection and protection of the working environment;
  - Providing adequate containment (e.g. drip trays, sealed and dipped work benches) and shielding (e.g. Lead or concrete blocks);
  - Establishing appropriate demarcation of the working premises according to their classification (e.g. Labels, rope or

other barriers) for area and personnel, as appropriate;

- Maintaining radiation control (measurement of dose rates and surface contamination);
- Arranging the location and layout of the equipment and systems in a way that provides ease of access for normal operation, reduction and control of potential contamination, maintenance and control;
- Maintaining safe handling of radioactive waste by having appropriate handling equipment and selecting short and uncomplicated routes;
- Providing adequate drainage and ventilation systems (e.g. By means of air filtration, air pressure differentials and flow considerations);
- Providing normal and emergency electrical supplies when needed;
- Establishing premises for emergency equipment;
- Providing fire detection and protection systems;
- Providing physical protection and security of radioactive waste and radioactive waste management facilities.

7. Facility Operation

7.1 Management System

- The authorized person should establish and implement a management system in accordance with relevant NRRC regulations.
- Operations should be based on documented procedures. All facility-specific operating procedures must be submitted for

approval.

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- Operations should be based on documented procedures. All facility-specific operating procedures must be submitted for approval.
- The authorized persons should ensure that all employees be informed annually of the importance of effective measures for protection and safety of the safe predisposal radioactive waste management and be trained in their implementation as appropriate.

7.2 Radiation Safety Officer

- The authorized person should appoint a Radiation Safety Officer to be responsible for overseeing radioactive waste management activities at the facility.
- In discharging his duties, the appointed Radiation Safety Officer, in relation to the radioactive waste management, among others, should:
    - Make and maintain contact with all relevant persons (inside or outside the facility) involved in the safe predisposal radioactive waste management to provide a qualified advice and guidance as well as monitoring of compliance;
    - Liaise as needed with other radioactive waste management organizations;

- Establish and maintain a detailed record-keeping system for all stages of predisposal radioactive waste management, including the inventory of radioactive waste;
- Ensure and/or control the proper radioactive waste conditioning for storage and future disposal;
- Ensure and/or control that on-site transfer of radioactive waste is carried out in accordance with written safety procedures;
- Ensure and/or control that waste packages for off-site transportation are prepared to be in compliance with transport regulations;
- Ensure and/or control that any transportation of radioactive waste has been approved by the NRRC;
- Ensure and/or control the appropriate shielding, labelling, physical security and integrity of waste packages;
- Ensure and/or control that any discharge of effluents is made below the limits authorized by the NRRC, and recorded;
- Ensure and/or control that solid released waste disposed of at a municipal landfill is in accordance with clearance levels established or approved in the licence´s conditions by the NRRC;
- Report on accidents and inappropriate predisposal radioactive waste management practices.

7.3 Radioactive Waste Characterization

- The authorized person should implement appropriate methods for the characterization of wastes, ensuring that all information relevant to process control and assurance that the waste or waste package will meet the acceptance criteria for managing, storage, transport, and disposal of the waste.

7.4 Marking and Labelling.

- Radioactive waste containers should be properly identified and labelled so that the required information will be available at all stages of the predisposal radioactive waste management. The information should be sufficient to ensure the effectiveness and safety of the next step in the management process. It should include:
  - Identification number;
  - Radionuclides;
  - Activity (if measured or estimated)/date of measurement;
  - Origin (room, laboratory, individual, etc. If applicable);
  - A radiation trefoil;
  - Other potential/actual hazards (chemical, infectious, etc.);
  - Surface dose rate/date of measurement; and
  - Quantity (weight or volume).

7.5 Radioactive Waste Records

- The authorized person should develop a comprehensive recording system for predisposal radioactive waste management activities.
- The record of the stored radioactive waste, including spent and/or disused radioactive sealed sources, should contain the following information pertaining to the waste:
  - The source or origin;
  - The physical and chemical form;
  - The amount (volume and/or mass);
  - The radiological characteristics (the activity concentration, the total activity, the radionuclides present and their relative proportions, the date at which measurement were performed);
  - The classification in accordance with the waste classification system established in the Regulation, "Management of Radioactive Waste";
  - The categorization in accordance with the categorization scheme approved by the NRRC.
  - Maximum dose rate at contact and 1m (transport index) and date of measurement;
  - Content of fissile material (such as 239 Pu–be sources);
  - Any chemical, pathogenic or other hazards associated with the waste and the concentrations of hazardous material;
  - Any special handling necessary owing to criticality concerns, the need for the removal of decay heat or

significantly elevated radiation fields.

7.6 Radioactive Waste Acceptance Criteria

- The authorized person should define the waste acceptance criteria, which should be submitted for regulatory review and approval by the NRRC.
- The authorized person should ensure that an appropriate control system is established to provide confidence that the waste under its responsibility meets the applicable waste acceptance criteria.
- The authorized persons should stablish procedures for the evaluation of compliance with acceptance criteria and provisions for safely managing waste that fails to meet the acceptance criteria.

7.7 Monitoring, Testing and Verification of Compliance

- The authorized person should conduct monitoring to verify compliance with the limits, conditions and controls of the license and with the requirements for the safe management of radioactive waste.

7.8 Management of Disused Sealed Radioactive Sources

- The following aspects should be considered in respect of the management of disused sealed radioactive sources:
    - Disused sealed radioactive sources with high potential hazard should be segregated and stored separately. For sources (such as radium sources) with a potential for

leaking, particular radiological precautions should also be taken during the handling and storage;

- Special attention should be paid to monitoring the surface and the air for contamination. These sources should be stored in a dedicated area with appropriate ventilation and equipment.

7.9 Discharge or Release of Radioactive Materials to the Environment

- As part of the discharge control, the authorized person should establish and document technical procedures to carry out discharge operations, monitoring and record as well as define the involvement of individual responsibility.

7.10 Clearance and its Control

- When applicable the applicant should propose methods and procedures to be used for general clearance its control and record. The plan should be approved by the NRRC. Upon approval, radioactive material may be cleared as it accumulates.
- Control measures for release of radioactive materials should include:
  - Determination of the activity concentration of the waste;
  - Segregation of such waste designated for decay;
  - Sampling of each batch of waste prior to removal from control; and

- Record the volume, activity concentration and radionuclides in the materials to be cleared.

7.11 Requirements for Reporting to the NRRC

- The authorized persons should:
  - Notify the NRRC 60 days or as specified by the NRRC in advance of any intention to transfer the management of the radioactive waste to another authorized person;
  - Notify the NRRC immediately of any event during the predisposal radioactive waste management in which a dose limit or any other limits, conditions or controls established in the licence exceeded;
  - Notify the NRRC as soon as practicable, but not later than 24 hours after discovery, of any significant unintended accidental event during the predisposal radioactive waste management;
  - Submit to the NRRC, within 30 days or as specified by the NRRC after discovery of any significant accident, a written report which states the cause of the accident and includes information on the doses, corrective measures and any other relevant information;
  - When required in the licence conditions, report a summary of the public exposure monitoring results to the NRRC at approved intervals and promptly inform the NRRC of any abnormal results which lead or could lead to an increase of public exposure;
  - Report discharges of radioactive materials to the

environment to the NRRC at intervals as may be specified in the licence and promptly report any discharges exceeding the authorized limits;

- Report promptly and within 30 days or as specified by the NRRC submit a written report to the NRRC any releases of radioactive material to the environment above the clearance criteria established by NRRC;
- Inform on material which has been removed from regulatory control to the NRRC as required in the licence conditions.

- In addition to the radiation safety related reports above, the authorized persons should submit the following reports to the NRRC:
  - Radioactive source inventory data and subsequent changes to those data, except for routine movements of the source allowed in the authorization;
  - Unusual events or incidents, such as:
    - o Loss of control over any radioactive waste or disused sealed source;
    - o Unauthorized access to, or unauthorized use of radioactive waste;
    - o Discovery of any orphan sources.

8. Radiation Protection Program

The authorized person should design and implement a Radiation Protection Program as specified in the Safety Regulation. Such program should include at least the following:

- Occupational Protection:
    - Education and training of workers.
    - Designation of controlled and supervised areas.
    - Assignment of responsibilities.
    - Local rules.
    - Individual monitoring.
    - Workplace monitoring.
    - Health surveillance.
    - Personal protective equipment.
    - Recording and reporting.
- Public Protection:
    - A system of protection and safety to protect the public.
    - Assessment, control, and surveillance of external public exposure.
    - Training of personnel on functions relevant to protecting public safety.
    - Monitoring program and records management.

9. Emergency Preparedness

- Authorized persons should 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. This situation should be evaluated in the safety assessment and safety case.

10. Physical Protection and Security

- The authorized person, subject to decision by the NRRC, should submit a security plan that described the measures in compliance with the established regulation to ensure the physical protection and security that prevent the unauthorized access of individuals and the unauthorized removal of radioactive materials.

11. Nuclear Safeguards

- When nuclear materials recognized by any safeguard agreement are present in the radioactive waste predisposal management facility or activity, the authorized person should consider nuclear safeguards requirements established by the NRRC in the design and the operation of these facilities and activities to which nuclear safeguards apply. These requirements should be implemented in such a way as not to compromise the safety of the radioactive waste predisposal management facility or activity.

12. Application for an Authorization

- The interim storage of radioactive waste requires an authorization. The information presented in application should demonstrate the compliance with the requirements established in relevant regulation.
- An application for an authorization should address all elements of predisposal management of radioactive waste, as applicable for the facility or activity for which an authorization is being sought. It should include an initial plan for the shutdown and decommissioning of the facility.

- In applying for an authorization, the applicant should ensure that the adequate financial mechanism is in place to cover the full costs of the safe management of the radioactive waste according to the National Policy.

13. Safety Case and Supporting Safety Assessment

- An application for an authorization for a radioactive waste predisposal management facility or activity should include in the safety assessment and safety case the following:
  - Description of how all the safety aspects of the site, the siting, design, construction, commissioning, operation, shutdown and decommissioning of the facility and/or activity and the managerial controls satisfy the regulatory requirements;
  - Demonstration of the radiological and non-radiological safety under normal operation and also to assess the potential effects of incidents and accidents, according to national regulations;
  - Considerations for reducing hazards posed to workers, members of the public and the environment during normal operation and in possible accident conditions;
  - The selection of operational occurrences and accidents to be analysed should take account of their estimated probabilities and impacts;
  - When appropriate and needed, such assessments should make use of appropriate modelling methods and data from available experience;
  - Where necessary, the assessments should demonstrate long

term safety;

- Cover all stages and safety aspects of the radioactive waste management process, in relation to the workers, the public and the environment.

14. Related documents and files

Document Name	Document Type	Document Number	Relation to the guideline
Radiation Safety	Technical Regulation	NRRC-R-01	This Regulation set out the general safety requirements in ensuring protection of people and the environment against the harmful effects of ionizing radiation and for the safety of radiation sources. in addition, this regulation harmonize the requirements applicable in the Kingdom with the international best practices in order to achieve the highest standards of safety in activities and facilities that give rise to radiation risks
Notification on and Authorization of Facilities and Activities with Radiation Sources	Technical Regulation	NRRC-R-02	Prescribes the general requirements for notification on and authorization of activities, facilities and practices with radiation source, nuclear material and/or ore containing uranium and thorium in the Kingdom

Safe Transport of Radioactive Materials	Technical Regulation	NRRC-R-15	This regulation is to prescribe requirements that shall be fulfilled to ensure safety, security and to protect persons, property, and the environment from any harmful effects of radiation on the transport of radioactive materials or nuclear material.
Management of Radioactive Waste	Technical Regulation	NRRC-R-16	This regulation sets out the safety objectives, criteria and requirements for the protection of human health and the environment that shall be applied to the activities and the requirements that shall be met to ensure the safety of such activities and facilities.
Security of Radioactive Material	Technical Regulation	NRRC-R-17	This regulation that addressed security of radioactive material, associated activity, and associated facility against unauthorized removal of radioactive material and sabotage performed with the intent to cause harmful radiological consequences

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