REGULATORY CONTROL/ RESPONSIBILITIES AND ADMINISTRATIVE MEASURES ASSOCIATED WITH PREDISPOSAL MANAGEMENT OF RADIOACTIVE WASTE IN NIGERIA

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INTRODUCTION

Radioactive waste is waste that contains radioactive materials. In Nigeria, radioactive waste are usually by-product of applications of nuclear technology such as for research and medical purposes. They also include human activities like crude oil exploration and exploitation; mining and milling of solid minerals which can result in Technically Enhanced Naturally Occurring Radioactive Materials (TENORM) in the products and by-product of these activities. The effect of these waste if not properly dispose is hazardous to most forms of life and the environment. Hence Radioactive Waste management must be properly regulated by appropriate regulations by government agencies. This write up explains in clear terms some of the role of the various bodies and activities involve in pre-disposal management of radioactive waste in Nigeria as enshrined in the Draft Nigerian Radioactive Waste Management Regulations 2013 and other relevant Regulations

REGULATORY AUTHORITY AND ITS RESPONSIBILITY

The Regulatory Authority is responsible for enforcement of compliance of the provisions of Regulations and all other relevant requirements by waste generators and the operators of Designated Radioactive Waste Management Facilities, Designated Storage Facilities and Repository as established under the relevant Regulations and the implementation of the licensing process for generation and management of radioactive waste. Below are breakdown of the responsibility of the Regulatory Authority:

The Authority shall inspect the facilities to verify that requirements for safety and environmental protection are being met by the Operators and Generators.

The inspection shall be supported by an effective management system, including the establishment and maintenance of a strong safety waste management culture.

The Authority Shall Provide guidance documents on the interpretation of regulatory requirements that takes into consideration the complexity of the operations and the magnitude of the hazards associated with the facility and operations;

The Authority shall where appropriate, undertake research, acquire independent assessment capabilities and participate in activities for international cooperation

The Authority shall work with other regulatory bodies in a co-operative manner and be responsible to enforce compliance with legal requirements and advising government as appropriate.

The Authority shall review and assess the safety case and Environment Impact Assessments for radioactive waste management facilities and activities, as prepared by the operator both prior to Authorizations and periodically during operation.

The Authority shall also be responsible for

Management of radioactive waste where the person that generates the waste is incapable of appropriate management of the waste either through bankruptcy, revocation of license, non existence of waste generator, as may be appropriately determined; and recovering of the costs incurred from those responsible, where they are identified.

Ensuring that due consideration is given to non-radiological hazards throughout the entire predisposal management of radioactive waste and to establish criteria for the clearance of material from regulatory control.

The establishment and clarification to the operator the processes used to evaluate safety, review applications and document the procedure the operator is expected to follow

Documenting the procedures that apply to the mechanisms for compliance verification, enforcement and establish a mechanism by means of which information on incidents significant to safety is disseminated to interested parties.

RESPONSIBILITIES OF WASTE GENERATORS AND OPERATORS OF PRE-DISPOSAL WASTE MANAGEMENT FACILITIES

All radioactive waste that is not expected to decay to clearance levels within one year from the time of its generation shall be transferred from the waste generator to the designated radioactive waste management facilities.

Generators or operators of radioactive waste predisposal facilities, as the case may be, shall be responsible for:

The safety of predisposal radioactive waste management facilities or activities

The technical, financial and administrative management of such wastes.

Carrying out safety assessments and development of a safety case.

Ensuring that the necessary activities for siting, design, construction, commissioning, operation, shutdown and decommissioning are carried out in compliance with legal and regulatory requirements

Development and review of facility 'specific waste management plan5s' in accordance with the national radioactive waste management policy and strategy

Execution of waste management plan by the operator of waste management facility.

Establishment of Management system, maintenance of records and proper reporting to the Authority.

Ensuring viability of adequate financial resources to discharge its responsibilities.

It should be noted that all generator of Ores which are processed in Nigeria are deemed to be generators of radioactive waste and shall comply with all the provisions of this Regulation and specifically the submission of waste management plans. In considering such plans the Authority shall determine if any of the relevant management options would be accepted.

The responsibility of the generators and operators of radioactive waste predisposal facilities, as the case maybe, shall be terminated upon closure of the predisposal facility at which time institutional control will commence.

CHARACTERIZATION AND CLASSIFICATION OF RADIOACTIVE WASTE

"Characterization" means the determination of the physical, chemical and radiological properties of the waste to establish the need for further adjustment, treatment, conditioning, or its suitability for further handling, processing, storage or disposal;

Radioactive waste shall be characterized according to:

(a) physical form
  (i) solid waste,
  (ii) liquid waste
  (iii) gaseous waste,
  (iv) sealed radiation sources,
  (v) medical waste (e.g. syringes, bed linen and contaminated clothing from a hospital environment)
(b) chemical composition –liquid aqueous waste, liquid organic waste
(c) Radiological - activity, activity concentration and half lives of radionuclides
(d) biological waste (e.g. animal carcasses which might undergo decomposition if not properly treated and stored),

Radioactive waste classification based on radiological properties

Classification I- Exempt Radioactive Waste (ERW): Exempt waste contains such small concentrations of radionuclides that do not require provisions for radiation protection, irrespective of whether the waste is disposed of in conventional landfills or recycled. Exemption activity concentrations and exempt activities of radionuclides are specified. Such material is exempt from regulatory control and does not require any further consideration from a regulatory control perspective. Liquid or gaseous effluents discharged to the environment under appropriate regulatory control is exempt waste, in as much as discharged material requires no further consideration from the perspective of radiation protection and safety.

Classification II- Very short lived Radioactive waste (VSLRW): (e.g. the activity is less than 10 MBq), Waste that can be stored for decay over a limited period of up to a few years and subsequently exempted from regulatory control according to arrangements approved by the relevant regulatory authority, for uncontrolled disposal, use or discharge. This class includes waste containing primarily short lived radionuclides only (e.g. with half life less than 50 days), very often used for industrial, medical and research purposes **t**hat will decay to clearance levels within one year after the time of its generation.

Classification III- Very low level radioactive waste (VLLRW): Waste that is low in activity concentration but contains some long lived radionuclides. It does not require a high level of containment, although radiation protection provisions are needed while the waste is being processed. Its activity concentration does not usually exceed one

hundred times clearance levels for each of the radionuclides concerned. For convenience, waste with activity concentrations in the region of, or below, clearance levels is sometimes processed together with VLLRW. VLLRW often exists in large volumes. It is mainly generated during the operational, decommissioning and dismantling stages of a nuclear facility. VLLRW includes concrete, soil and rubble.

Classification IV- Low Level radioactive Waste (LLRW): contains higher activity concentrations than VLLRW but with a limit on the concentration of long lived radionuclides, i.e. radionuclides with half life > 30 years. It requires robust isolation and containment from the biosphere for periods of up to a few hundred years and is suitable for disposal in engineered near surface disposal facilities This class covers a very broad range of materials that can include short-lived radionuclides at higher activity levels and long lived radionuclides but only at relatively low activity concentration.

Classification V- Intermediate level radioactive waste (ILRW): contain, long lived radionuclides, therefore .requires a greater degree of containment and isolation. However, ILRW needs little or no provision for heat dissipation during its storage and disposal. ILRW may contain long lived radionuclides that will not decay to an activity concentration that is acceptable for near surface disposal during the time for which control of disposal site can be relied upon. Therefore ILRW require disposal at greater depths. (Limitation of longer lived alpha emitting radionuclides to 400 Bq/g individual waste packages and to an overall average of 400 Bq/g per waste package).

Classification VI- High level radioactive waste (HLRW): High level radioactive waste, with thermal power above 2 kW/m^3 and concentration of alpha emitters exceeding the limitations for Classification III (e.g. spent-fuel from research reactors). Waste with activity concentration levels high enough to generate significant quantities of heat by the radioactive decay process or waste with large amounts of long lived radionuclides that need to be considered in the design of a disposal facility for such waste. Disposal in deep, stable geological formations usually several hundred meters or more below the surface is the generally recognized option for disposal of HLRW.

MANAGEMENT SYSTEM OF RADIOACTIVE WASTE (QUALITY ASSURANCE)

The management system shall apply to the integrated system that brings together requirements for safety, security, quality, environmental, and business management.

The management system shall address the managerial tasks, including planning and scheduling activities, responsibilities and the use of resources, and the tasks results of the activities shall be documented.

Quality control shall be applied to all stages and elements of the predisposal management of radioactive waste. It shall be at a level to demonstrate effective control of the radioactive waste

All licensees shall ensure that all radioactive waste management operations are carried out in accordance with a suitable quality assurance programme commensurate with the scope of activity and approved by the Authority.

The Quality Assurance programme shall ensure that the facilities and equipment are designed, constructed and operated in accordance with specified requirements for safe operation.

Each licensee shall develop and maintain an accurate documentation system to cover all stages of radioactive waste management from its generation to disposal, and quality assurance programme shall provide for controlled approval, receipts, retention, distribution and disposition of all records important for safety in accordance with the Authority requirements.

Records such as letters, drawings, specification, must include all pertinent information, such as stamps, initials, signatures, and licensee shall retain the records until the Authority terminates each relevant license requiring the record.

The licensee shall maintain adequate safeguard against tampering with and loss of records.

The effectiveness of the quality assurance programme shall be verified by an independent audit to ensure that a radioactive waste management programme meets specific requirements covered by procedures, and that implementation is adequate.

The management system shall include procedures and processes for:

a. pretreatment including characterization of the waste;

b. approval of the treatment and conditioning processes for the waste;

c. development of the specifications for packages for radioactive waste;

d. confirmation of the characteristics for waste packages; and

e. Review of quality control records.

INTEGRATED APPROACH TO SAFETY AND SECURITY

Security measures shall be put in place to prevent the unauthorized access of individuals and the unauthorized removal of radioactive material, both safety and security shall be approached in an integrated manner in the predisposal management of radioactive waste

Radioactive waste shall be managed in order to isolate it from people and the environment. Radioactive waste shall also be managed in a way that prevents it from being accessed by anybody with malicious intent.

Radioactive sources for which no further use is foreseen shall be returned to the supplier, either for recycling or disposal.

In the event of safety lapses and security breaches that may include theft, loss, unauthorized damage, unauthorized access, or transfer of Radioactive source or any other malicious intent, the generator /operator shall notify:

a. the Security Personnel Services;
b. the Authority;

Notwithstanding the provisions of section 9 (4) the generator / operator shall provide the following minimum information to the authority within 7 days of the incident:

i. Circumstances of the security breach;
ii. Steps taken or proposed to be taken to rectify the breach; if a radioactive source is lost or stolen, any information that may assist in the recovery of the source
iii. A written report of the incident containing the information numerated in section 9 (4).

The personnel that deal with the radioactive waste shall be alert of suspicious behavior in the facility and immediate environment and not restricting to radioactive waste.

INTERDEPENDENCES MANAGEMENT OF RADIOACTIVE WASTE

The interdependences among various steps in the predisposal management of radioactive waste including all the activities from the generation of radioactive waste up to its predisposal shall be appropriately taken into account.

The management elements of each step shall be selected so as to be compatible with the steps involved.

The responsible person for a particular step in the predisposal management of radioactive waste, or for an operation in which waste is generated shall recognize these interactions and relationships so that the safety and the effectiveness of the predisposal management of radioactive waste may be considered in integrated manner.

RADIOACTIVE WASTE GENERATION AND CONTROL

The principal approach to the predisposal management of radioactive waste shall be ‘delay and decay’, ‘concentrate and contain’ and ‘dilute and disperse’. All radioactive waste shall be identified and controlled, and shall be kept to minimum practicable. Control of radioactive waste shall include:

All radioactive waste shall be controlled, in terms of both volume and radioactivity content, and have to be considered before the construction of a facility, beginning with the design phase, and throughout the lifetime of the facilities

The authorization of effluent and clearance of material discharged from regulatory control after some appropriate processing or long period of storage, together with reuse and recycling of material, can be effective in reducing the amount of radioactive waste that needs further processing or storage

The operator shall ensure that these management options, if implemented, are in compliance with the conditions and criteria of the regulations developed by the Authority. The regulatory body also has to ensure that the operator gives due consideration to non-radiological hazards in applying such options

PROCESSING OF RADIOACTIVE WASTE

Processing of radioactive waste shall enhance safety by producing a waste form, packaged or unpackaged, that fulfils the Waste Acceptance Criteria for safe processing, pretreatment, treatment, conditioning, transport, storage and disposal of the waste.

Radioactive waste shall be processed into a safe and passive form for storage or disposal as soon as possible. The processing of radioactive waste can yield effluent that is suitable for authorized discharge or material that can be reused.

Radioactive waste shall be processed to ensure safety during normal operation while appropriate measures are taken to prevent the occurrence of incidents or accidents, and provisions are made to mitigate the consequences if accidents occur.

The process shall be consistent with the type of waste, the possible need for its storage, the anticipated predisposal option, the dose limits, conditions and controls established in the safety case and in the assessment of environmental impacts.

STORAGE OF RADIOACTIVE WASTE

A licensee shall provide for interim storage of radioactive waste prior to its clearance, discharge or disposal.

Storage shall take place between and within the basic steps in the predisposal management of radioactive waste and shall act as a buffer between and within waste management steps; to allow time for the decay of radionuclides prior to authorized discharge; or to hold waste generated in emergency situations pending decisions on its future management.

Radioactive waste shall be stored in a manner that it can be inspected, monitored, retrieved and preserved in a condition suitable for its subsequent management and measures shall be taken to prevent degradation of the waste containment.

The design of the storage facility shall depend on the type of radioactive waste, its characteristics and radioactive inventory, which are anticipated in the period of storage.

Provisions shall be made for regular monitoring, inspection and maintenance of the radioactive waste and of the storage facility to ensure their continued integrity. The storage capacity shall be reviewed periodically taking in to account predicted waste, both from normal operation to possible incidents of the expected lifetime of the storage facility.

The interim storage facility shall be properly designed and constructed with at least one physical barrier between the radioactive waste and other material in the store.

The store shall be large enough to hold all generated and anticipated waste in an orderly manner and keep different categories separated. In addition, the store designed shall provide for;

(i) adequate shielding of the radioactive waste;

(ii) prevention of deterioration of waste packages ;

(iii) handling and ability to retrieve waste packages;

(iv) adequate ventilation of waste packages;

(v) conventional safety;

(vi) Physical protection.

The radioactive waste store shall not be located close to any corrosive, exposure or flammable material and shall be clearly and legibly marked with the radiation symbol.

Consideration shall be given to the protection of present and future generations in accordance with the fundamental safety principles.

The adequacy of the storage capacity shall be reviewed periodically. The radioactive waste storage area shall be clearly demarcated and have controlled access.

The radioactive waste storage facility shall be designed in such a way that the waste can be retrieved whenever required.

The storage facility shall be designed on the basis of the assumed conditions for its normal operation and assumed incidents or accidents. It shall be designed and constructed for the likely period of storage, preferably with passive safety features, with the potential for degradation taken into account.

POLICY ON EXPORT/IMPORT OF RADIOACTIVE WASTE

Any person or facility who intends to import any radioactive waste material for any practice shall:

(a) require the supplier, as a condition of any contract for the purchase or transfer, to receive the radioactive waste material back;

(b) submit to the Authority a copy of relevant parts of the purchase or transfer document and obtain its authorisation prior to entering the contract in force or accepting the radioactive waste

(2) The Authority shall be responsible for management of the spent radioactive material where the recipient is incapable of returning it, or the license is revoked, or the recipient no longer exists and the Authority may request to recover the costs incurred from those responsible, where they are known.

PUBLIC INFORMATION IN THE CAUSE OF AN ACCIDENT

In the event of an accident the Public information officer/team shall:

- Operate under the ICS incident commander.
- Prepare for immense media attention once the emergency becomes publicly known.

Provide media briefings from a single official source on the threat and the appropriate and inappropriate public response actions (e.g. who should be monitored and where to go) and actions being taken to ensure public safety, to protect products and international trade etc; activate a Joint Information Centre (JIC) if needed.

Operational location for Public Information

An operational location for public information (Centre) shall be established at a defined area by the Incident Commander. The process of co-ordinating public information will be located at the Information Services Department at the national, state, local and Information Centres.

Responding organisations are to appoint a spokesperson. from each major response organisation at a single location. The media should be informed that this centre is the primary source of public information to be known as the Joint Information Centre (JIC). from the national, state and local spokesperson. This primary source of public information would be called the Joint Information Centre (JIC).

If the substance is released into the environment with an amount equal to or greater than the RQ, the release must be reported to the federal government. This helps EPA respond to the release to protect human health and the environment from the adverse effects of that hazardous substance.

The exposure pathway of a hazardous substance is an important consideration in determining emergency response actions. An exposure pathway refers to the way a person can come into contact with a hazardous substance. There are three basic exposure pathways: inhalation, ingestion, or direct contact. The degree or extent of exposure is determined by measuring the amount of the hazardous substance at the point of contact. Health and ecological hazards can result from such exposures. Common ways in which people can become exposed to hazardous substances include:

PART IV TRANSPORTATION AND MANAGEMENT OF RADIOACTIVE WASTE

Preparation for Transportation of Radioactive Waste

(1) The Designated Radioactive Waste Management Facility shall be provided with full information on the radioactive waste sent to it prior to delivery.

(2) If incomplete or incorrect information is given, the Designated Radioactive Waste Management Facility shall at the expense of the waste generator, make the necessary investigation and report to the Authority for instructions regarding receiving such waste and its further management.

(3) The radioactive waste to be transported to a Designated Radioactive Waste Management Facility shall be prepared by the waste generator in accordance with the requirements developed by the Designated Radioactive Waste Management Facility and approved by the Authority.

(4) The Radioactive Waste Coordinator shall supervise the preparation of the radioactive waste for the transportation and in particular check that adequate shielding, labeling and documentation is provided.

On –Site and Off- Site Transportation

(1) Transportation of radioactive waste within any installation shall be performed by a licensee under separate operating instructions issued by the management of the facility and approved by the Authority.

(2) The off-site transportation of radioactive waste shall be in accordance with the Nigerian Transportation of Radioactive Sources Regulation (2006) and other relevant regulations.

(3) The Designated Radioactive Waste Management Facility shall secure a license for transportation of radioactive waste from the Authority in addition to the license from any other appropriate authority.

(4) The Authority shall be notified at least 14 days in advance of any off-site transfer of radioactive waste, and waste generator shall ensure that he receives an acknowledgement receipt of the dispatched radioactive waste within 14 days from the Designated Radioactive Waste Management Facility

(5) Any shipment, of which acknowledgement is not received within the specified time shall be investigated by the sender and a report shall be prepared and submitted to the Authority within one (1) week after completion of the investigation but not later than twenty eight (28) days after the date of shipment.

(6) Transportation of Waste may be required in between the various predisposal management steps and may include on and off –site transportation, the collection route shall be the most direct one from the final collection point to the central storage facility designated in the waste management plan.

(7) The collection shall not be left even temporarily anywhere other than at the designated central storage facility

Off-Site Transportation

Off –Site Transportation shall, unless otherwise agreed, be the responsibility of the radioactive waste management facility which shall ensure

(a) All concerned personnel shall be trained properly in handling, unloading, transportation and predisposal, and are fully aware of emergency procedures for dealing with accidents and spillage.

(b) The transportation of waste shall be properly documented and all vehicles shall carry consignment note from the point of collection to the predisposal facility.

(c) The packaging of waste for shipment to the predisposal site, whether in a conditioned form or not, shall be done in compliance with the relevant transport regulations.

(d) Radioactive waste material especially disused sealed sources (such as. CO 60 sources, AM-241, smoke detectors shall be transported using an over pack.

Responsible Person for safe transportation of radioactive material.

The responsibility for the safe transportation of radioactive material shall be:

(i) The carrier or person who owns the vehicle on which the package of material is to be carried.
(ii) The consignor or person who owns the radioactive material that to be transported.
(iii) The driver and storekeeper i.e. the employees of the carrier who drive the vehicle and any other person that may handle the package.

The specific responsibilities of these groups are set out in the code of practice and the regulations. There is also a general responsibility that no person may interfere with a package without the permission of the consignor or carrier.

The licensee shall ensure that radioactive waste is prepared for transport to a storage or predisposal site for this purpose it shall be regarded as a radioactive source for transport in accordance with all applicable regulations.

Treatment

(1) The treatment processes shall be directed towards volume reduction and the removal of radionuclides from the bulk of the waste which results in a concentrated waste stream

(2) The Designated Radioactive Waste Management Facility shall treat the radioactive waste received from the waste generator in order to reduce its volume and to facilitate further conditioning.

(3) The treatment method shall be suitably selected for the radioactive waste received depending on factors such as volume and type of the waste, the

discharge requirement for liquid effluent and additional conditioning requirements.

(4) Before predisposal, the radioactive waste shall be treated (where necessary) to ensure that it meets the Waste Acceptance Criteria

(5) The waste shall also comply with any additional specifications of the Authority. The operator shall submit a detailed specification of the proposed treatment for approval by the Authority.

(6) Facilities may be provided at the predisposal site by the operator for conditioning of waste to ensure that it conforms to the predisposal criteria for the particular category of waste.

(7) Waste producers, or their Consultant, shall be provided with the necessary specifications for treating particular shipments of their waste to ensure that they will be acceptable for predisposal at the facility.

Conditioning

1. The radioactive waste to be accepted for long term storage, transportation and disposal shall be properly conditioned by the Designated Radioactive Waste Management Facility.

2. Waste packages produced by a conditioning process shall be fully characterized with regard to important physical, chemical, radiological, mechanical and biological properties specified by the Authority.

3. The waste packages to be transported off-site shall comply with the Nigerian Transportation of Radioactive Sources Regulation (2006) and shall meet waste acceptance criteria for disposal

4. Radium sources shall be conditioned for storage by encapsulating the source in a welded stainless tube, placing the tube in a lead shielding container followed by emplacement of the container inside a 200 litre mild steel drum filled with concrete.

5. Provision shall be made for the retrieval of the encapsulated radium sources from drums and transportation to the disposal facility.

6. The operator shall institute a quality assurance program to verify that all packaging, labeling and accompanying documentation accurately reflects the contents of conditioned waste packages received for predisposal. This program shall meet the requirements of the authority

Radioactive waste acceptance criteria

1. The Operator shall provide the waste acceptance criteria for waste packages and unpacked waste that are accepted for processing, storage and/or disposal; taking into account all relevant operational limits consistent with the safety case.

2. Associated non-radioactive waste and potential contaminants shall be considered; however, some contaminants (and naturally occurring species) have the potential to affect the fate and transport of radionuclides.

3. The waste shall be in a packaged form that is retrievable during and at the end of the storage period. The operator shall demonstrate that the design life of the packages exceeds the design life of the radioactive waste stored and shall describe the broad arrangements envisaged for re-packaging or re-certification of the waste packages prior to the end of their design life

4. The operator shall show how any special properties of the package that may affect the radioactive waste are taken into account in the design of containers.

5. The operator shall describe how, waste packages are to be checked for container breaches and surface contamination, and to ensure that they are consistent with the documentation

6. The operator shall describe in detail characteristics of any non-radiological contaminants in the waste that will be accepted for storage and how such contaminants will be managed to ensure safety and integrity of the waste forms

7. The operator shall take into account the relevant part of the following Safety rules:

a. The requirements for the performance of the container, in the event of incidents and accidents, shall be specified to ensure the protection of workers and the public

b. The storage environment such as ambient temperature and humidity ,in the design of storage containers as appropriate. Containers shall be sufficiently resistant to corrosion over the duration of storage, and the placement of storage containers on surfaces where condensation cycles can develop shall be avoided

c. Certain types of waste particularly corrosive liquid waste, special precautions such as the use of double walled containers and/or the lining of storage rooms with stainless steel or other corrosion resistance material may be necessary.

d. Liquid waste may require a collection and recovery system below the containers (i.e. secondary containment) with provision for monitoring for any leakage. In keeping with the principles of passive safety, liquid waste shall be converted to solids as early as practicable

e. Consideration shall be given to the dynamic and static loads resulting from the handling and stacking of the waste packages. The wall thickness of the containers, the filled weight of the stacking orientations shall be taken into account at the design stage

f. Some waste may have the potential for generating airborne radionuclides within the containers; many types of storage container has vent naturally but some may require a purpose built vent. The need for package venting should be considered as part of the safety assessment

g. The design of waste storage containers should facilitate monitoring to all the early detection of any failure of the containment, as appropriate (e.g. for gases and liquid)

h. Liquid waste may contain suspended solids which could settle on the bottom of a container (e.g. tank waste) or may contain substances that could precipitate out of solution. For some waste it may be necessary to prevent settling to solids; for example, to prevent critically or to facilitate decommissioning. For such wastes, solid shall be kept suspended by means of a mixing device such as mechanical stirrer, a pneumatic mixer or a circulation pump. Sluicers may need to be part of the design to facilitate the removal of any waste that may have precipitated on the interior surfaces of a tank. Additional interior hardware should be minimized to limit obstructions

Financial remittance for radioactive waste management

1. In keeping with the Polluter Pays Principle, the contributors to the fund will be from the generators of radioactive waste, the fund shall be paid into the Radioactive Waste Management Fund (RWMF)

2. The contributions shall be managed in an equitable manner, without cross-subsidization and amongst others be based on classification of the waste as well as the volume

3. The purpose of the fund shall be to ensure that there are sufficient provisions for the long term management options of the various waste forms

These shall include:

a. Fees for disposal activities

b. Research and development activities including investigations into waste management disposal options

c. Capacity building initiatives for radioactive waste management/disposal

d. Fees for other activities related to radioactive waste management/disposal

e. The management of the fund shall be determined by Government and shall be reported upon annually

f. The fund shall be managed in accordance with accepted investment and accounting principles. The report of the fund shall be subject to the Auditor General's examination

g. Each of the fund generators shall enter into an agreement with the Radioactive Waste Management Fund (RWMF) for managing long term provisions for institutional control measures

Clearance of radioactive waste from regulatory control

1. The licensee shall seek authorization from the Authority for the release of clearance waste from regulatory control. For this purpose, information regarding the origin, characteristic, and accumulation rate of the waste and the methods to be used for the determination of its radionuclides contents shall be submitted to the Authority.

2. Details of clearance levels,exempt waste and exclusion is given on schedule 1 of this regulation

PART V - SAFETY APPROACH TO RADIOACTIVE WASTE MANAGEMENT

Preparation and assessment of safety measures

1. The Operator shall develop a safety case to justify safety during design, construction, , commissioning, operation and decommissioning. The step by step approach has to provide for the collection, analysis and interpretation of the relevant technical data..

Supporting safety case assessment and documentation

1. The safety case shall include a description of how all the safety aspects of the site, the design, operation, shut-down and decommissioning of the facility, and the managerial control satisfy the regulatory requirements. The safety case and its supporting safety assessment shall demonstrate the level of protection provided and shall provide assurance of safety to the Authority

2. The safety case and its supporting safety assessment shall be documented at a level of detail and to a quality sufficient to demonstrate safety, to support the decision at each stage and to allow for the independent review and approval by the Authority.

3. The documentation shall be clearly written and shall include argument justifying the approaches taken in the safety case on the basis of information that is traceable.

Periodic Safety Review.

1.The operator shall carry out periodic safety review and shall implement any safety upgrades required by the Authority following this review. The result of the periodic safety review shall be reflected in the up dated version of the safety case for the facility.

PART VI - DEVELOPMENT, DESIGN AND OPERATION OF RADIOACTIVE WASTE MANAGEMENT FACILITY

Location and design of Facilities

Predisposal radioactive waste management facilities shall be design and located so as to ensure safety for the expected operating lifetime under both normal and possible accident condition and their conditioning

a. Suitable engineered barriers of natural or manufactured materials of predisposal radioactive waste shall be incorporated in the design of the facility. Their purpose is to guarantee the integrity of the waste under all foreseeable circumstances, to minimize the possibility of water infiltrating the disposal structure, and to delay or prevent radionuclide migration, both during operations and after closure of the facility.

b. In addition, the engineered barriers shall be designed to provide protection in the event of inadvertent intrusion into the disposal structure. For Category II and III waste the design life of the barriers shall be not less than 300 years with a structural life of 1000 years. For Category II waste the conditioned waste package may provide one such barrier.

c. The design shall include a suitably engineered cover for the disposal structure following a consideration of site specific parameters. The cover shall require several layers of material to be incorporated into the design, each layer having a specific function to stabilize the structure, prevent ingress of water, discourage entry of animals and people, and inhibit erosion

d. The features to be incorporated in the design shall depend largely on the properties, total inventory and potential radiological and non-radiological hazards associated with the radioactive waste that is to be managed.

e. Radioactive waste management facilities shall be located and designed so as to ensure safety, operational maintenance, testing, examination and inspection for the expected operating lifetime under both normal and possible accident conditions, and for their decommissioning.

Construction of radioactive waste management facilities

Predisposal radioactive waste management facility shall be constructed in accordance with the design as described in the safety case and approved by the Authority.

1. Construction of a radioactive waste management facility shall be in line with the overall good of the society, as judged by the authority.. An Environmental impact assessment shall be conducted prior to the first authorization step of a major radioactive waste facility.

2. The operator shall be responsible for the construction of facilities in accordance with the approved design, including conducting any verification tests that need to be performed. The Authority shall be responsible for oversight of these activities for construction and verification.

Commissioning of radioactive waste management facilities

1) Commissioning shall be carried out in several stages to verify that the equipment, structures, systems, components, and the facility as a whole, perform at optimal capacity; and shall be subject to review and approval of the authority.

2) The commissioning of radioactive waste management facility shall be carried out in the following stages: completion of construction and inspection, installation and testing of equipment, demonstration of performance, non-active and active commissioning..

3) A report shall be produced upon completion of commissioning by the operator and it shall document the as-built status of the facility, provide information of the facility for possible future modification, shutdown and decommissioning.

Facility operation and closure

Predisposal radioactive facilities shall be operated in accordance with national regulations and with the conditions imposed by the Authority and consideration shall be given to the maintenance of the facility to ensure its safe performance

1) Operation shall be based on approved documented procedures by the Authority.

2) Facility closure consist of the following:

a. Closure and stabilization measures as set forth in the site closure plan shall be carried out as each predisposal unit is achieved.

b. Active predisposal waste operations shall not have an adverse effect on completed closure and stabilization measures.

Shutdown and decommissioning of radioactive waste management facility

1) The Operator shall develop, in the design stage, an initial plan for the shut-down and the decommissioning of the predisposal radioactive waste management facility and shall periodically update it throughout the operational period.

2) The decommissioning of the facility shall be carried out on the basis of the final decommissioning plan as approved by the Authority.

3) Assurance shall be provided that sufficient funds will be available to carry out shut-down and decommissioning.

4) Operator of radioactive waste shall be responsible for the waste management shutdown and decommissioning, including related planning, research and development work.. The authority has the secondary responsibility in case that an operator of radioactive waste Management Facilities is incapable to fulfill her management obligation.

5) Radioactive waste management Facilities shall be shut down and decommissioned in accordance with the conditions set by the Authority. The time period between updates of the decommissioning plan shall be dependent on the type of facility and the operational history and have to be agreed with the Authority.

Facility accounting and control system of radioactive waste material

Facility subject to International Agreements on Nuclear Material Accounting, in the design and operation of predisposal radioactive waste management facility. The system of accounting for and control of nuclear material shall be implemented in such a way as not to compromise the safety of the facility.

The facility accounting and control system shall include the following

a. Assignment of organizational and custodial responsibilities for the radioactive waste material in the facility

b. System for recording and reporting radioactive waste material inventories and transfer, that provide for adequate and timely measurement of material in inventory and being transferred, and for estimating measurement uncertainties. Documents describing this system shall define :

i. all data to be maintained in accounting and operating records, establish time limits for the completion of records and make provision for storing records for the stipulated time.

ii. all data to be included in accounting reports, and include specimen report forms

Existing facilities

1. The safety and upgrade of all existing facilities of predisposal radioactive waste shall be reviewed in compliance with the relevant regulations, and shall be carried out by the operator.

2. The Authority shall initiate if need be additional modifications, operational restrictions or shutdown if the operator is not in compliance with the relevant regulations

3. The safety of existing pre- disposal facilities shall be assessed periodically until licence termination and when a significant safety modification is planned or when changes with respect to the authorized conditions happen.

4. In the event that any safety requirements set down in this publication are not met, measures shall be put in place to upgrade the safety of the facility, economic and social factors being taken into consideration.

Disposal of radioactive waste

1 Where the radioactive waste does not qualify for discharge or release to the environment or for clearance in a reasonable period of time, it shall be disposed in a near surface repository.

2 No person or organization shall dispose of radioactive waste in a repository unless the requirements for acceptance of radioactive waste for disposal, approved by the Authority are satisfied.

4 Radioactive waste disposal facilities shall be developed, operated and closed in a series of steps each supported by regular evaluations of the site, the options for design, construction, operation and management, and of the performance and safety of the disposal system

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