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1. Strategic and License Framework proviso

Before any solid radioactive waste, as discussed under this guideline document, can be removed from the Koeberg Nuclear Power Station (KNPS) site, strategic and regulatory agreements are to be established with the various authorities, including Necsa, NRWDI, NNR, DMRE, which will be implemented by Eskom.

Currently an Eskom User Requirement Specification has been issued, reference DSG-310-365 [1], to contract a suitably qualified company, together with Eskom, to lead the review of the current Post-Closure Radiological Safety Assessment (PCRSA), in consultation with all affected and responsible parties.

The review shall consider the historical, current and foreseeable utilisation of the authorised facility, e.g., Vaalputs, for near surface disposal. The review shall further make recommendations to update the PCRSA within the Improvement of Safety Assessment Methodology (ISAM) framework. The recommendations to the PCRSA shall also consider associated authorities, licenses and ensure such are internationally acceptable and consistent with the IAEA as well as RSA Regulatory requirements.

2. Introduction

This waste management guideline aims to provide a framework for the development for the disposal of Unit 1 reactor pressure vessel closure head (RPVCH) and the Unit 2 reactor pressure vessel closure head (RPVCH) with control rod drive mechanisms (CRDM) solid waste from Koeberg Nuclear Power Station (KNPS) to an authorised facility, or to consider options for the reprocessing of the two RPVCHs with CRDMs.

To provide the appointed Contractor guidance in the preparation and issuing of a RPVCHs with CRDMs Solid Radioactive Waste Disposal Plan (SRWDP), which should be supported by several plans and safety case type documents, for submission to the applicable structures to obtaining the Minister of the Department of Mineral Resources and Energy (DMRE) and as applicable the National Nuclear Regulator (NNR), approvals.

This guideline must be read with the following identified documents, namely the National Radioactive Waste Management Policy [20], Solid Radioactive Waste Management Plan for Koeberg [4] and Vaalputs Waste Acceptance Criteria [19]. Inter alia to these documents are several other referenced Eskom documents that set out regulatory requirements, specifications and criteria that must be considered in the preparation of the Solid Waste Management Disposal Plan for the disposal of the two RPVCHs with CRDMs solid waste.

The RPVCHs with CRDMs Solid Radioactive Waste Disposal Plan (SRWDP) will comprise of various parts, including a waste removal plan, transportation plan, security plan and a disposal plan for the two RPVCHs with CRDMs or optionally for reprocessing.

During KNPS Outages 116 and 225 the Unit 1 and 2 reactor heads were replaced, respectively. The RPVCHs are currently under interim storage at the KNPS low level waste building (LLWB) together with the Unit 2 CRDMs. All this waste is considered as solid radioactive waste that requires removal to an authorised facility for disposal.

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Other hazardous and radioactive waste from the respective Outages was disposed of in accordance with KNPS procedures KAE-102 and KWH-S-033. These procedures respect the requirements set out under the Solid Radioactive Waste Management Plan for Koeberg, reference 240-113228853 [4]. The Solid Radioactive Waste Management Plan for Koeberg takes guidance from the Department of Minerals and Energy's Radioactive Waste Management Policy and Strategy of 2005 [20].

The Unit 1 RPVCH currently has protective wrapping in accordance with Outage 116 RVH treatment procedure [16] and Unit 2 RPVCH and CRDMs in accordance with Outage 225 specification [6].

3. Supporting Clauses

3.1 Scope

This document applies to the disposal of Koeberg project solid radioactive waste, namely the two RPVCHs with CRDMs, arising from the KNPS projects during Outages 116 and 225 during which the reactor heads were replaced. This document provides a framework and guidance for the removal, transportation, and security and for disposal at an authorised off-site radioactive waste facility, namely Vaalputs National Radioactive Waste Disposal Facility, or for the reprocessing of the two RPVCHs.

This document provides guidelines to the processes that need to be considered for the removal, transportation, and disposal of the two RPVCHs and CRDMs to an authorised radioactive waste facility, namely the Vaalputs National Radioactive Waste Disposal Facility, or for the reprocessing of the two RPVCHs.

This guideline document should be read in conjunction with the various referenced documents which provide specific details and conditions that may be applicable, including User Requirement Specification [1].

3.1.1 Purpose

The purpose of this guideline is to provide a framework to the processes and interventions that are to be considered in the development of the various plans, authorisations, and permits for the removal, transportation, and delivery of solid radioactive waste to an authorised low-level waste disposal site, or for the reprocessing of the two RPVCHs.

This guideline considers the requirements of the following Eskom documents, namely the Eskom Policy 32-227 [23], Requirements and rules for radiation protection and the safety of radiation sources Standard 32-226 [5], and Radioactive Waste Management Standard 238-51 [3].

3.1.2 Applicability

This document applies to all parties responsible for the removal, transportation, and delivery of the RPVCHs and CRDMs from KNPS to an authorised low-level waste disposal site, namely Vaalputs site or for the reprocessing of the two RPVCHs.

3.1.3 Effective date

This document is effective from the date of its authorisation.

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3.2 Normative/Informative References

Parties using this document should apply the latest approved edition of the documents listed in the following paragraphs.

3.2.1 Normative

- [1] DSG-310-365 - User Requirement Specification – Disposal of the original Unit 1 RPVCH and Unit 2 RPVCH and CRDMs
- [2] 238-14 - Security Measures for Nuclear Power Stations and Facilities
- [3] 238-51 - Radioactive Waste Management Standard
- [4] 240-113228853 - Solid Radioactive Waste Management Plan for Koeberg Nuclear Power Station
- [5] 32-226 – Requirements and rules of radiation protection and the safety of radiation sources Standard
- [6] D02-ARV-01-138-232 - RPVCH KB2 - TO6 - EWP 5 - Existing RPVCH packing with shielding
- [7] D02-ARV-01-138-232 revision C - RPVCH KB2 - TO6 - EWP 5 - Existing RPVCH packing with shielding
- [8] KAA-768 - Safety, Health and Environmental Risk Assessment and Programme
- [9] KAE-012 - Hazardous and Non-Hazardous Waste and Scrap Disposal
- [10] KEP-086 - Emergency Plan for Radwaste Transport to Vaalputs
- [11] KSA-048 - Management of the Solid Radioactive Waste Programme
- [12] KSA-132 - Lifting and Rigging Program Standard
- [13] KWH-S-001 - Radiation and Surface Contamination Surveys
- [14] KWH-S-033 - Processing and Administration of Solid Radwaste
- [15] KWH-S-037 - Classification of Solid Radioactive Materials and the Acceptable On- and Off-Site Packaging Requirements for such Materials
- [16] SFCT DC 3186 - Old RVH Treatment and Removal from Reactor Building for Containment
- [17] SFCT DC 3186 revision B - Old RVH Treatment and Removal from RB for Containment
- [18] SSR-6 - IAEA: Regulations for the Safe Transport of Radioactive Material – 2018
- [19] VLP-WAC-001 – NECSA: Vaalputs Waste Acceptance Criteria

3.2.2 Informative

- [20] Department of Minerals and Energy: Radioactive Waste Management Policy and Strategy for the Republic of South Africa, 2005.
- [21] R.388: Regulations in Terms of Section 36, Read with Section 47 of the National Nuclear Regulator Act, 1999 (Act No. 47 of 1999), on Safety Standards and Regulatory Practices
- [22] Act No. 53 of 2008: National Radioactive Waste Disposal Institute Act, 2008. (NRWDI)
- [23] 32-227 – Radiation Protection and the Safety of Radiation Sources Policy

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3.3 Definitions

Term	Description
Authorisation	The granting by a regulatory body or other governmental body of written permission for an operator to perform specified activities. Authorisation could include, for example, licensing, certification, and registration.
Authorised disposal	Disposal of radioactive waste in accordance with an authorisation issued by the Regulator for disposal on a site that is not regulated in respect of the radioactive properties of the waste and where the radioactivity concentration levels are sufficiently low that post disposal regulatory control is not required.
Characterisation	Determination of the physical, chemical, and radiological properties of the waste to establish the need for further adjustment, treatment, or conditioning; or its suitability for further handling, processing, storage or disposal.
Conditioning	Those operations that produce a waste package suitable for handling, transport, storage and/or disposal. Conditioning may include the conversion of the waste into a solid waste form, enclosure of the waste in containers, and, if necessary, providing an overpack.
Disposal	The emplacement of waste in an approved specified facility (for example, near surface or geological repository).
Long-lived waste	Radioactive waste that contains significant levels of radionuclides with half-lives greater than 31 years. Typical characteristics are long-lived radionuclide concentrations exceeding the limitations for long-lived waste.
Low and intermediate level waste	Radioactive waste with radiological characteristics between those of exempt waste and high-level waste. These may be long-lived waste (LILW-LL) or short-lived waste (LILW-SL). Typical characteristics of LILW are activity levels above clearance levels and thermal power below 2 kW/m ³ .
Near-surface disposal	The disposal of radioactive waste at or within a few tens of metres from the earth's surface.
Pre-treatment	Any or all of the operations prior to waste treatment, such as collection, segregation, chemical adjustment and decontamination.
Project waste	Project-generated waste such as reactor components and auxiliary equipment that is taken out of service.
Public	As commonly understood, affected public and communities, including Interested Parties (IP)
Short-lived waste	Radioactive waste that does not contain significant levels of radionuclides with half-lives greater than 31 years. Typical characteristics are restricted long-lived radionuclide concentrations (limitation of long-lived radionuclides to 4 000 Bq/g in individual waste packages and to an overall average of 400 Bq/g per waste package).

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Storage	The placement of radioactive waste in a nuclear facility where isolation, environmental protection and human control (for example, monitoring) are provided with the intent that the waste will be retrieved.
Treatment	Operations intended to benefit safety and/or economy by changing the characteristics of the waste. Three basic treatment objectives are: volume reduction, removal of radionuclides from the waste and change of composition. Treatment may result in an appropriate waste form.
Waste	Material in gaseous, liquid, or solid form for which no further use is foreseen.
Waste acceptance criteria	Quantitative or qualitative criteria specified by the regulatory body or specified by an operator and approved by the regulatory body, for radioactive waste to be accepted by the operator of a repository for disposal, or by the operator of a storage facility for storage. Waste acceptance requirements might include, for example, restrictions on the activity concentration or the total activity of particular radionuclides (or types of radionuclides) in the waste or requirements concerning the waste form or waste package.
Waste characterisation	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.
Waste classification	A method used to group various types of radioactive waste according to their physical characteristics.
Waste form	Waste in its physical and chemical form after treatment and/or conditioning (resulting in a solid product) prior to packaging. The waste form is a component of the waste package.

3.4 Abbreviations

Abbreviation	Explanation
ACP	Koeberg Access Control Point
ASME	American Society of Mechanical Engineers
ALARA	As Low As Reasonably Achievable
BATNEEC	Best Available Technology Not Entailing Excessive Cost
CRDM	Control Rod Drive Mechanisms
DME	Department of Minerals and Energy (old name)
DMRE	Department of Mineral Resources and Energy (new name)
Bq/g	Becquerels per gram
EWP	Engineering Work Package
IAEA	International Atomic Energy Agency

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IP	Interested Parties
ISAM	Improvement of Safety Assessment Methodology
JPC	Joint Planning Committee (Koeberg)
KB2	Koeberg Unit 2
KNPS	Koeberg Nuclear Power Station
LEA	Law Enforcement Agency
LILW	Low and intermediate level waste
LILW-LL	Low and intermediate level waste - long-lived waste
LILW-SL	Low and intermediate level waste - short-lived waste
LLWB	Low Level Waste Building
NCRWM	National Committee on Radioactive Waste Management
NECSA	The South African Nuclear Energy Corporation SOC Ltd
NNR	National Nuclear Regulator
NPM	Nuclear Project Management
NRWDI	National Radioactive Waste Disposal Institute
OHS	Occupational Health and Safety
PCRSA	Post-Closure Radiological Safety Assessment
RP	Radiation Protection
RPVCH	Reactor Pressure Vessel Closure Head
RVH	Reactor Vessel Head
SANS	South African National Standards
SHE	Safety Health and Environment
SRWDP	RPVCHs with CRDMs Solid Radioactive Waste Disposal Plan
SSR	Specific Safety Requirements
T	Temporary
WAC	Waste Acceptance Criteria

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3.5 Role Players

The RPVCHs with CRDMs Solid Radioactive Waste Disposal Plan identified the role players with respective authoritative and regulatory functions to be performed during the Plan development and implementation phases. These role players include but are not limited to the following:

INTERNAL

- Joint Planning Committee (JPC).
- NPM Project Managers.
- KNPS Nuclear Engineering.
- KNPS Radiation Protection Department.
- KNPS Security Group.
- KNPS SHE Practitioners.

EXTERNAL

- National Nuclear Regulator.
- Department of Mineral Resources and Energy and NCRWM.
- NRWDI representing Vaalputs National Radioactive Waste Disposal Facility.
- Contractors appointed to execute the planned operations.

3.6 Process for Monitoring

This guideline document and its processes will be measured based on control documents created during the implementation, namely identified plans, safety cases, procedures, risk assessments, inspection plans and milestone certificates, as reviewed by the assigned Project.

This guideline document may also be included in any project review or assessment conducted by a quality oversight team and radiation protection practitioners having responsibilities for radioactive waste management.

3.7 Radioactive Waste Disposal Plan framework

The diagram below aims to provide a framework of the major parts for the development of the RPVCHs with CRDMs Radioactive Waste Disposal Plan for the removal of the two RPVCHs with CRDMs from the KNPS site for disposal at an authorised facility, e.g., Vaalputs or for the reprocessing of the two RPVCHs. See paragraph 3.7.2 below for the projected timelines.

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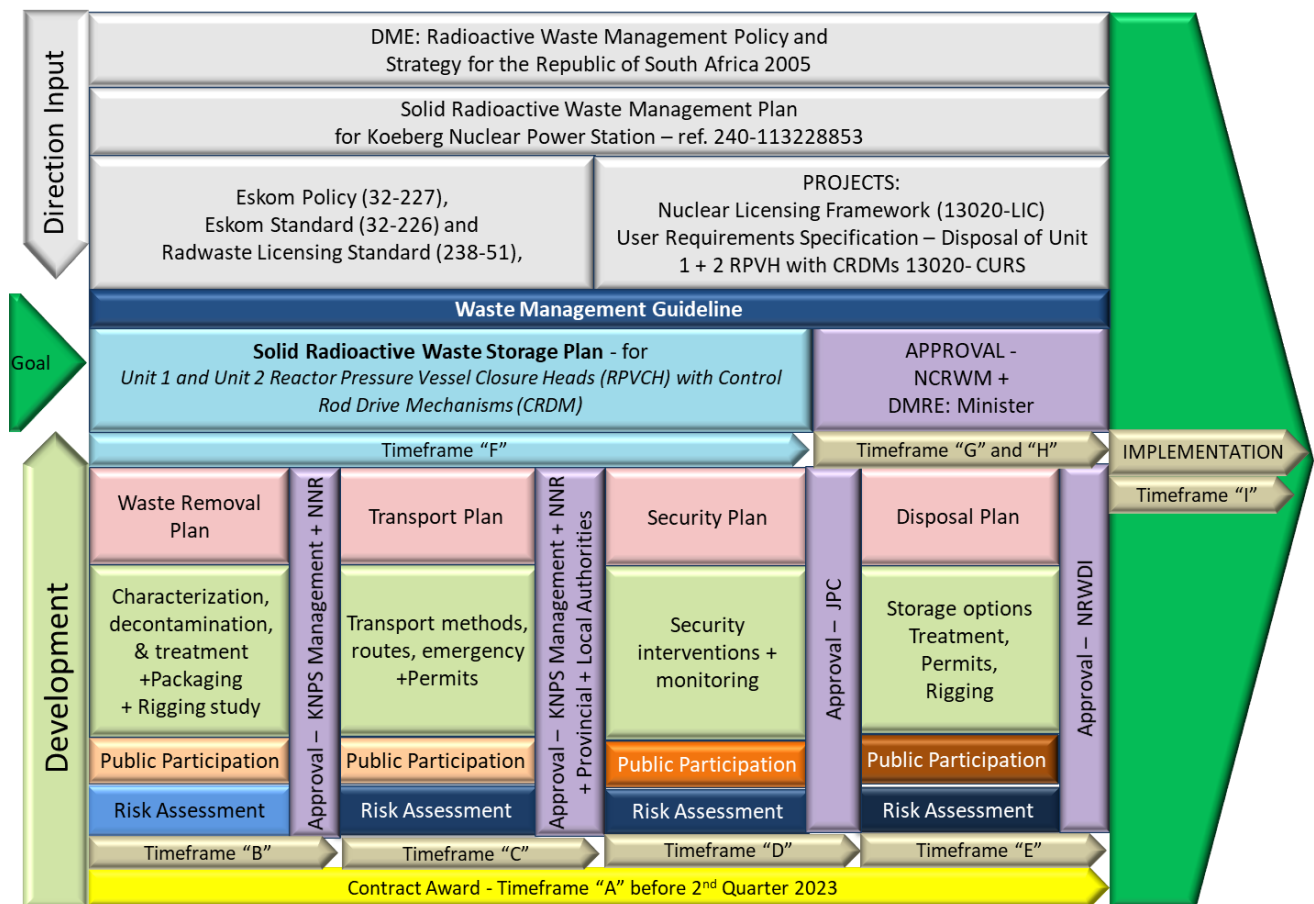


Figure 1: Framework for a Solid Radioactive Waste Disposal Plan

The Department of Minerals and Energy (DME) has issued a Policy document in 2005 [20] setting out the Principles Applicable to Radioactive Waste Management Strategy in South Africa, in accordance with applicable regulatory requirements.

KNPS has issued a Solid Radioactive Waste Management Plan ref. 240-113228853 [4] which provides direction for the management of waste generated at the KNPS, in accordance with the DME Radioactive Waste Management Strategy Policy [20].

The Solid Radioactive Waste Management Plan [4] describes the processes for radioactive waste management and the development of plans, as described under section 5.3 of the referenced document. The process includes:

- Identification, collection, and segregation of waste-streams.
- Classification and categorisation of waste streams.
- Identification of waste management options.
- Evaluation of the different waste management options in terms of cost-effectiveness.
- Technological benefits, safety, as well as social and environmental sustainability.
- Selection of the waste management option.
- Development of waste management plans via consultation.

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- Submission of waste management plans to institutional organisation.
- Approval of waste management plans; and
- Implementation of plans via the regulatory processes.

3.7.1 Evaluating radioactive waste management options

The Solid Radioactive Waste Management Plan [4] under paragraph 5.3 describes the Plan development process and sets out the evaluation criteria for radioactive waste management options, that must be considered. See Appendix B to this guideline for extracts of Figure 2 and Table 2.

3.7.2 Waste Management Plan development projected timelines

The following table provides a projection of the foreseeable activities and the anticipated timelines to completion.

ID	Major Deliverables	Supporting Activities	*Planned completion date
	Strategic and License Framework proviso	Eskom team engages with Government Structures to enable authorizations and licenses.	3 rd Q - 2024
A	Contract Award	Preparation and Review of Plans with procedures & specifications	2 nd Q - 2023
B	Waste Removal Plan	Engage with Eskom and approving authority on requirements	3 rd Q – 2023
		Preparation and Review of Plans with procedures & specifications	
		Submission of Waste Removal Plan	3 rd Q – 2024
		Approval of Waste Removal Plan	4 th Q - 2024
C	Transport Plan	Engage with Eskom and approving authorities e.g. Provincial + Local Authorities on requirements	3 rd Q – 2023
		Preparation and Review of Plans with procedures & specifications	
		Submission of Transport Plan	2 nd Q – 2024
		Approval of Transport Plan	3 rd Q - 2024

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D	Security Plan	Engage with Eskom Security and JPC on requirements	4 th Q - 2023
		Eskom Security - Preparation and Review of Plans with procedures & specifications	
		Eskom Security submission of Security Plan	2 nd Q – 2024
		Approval of Security Plan by JPC	3 rd Q - 2024
E	Disposal Plan	Engage with Eskom and approving authority, e.g. NRWDI on requirements	1 st Q - 2024
		Preparation and Review of Plans with procedures & specifications	
		Submission of Storage Plan	3 rd Q - 2024
		Approval of Storage Plan	4 th Q – 2024
F	Solid Radioactive Waste Storage Plan	Compilation of final Plan for approval	2nd Q - 2025
G	Submission to NCRWM -		
		Review	4 th Q – 2025
		Approval	1 st Q - 2026
H	Submission for DMRE Ministerial approval		2nd Q - 2026
I	Implement approved - Solid Radioactive Waste Storage Plan		3 rd Q - 2026

Figure 2: Project timelines for the Solid Radioactive Waste Disposal Plan

4. RPVCHs with CRDMs Solid Radioactive Waste Disposal Plan

As allowed by the national policy and strategy, a separate Solid Radioactive Waste Management Plan for the two RPVCH with CRDMs is to be developed for Ministerial approval.

The plan must consider various options, applicable to the removal, transportation, security, and disposal of the RPVCH from the Koeberg site. Alternatively, the plan will consider the option for the reprocessing of the two RPVCHs with CRDMs.

The SRWSP is a compendium of several parts, namely the Waste Removal Plan, Transportation Plan, Security Plan, and the Disposal Plan. Each Plan consists of lower tier process topics and documentation which require applicable approval, authorisation, or licensing.

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4.1 Waste Removal Plan

Considering the requirements of the Solid Radioactive Waste Management Plan [4], a specific Waste Removal Plan should be documented which describes all the interventions and activities that will be performed in readiness for the removal of the two RPVCHs and the CRDMs from the KNPS Low Level Waste Building.

The Waste Removal Plan will describe inter alia the scope of the activities and specific interventions; namely the waste treatment options of solidify, reduce, eliminate, and package the waste, including location, responsibilities (person or entity); and measurable outcomes.

Further considering the following.

4.1.1 Radioactivity and Dose Rate Survey

The two RPVCHs and CRDMs are currently packaged within steel casings and tarpaulins as per the specifications [16] and [6], which were applied during the removal of the heads and CRDMs from the respective reactor buildings during the applicable Outage and transported to the LLWB.

A radiation survey procedure is to be documented, based on current KNPS documented practices, considering [11], [13] and [14] and radiation surveyance best practices.

A radiation survey is to be conducted on the current state of radioactivity of the two RPVCHs and CRDMs in the LLWB to verify the actual levels and dose exposure rates, in accordance with guidance from the KNPS Radiation Protection Manager.

The survey results should be an input to the classification and characterisation of the radioactive waste, based on the guidance defined in the Solid Radioactive Waste Management Plan [4] see sections 6 and 7 and read with Appendix E. Further the survey reports should also be an input to the transportation plan, see section 4.2 and disposal plan see section 4.3.

4.1.2 Waste Characterisation and Quantification

The Waste Removal Plan should be supported by a characterisation and quantification Procedure setting out the acceptance criteria, methods and results for the identification, classification, characterisation, and quantification of the identified radioactive waste, of the 2 RPVCHs and the CRDMs. The Procedure should consider the waste treatment options being applied namely, to solidify, reduce, eliminate, package the waste, and location where this will be performed.

The Waste Removal Plan should draw on the direction provided in the Solid Radioactive Waste Management Plan [4] for waste identification, classification and characterisation, see section 4 and 6 read with Appendix A and the radiation survey as described in section 4.1.1 and Classification of Solid Radioactive Materials [15].

The characterisation and quantification Procedure should also meet the requirements of the Vaalputs Waste Acceptance Criteria document [19] and applicable Appendices, including reporting formats, waste mass and labelling information.

The characterisation and quantification Procedure should identify the approving authorities, e.g., the NNR, who are required to issue authority or license before implementation. See also the requirements and rule Standard 32-226 [5].

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4.1.3 Packaging characterisation

The Waste Removal Plan should be supported by a Procedure setting out the requirements for pre-treatment, treatment, packaging and shielding the reactor heads and CRDMs and considering the results for the radiation survey, see section 4.1.1, and detailing any additional packaging requirements to meet the Solid Radioactive Waste Management Plan [4], Vaalputs Waste Acceptance Criteria [19] and the Radioactive Waste Management Standard 238-51 [3].

Further the treatment and packaging requirements of the solid waste should also consider the requirements for the safe and secure transportation as defined under IAEA SSR-6 [18] and applicable codes and standards, see Appendix A.

The Procedure should describe the purpose and nature of the packaging and quantifying the radiation mitigation effects to meet transportation and disposal requirements. After considering the current biological shielding applied, determine what if necessary additional packaging will be required. After any such additional packaging has been applied a further radiation survey should be conducted to record actual radioactivity limits and evaluated against original requirements recorded under section 4.1.1.

The final waste packaging should meet the requirements described under Vaalputs Waste Acceptance Criteria document [19] including labelling information, including unique identification, nature of waste, gross mass of package, surface contact dose rate, radiological survey date, and so forth.

4.1.4 Risk Assessment

A comprehensive risk assessment should be conducted considering the potential risks to the removal of the reactor head and CRDM waste from the LLWB. The risk assessment should be conducted in accordance with Risk Assessment Procedure [8].

The risk assessment should consider inter alia radioactivity and dose levels and other activities during preparations, rigging activities, and transportation from the LLWB to KNPS main gate at ACP 2.

The mitigations to any identified high and medium risks should be checked for compliance, through actions taken and safety checks.

4.1.5 Rigging and Site Transportation Plan

A rigging and transportation plan (study) should be documented and approved for all rigging and transport operations that are performed on the KNPS site. Including the lifting the reactor heads and CRDMs in the LLWB to the transportation to the KNPS main gate at ACP 2. The rigging and transportation Plan should include details of the rigging and transportation operations, drawings indicating the nature of the operations, qualification of both machinery and personnel, approved routes used and dose mitigation interventions.

The Plan should meet the requirements of the Lifting and Rigging Program Standard [12] and consider the applicable requirements of the Emergency Plan for Radwaste Transport to Vaalputs Procedure [10] and Hazardous and Non-Hazardous Waste and Scrap Disposal [9].

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4.1.6 Public Participation

A public participation program should be documented setting out the objectives, communication channels and targeted public to provide public safety information, for the removal of the two RPVCHs and CRDMs from KNPS.

Once the RPVCHs with CRDMs Radioactive Waste Disposal Plan has been approved by the Minister of DMRE, the public participation program will be implemented through the regulatory processes.

4.1.7 Authority or licence of the Waste Removal Plan

The Waste Removal Plan should identify the authorities, namely the NNR and KNPS Power Station Manager for authority or licence, and the Chief Nuclear Officer for information, which should issue authority or licence before submission of the Removal Plan under the SRWSP to the Minister of DMRE. Refer also to the requirements and rules Standard 32-226 [5].

The Waste Removal Plan, including any Safety Case, should provide an overview of all the relevant operations, methods, and interventions to ensure the safe and secure removal of the two reactor heads and CRDMs from the KNPS LLWB, for delivery to the authorised facility, e.g., Vaalputs, or for the reprocessing of the two RPVCHs.

4.2 Transportation Plans

Considering the requirements of the Solid Radioactive Waste Management Plan [4], a Transportation plan should be documented to describe the interventions and activities that will be performed to transport the reactor heads safely and securely and CRDMs from the KNPS site, initially from the interim storage area and then to the authorised facility, e.g. Vaalputs site, or for the reprocessing of the two RPVCHs.

These plans should consider the final characterisation and quantity of the radioactive waste for transportation, the transportation classification for a public domain, and treatment measures applied to address radiation levels during transportation; see also thresholds under the Vaalputs Waste Acceptance Criteria [19].

4.2.1 Travel Route procedure – considering the classification the Radioactive Waste

The initial transport plan for the transportation of the reactor heads and CRDMs from the interim onsite storage area to the ACP2 exist gate.

The second transportation plan being from the point of departure namely the KNPS main gate ACP 2 to the authorised facility e.g. Vaalputs entrance, or for the reprocessing of the two RPVCHs. A transport Procedure and plan with supporting forms should be documented detailing all applicable activities and interventions to ensure the safe and secure transportation operation.

The Procedure should detail criteria for determining the recommended route and should consider the requirements set out under Emergency Plan for Radwaste Transport to Vaalputs Procedure [19] and applicable codes and standards, see Appendix A.

The Procedure should inter alia detail:

- The planned route survey, with maps and important features.
- Pre-departure preparations and checks (verify permits and authorities are issued).

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- Communications control and protocols.
- Plans for on-road emergency scenarios (including breakdowns and traffic accidents), emergency support and equipment.
- Security protection provisions, see paragraph 4.3 below.
- The roles of controlling personnel, support persons, and to-be-informed persons.

4.2.2 Transport Vehicle Assessment

To ensure a safe and secure transportation operation a survey report should be documented detailing the method and approach applied to determining the BATNEEC transport vehicles (details of horse, trailer and support and back-up vehicles) that should be used. The survey should consider the mass and configuration of the loads, load's centre of gravity, distance to be travelled, road conditions, and cost options. Considering the requirements set out under the IAEA SSR-6 regulations for safe transport [18]. The two RPVCH packaging documents [17] and [7] and for the CRDM packaging and load drawings will be made available as required.

4.2.3 Risk Assessment

A comprehensive Transportation and Safety risk assessment using the prescribed latest template is required, in compliance with the Safety, Health and Environmental Risk Assessment and Programme [8].

The risk assessment should be focussed on the applicable transportation and safety scope to move the 2 reactor heads and CRDMs from the interim storage area to the KNPS main gate ACP 2 and then to the authorised facility, e.g., Vaalputs entrance, or for the reprocessing of the two RPVCHs.

4.2.4 Public Participation

A public participation program should be documented setting out the objectives, communication channels and targeted public, including affected local authorities, near to KNPS and for communities en-route to Vaalputs, or for the reprocessing of the two RPVCHs, to provide public safety information, related to the transportation of the two RPVCHs and CRDMs from KNPS to Vaalputs or for the reprocessing of the two RPVCHs.

Once the RPVCHs with CRDMs Radioactive Waste Disposal Plan has been approved by the Minister of DMRE, the public participation program may be implemented through the regulatory processes.

4.2.5 Authorisations / Transport Permits from Provisional / Local authorities

The transport and security plan should identify which provincial and local traffic authorities are affected and from whom authorisations and or permits should be issued to allow the transportation of the reactor heads and CRDM loads.

The transportation plan operations should consider the limitations set by these authorisations and permits.

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4.3 Security Plan

A Security Plan should document and detail the security measures that will be applied to provide inter alia physical protection during the transportation of the reactor heads and CRDM loads between KNPS main gate ACP 2 and the authorised facility e.g., Vaalputs entrance, or for the reprocessing of the two RPVCHs.

The security measures should be developed by the Koeberg Security group in conjunction with the Law Enforcement Agency (LEA) and to be reviewed and approved by the JPC and NNR, considering the guidance given by the IAEA SSR-6 Safe Transport of Radioactive Material document [18] and as applicable Security Measures for Nuclear Power Stations and Facilities [2] .

The security measures should be designed to mitigate the security risks and threats as identified in the Threat and Risk Assessment and Real Time Threat as provided by LEA.

The **Security Plan is a classified document.**

4.4 Disposal Plan

Considering the requirements of the Solid Radioactive Waste Management Plan [4], a specific Disposal Plan should be documented which should describe all the interventions, activities performed for the pre-disposal phase (see also paragraph 4.4.3) that will be performed to support the NRWDI acceptance and delivery of the two reactor heads and CRDMs to an authorised facility, e.g. Vaalputs, or optionally for the reprocessing of the two RPVCHs.

The Disposal Plan should consider the results of the radiation survey, see section 4.1.1, of the reactor heads and CRDMs, and any additional treatment measures for the disposal at Vaalputs; considering the requirements of Vaalputs Waste Acceptance Criteria [19] and those of the NRWDI, or for the reprocessing of the two RPVCHs.

4.4.1 Classification and Characterisation of Waste

Further to the results of the radiation survey for the characterisation of the waste and quantification, the outcomes are to be verified against the requirements of NRWDI and the Vaalputs Waste Acceptance Criteria [19] for acceptance. The Vaalputs Repository Operator requires specified information to be provided in the form of a “data pack” for the final disposal approval, see the requirements under the Vaalputs Criteria document [19] clause 9.1 read with Appendix D, as applicable, or for the reprocessing of the two RPVCHs.

4.4.2 Packaging requirements

A packaging specification should be documented considering the requirements of the Vaalputs Repository Operator and the requirements as described under Vaalputs [19]; considering the current packaging applied to the reactor heads and CRDMs, or for the reprocessing of the two RPVCHs.

The packaging specification should consider the requirements, nature, type, and form, for the disposal of the identified waste.

The packaging specification should detail the labelling to be applied to the waste packaging considering the minimum requirements prescribed by the Vaalputs Repository Operator, see Vaalputs [19] under clause 9, and applicable codes and standards, see Appendix A for the transportation of dangerous goods.

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4.4.3 Nature of disposal at an authorised facility

A waste disposal specification should be prepared for authority or licence considering the waste characterisation (see waste removal section 4.1.2) and the form of the waste and the waste treatment packaging applied (see Vaalputs document [19] clause 9.2 and 9.3 and 9.4 respectively).

As part of the two RPVCH and CRDMs disposal activities, procedures should be documented describing the process and methods for the off-loading the waste packages at Vaalputs, including rigging plans/studies, drawings of locations and safety practices to be observed at the Vaalputs site.

The Procedures should detail the scopes and responsibility for the different activities that will be performed on the Vaalputs site and should be approved by the Vaalputs Repository Operator namely NRWDI.

4.4.4 Public Participation - consultation with the public through public safety information forums

A public participation program should be documented setting out the objectives, communication channels and targeted public near Vaalputs for the disposal of the reactor heads and CRDMs, or for the reprocessing of the two RPVCHs.

This program and objectives may be performed as part of the existing public participation program run by the Repository Operator namely NRWDI.

4.4.5 Risk Assessment

A comprehensive risk assessment using the prescribed latest template is required, in compliance with the Safety, Health and Environmental Risk Assessment and Programme [8].

The risk assessment should be focussed on the scope of Disposal Plan for the delivery and safe off-loading of the waste packages at the Vaalputs site or for the reprocessing of the two RPVCHs.

4.4.6 Repository Operator - NRWDI authority or licence

The Disposal Plan and supporting documentation should be submitted to the Repository Operator - NRWDI, for authority or licence, according to the Solid Radioactive Waste Management Plan [4].

A document submission specification should be documented setting out all the documentation and timeframes required for the submission to Repository Operator - NRWDI for review and authority or licence, related to the acceptance of the radioactive waste from the waste generator, namely KNPS.

4.5 Nuclear Insurance Cover

The Eskom Insurance group must be engaged at various stages during the development and implementation of the RPVCHs with CRDMs Radioactive Waste Disposal Plan and its different parts to ensure adequate insurance cover and policies are arranged.

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4.6 NNR authority or licence

A document submission specification should be prepared, detailing all the documentation (e.g., safety case, procedures, methods, etc) created under the Waste Removal Plan, Transportation Plan and Security Plan and as applicable the Disposal Plan that should be submitted to the National Nuclear Regulator (NNR) for review and authority or licence.

The NNR should be consulted on this specification to identify all documentation that will require submission for authority, licence or for information.

4.7 Radioactive Waste Disposal Plan authority or licence

Once the Waste Removal, Transportation and Security and the Disposal Plans have been reviewed and authorised or licensed by the applicable authorities, including the KNPS authorities, NRWDI and the NNR, an overarching RPVCHs with CRDMs Radioactive Waste Disposal Plan should be compiled with its portfolio of documents and evidence.

The compiled Plan should consider the requirement set out under Figure 1 of the Radioactive Waste Management Policy and Strategy [20] before submission to the DMRE – for Ministerial approval of the Plan. Alternative submission schedules may also be considered.

5. Acceptance

This document has been seen and accepted by:

Name	Designation
Israel Sekoko	Nuclear Engineering Manager
Phina Thauge	Engineer: Nuclear Back-End Management
Ravid Goldstein	Manager Engineering
Tertius Karsten	Chief Advisor - Radiation Protection
Carla Le Roux	Snr Supervisor Radiation Waste
Marc Maree	Corporate Specialist (Radiation Protection)
Mvola Flatela	Officer Security Systems
Ivan Jones	Safety Officer
Tayeb Jappie	Waste & Environmental Manager – Nuclear Project Management
Justice Nzimande	Senior Advisor Projects

6. Revisions

Date	Rev.	Compiler	Remarks
20 October 2022	0	X. Motlhale	Initial document

7. Development Team

The following people were involved in the development of this document:

- Xoliswa Motlhale

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- Letitia Geldenhuys
- Larry Kloppenborg

8. Acknowledgements

All comments and inputs provided by the Koeberg team in the development of this document.

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Appendix A: Reference Codes and Standards for information

Reference Codes and Standards for information. Note, this list cannot be considered conclusive.

SANS 1157:2013	Transport of dangerous goods — Inspection requirements of road vehicles for the issue of municipal dangerous goods transport permits
SANS 10228:2012	The identification and classification of dangerous goods for transport by road and rail modes
SANS 10229-1:2010	Transport of dangerous goods — Packaging and large packaging for road and rail transport Part 1: Packaging
SANS 10229-2:2010	Transport of dangerous goods — Packaging and large packaging for road and rail transport Part 2: Large packaging
SANS 10231:2019	Transport of dangerous goods by road — Operational requirements
SANS 10232-1:2018	Transport of dangerous goods — Emergency information systems. Part 1: Emergency information system for road transport
SANS 10232-3:2021	Transport of dangerous goods — Emergency information systems. Part 3: Emergency response guides
SANS 10232-4:2019	Transport of dangerous goods — Emergency information systems. Part 4: Transport emergency card
SANS 10233:2011	Transport of dangerous goods — Intermediate bulk containers for road and rail transport
SANS 969-1:2020	Clean-up of dangerous and non-dangerous goods incidents Part 1: Road occurrences
SANS 10187-1: 2009	Load securement on vehicles Part 1: General requirements.
OHS Act R295: Driven Machinery Regulations, Reg. 18, Lifting Machines and Lifting Tackle	National Code of Practice for Training Providers of Lifting Machine Operators – as per Government Gazette No. 38904
SANS 10296:2008	Hand signals used with cranes and with lifting and suspended equipment
SANS 2972:2018:	Lifting tackle inspection
SANS 4310:2002	Cranes — Test code and procedures
ASME B30 series	Read with – Basic Rigging Workbook – Brookhaven National Laboratory
ISO 31000:2018	Risk management — Guidelines
SANS 31010:2020	Risk management — Risk assessment techniques
IAEA Safety Standards Series No. SF-1	Fundamental Safety Principles
IAEA Safety Standards Series No. SSR-6 (Rev.1)	Regulations for the Safe Transport of Radioactive Material
IAEA General Safety Requirements – GSR Part 5	Predisposal Management of Radioactive Waste

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Appendix B: Extracts from reference – 240 113228853 – Solid Radioactive Waste Management Plan for KNPS

“Figure 2 Plan Development Process” and “Table 2 Evaluation Criteria”

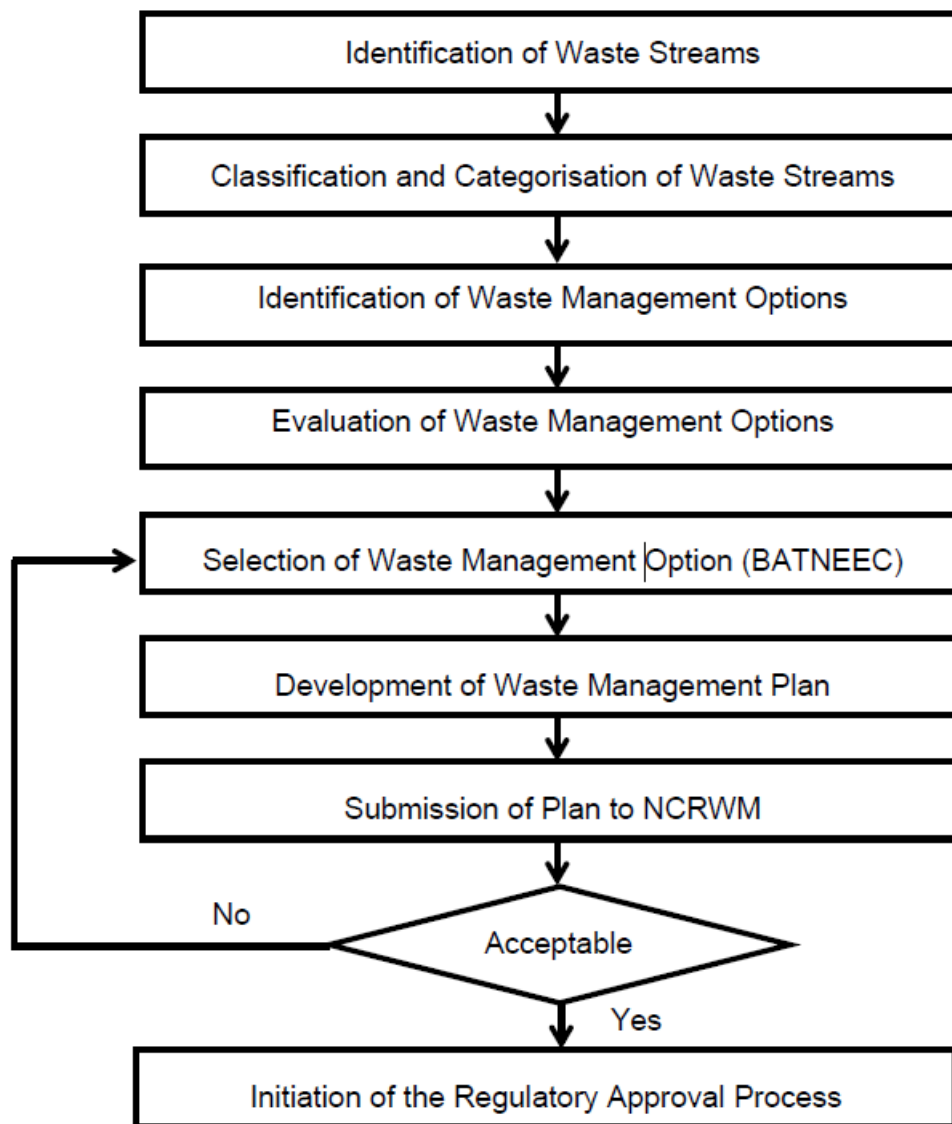


Figure 2: The Radioactive Waste Management Plan Development Process

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Table 2: Evaluation criteria for radioactive waste management options

Element		Sub-element	
A	Cost effectiveness	A1	Life cycle cost of waste
B	Technological status / benefit	B1	Existing or new technology
		B2	International practice
		B3	Waste prevention potential
		B4	Waste minimisation potential
		B5	Waste quality
		B6	Regulatory implications
C	Safety	C1	Worker safety impact
		C2	Public safety impact (operational)
		C3	Transport minimisation / prevention
		C4	Accident risk
		C5	ALARA
D	Social and environmental sustainability	D1	Public safety impact (long term)
		D2	Perceived risk and social acceptability
		D3	Benefit to the community in relation to the "no action" option
		D4	Environmental impact
		D5	Continual improvement potential

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