Eskom	Strategy	Koeberg Operating Unit

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Content

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1. Introduction

Eskom's Nuclear Management Policy [1] provides a framework of policy principles to guide its nuclear strategies, operations and decision making. The principles of this policy include, amongst others, that:

- Eskom shall strictly adhere to and respect the requirements of legislation and regulations; and
- Eskom shall emulate internationally benchmarked best practice, and apply international operational experience.

The national Radioactive Waste Management Policy and Strategy [2] contains International Atomic Energy Agency (IAEA) and national principles with which all radioactive waste management activities in South Africa shall comply. According to the National Radioactive Disposal Institute Act (Act No. 53 of 2008) [3], Eskom, as the generator of radioactive waste, is "responsible for technical, financial and administrative management of [its] waste within the national regulatory framework at [its] premises and when such waste is transported to an authorised waste disposal facility." Eskom is further required in terms of this Act and of the Radioactive Waste Management Policy and Strategy for the Republic of South Africa [2] to submit its radioactive waste management plans / strategies to Government for evaluation and authorisation.

Koeberg Nuclear Power Station (hereinafter referred to as Koeberg) is operated under the Nuclear Installation Licence NIL-01 Variation 19 [4], which stipulates the licence conditions on the implementation of programmes for the minimisation and safe management of radioactive waste on site.

The objective of this document, therefore, is to provide a strategy for Koeberg spent fuel management (SFM) as developed in terms of national policy, regulatory and legislative requirements.

2. Supporting Clauses

2.1 Scope

This Strategy is applicable to the management of spent nuclear fuel generated during the operating life of Koeberg. The strategies for the management of short-lived low and intermediate level waste (LILW-SL) and decommissioning waste are addressed in separate strategy documents, [9] and [10] respectively. An overview of solid radioactive waste management strategies for Koeberg is provided in Appendix A.

2.1.1 Purpose

This Strategy serves as Eskom's commitment to addressing the management and disposal of Koeberg spent nuclear fuel in a systematic and coordinated manner that maintains confidence and acceptance by the public, keeping the workers, public, property and environment as safe as possible. The Strategy also serves to provide a necessary framework for technical and financial planning purposes and is driven by the following needs:

- Compliance with the national Radioactive Waste Management Policy and Strategy [2], which requires waste generators to develop radioactive waste management plans for authorisation by Government.

- Provision of a basis for developing a comprehensive SFM plan and costing of the plan in order to establish a best estimation of the financial provision required for Eskom's SFM.
- Safe and cost-effective management of radioactive waste at Koeberg.

2.1.2 Applicability

This Strategy shall apply throughout the Koeberg Operating Unit.

2.1.3 Effective date

This Strategy will become effective in accordance with the authorisation date.

2.2 Normative/Informative References

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

[1] 32-83: Eskom Nuclear Management Policy.

[2] Radioactive Waste Management Policy and Strategy for the Republic of South Africa, Department of Minerals and Energy, 2005.

[3] National Radioactive Waste Disposal Institute Act, 2008 (Act No. 53 of 2008).

[4] Nuclear Installation Licence, NIL-01 Variation 19.

[5] Nuclear Energy Act, 1999 (Act No. 46 of 1999).

[6] National Nuclear Regulator Act, 1999 (Act No. 47 of 1999).

2.2.2 Informative

[7] Nuclear Energy Policy for the Republic of South Africa, 2008.

[8] Integrated Resource Plan for Electricity, as updated.

[9] 240-164755658: Koeberg Strategy for LILW-SL Radioactive Waste Management.

[10] 240-165290591: Koeberg Strategy for Decommissioning Waste Management.

2.3 Definitions

Term	Description
Decommissioning	Administrative and technical actions taken to allow the removal of some or all of the regulatory controls from a facility.
Decommissioning waste	Waste expected to be generated from the decommissioning of the power station.
Disposal	Emplacement of waste in an appropriate facility without the intention of retrieval.

Term	Description
High level waste	The radioactive liquid containing most of the fission products and actinides present in used fuel – which forms the residue from the first solvent extraction cycle in reprocessing – and some of the associated waste streams; this material following solidification; used fuel (if it is declared a waste); or any other waste with similar radiological characteristics. Typical characteristics of HLW are thermal powers above about 2 kW/m^3 and long-lived radionuclide concentrations exceeding the limitations for short-lived waste
Radioactive waste	Waste that contains or is contaminated with radionuclides at concentrations or activities greater than clearance levels as established by the regulatory body.
Reprocessing	A process or operation, the purpose of which is to extract radioactive isotopes from spent nuclear fuel for further use.
Spent fuel	Nuclear fuel removed from a reactor following irradiation, which is no longer usable in its present form because of the depletion of fissile material, build-up of poison or radiation damage. Spent fuel is not classified as waste unless it is declared as such. Also referred to as used fuel.
Used fuel	Nuclear fuel removed from a reactor following irradiation, which is no longer usable in its present form because of depletion of fissile material, poison build-up or radiation damage, which is not yet declared as radioactive waste.

2.4 Abbreviations

Abbreviation	Explanation
CISF	Centralised Interim Storage Facility
DMRE	Department of Mineral Resources and Energy
HLW	High Level Waste
IAEA	International Atomic Energy Agency
LILW-SL	Low and Intermediate Level Waste – Short Lived
NNR	National Nuclear Regulator
NRWDI	National Radioactive Waste Disposal Institute
SFM	Spent Fuel Management

2.5 Roles and Responsibilities

Role	Responsibility
Chief Nuclear Officer	It is the accountability of the Chief Nuclear Officer to ensure that this strategy is adhered to uniformly across the business.
Senior Manager: Nuclear Fuel	It is the responsibility of the Senior Manager to: • Ensure that this strategy is implemented and applied uniformly across the business. • Ensure that this strategy is developed, reviewed and updated as and when necessary. • Compile and periodically review technical plans on SFM based on this strategy.

Role	Responsibility
Nuclear Power Station Managers, General Managers and Senior Managers	It is the responsibility of the Nuclear Power Station Managers, General Managers and Senior Managers to ensure that this strategy is adhered to within their respective areas.
Senior Manager: Nuclear Engineering	It is the responsibility of the General Manager: Nuclear Engineering to ensure that the Eskom nuclear plant decommissioning strategy is aligned with this strategy.
Senior Manager: Nuclear Project Management	It is the responsibility of the Senior Manager: Nuclear Project Management to: • Ensure that this strategy is aligned with projects.
Finance Business Partner	It is the responsibility of the Senior Manager: Finance to ensure that financial provision for SFM based on this strategy and associated technical plans are provided for in accordance with Eskom policies and procedures.

2.6 Process for Monitoring

Adherence to the strategy and awareness by Koeberg personnel will be monitored through regular audits and peer reviews.

2.7 Related/Supporting Documents

N/A

3. Koeberg Spent Fuel Management Strategy

3.1 Strategy Assumptions

This Strategy is based on the following assumptions:

- A minimum period of 10 years is required for the wet storage of spent nuclear fuel that has been discharged from the nuclear reactors in spent fuel pools. This is a conservative assumption and may be revised in future based on the dry storage technology to be deployed after wet storage.
- An on-site interim dry storage capacity will be established at reactor site as a buffer store for transferring spent nuclear fuel to an off-site national centralised interim storage facility (CISF).
- A CISF will be established and operated by the National Radioactive Waste Disposal Institute (NRWDI) by 2030.
- Before delivery of the spent nuclear fuel to the CISF, Eskom will declare the spent nuclear fuel as waste in accordance with the Radioactive Waste Management Policy and Strategy for the Republic of South Africa [2].
- Upon delivery to the CISF and acceptance by NRWDI, ownership and liability of the spent nuclear fuel will pass to NRWDI in accordance with [3].
- The spent nuclear fuel will be stored by NRWDI at the CISF until the spent nuclear fuel is encapsulated and disposed of in a deep underground repository.

- All spent nuclear fuel will be encapsulated in metallic disposal canisters at an encapsulation plant attached to the surface facilities of the repository. This will be the responsibility of NRWDI [3].
- The repository site selection, characterisation and confirmation, design, construction, commissioning, operation and eventual closure of the repository will be the responsibility of NRWDI.
- Eskom is financially responsible for the lifecycle management of radioactive waste generated at Koeberg.
- The national Radioactive Waste Management Policy and Strategy [2] makes provision for the establishment, via statute, of a state-owned Radioactive Waste Management Fund. Once the Radioactive Waste Management Fund is established, Eskom, together with other radioactive waste generators, will make contributions to this Fund in order to ensure that sufficient funds are available for the long-term management of radioactive waste generated.

3.2 Strategy Objectives

This Strategy, which combines the long-term storage and final disposal of spent nuclear fuel, aims to address the lifecycle management of spent nuclear fuel from Koeberg as follows:

- Store spent nuclear fuel in spent fuel pools at reactor site for a minimum period of 10 years; and dry storage on-site until transfer to the CISF.
- Transfer the spent nuclear fuel from 2030 onwards to the CISF for a period that will allow at least 50 years of cooling after discharge from the reactor before disposal. The Radioactive Waste Management Policy and Strategy for the Republic of South Africa allows for a dry-storage period of up to 100 years [2].
- Encapsulate and dispose of all spent nuclear fuel in a deep geological repository.

Alternative strategies, e.g. reprocessing and recycling, will be reviewed continually and implemented if and when desirable.

3.3 Implementation Process

The implementation process of the strategy is detailed in Figure 1.

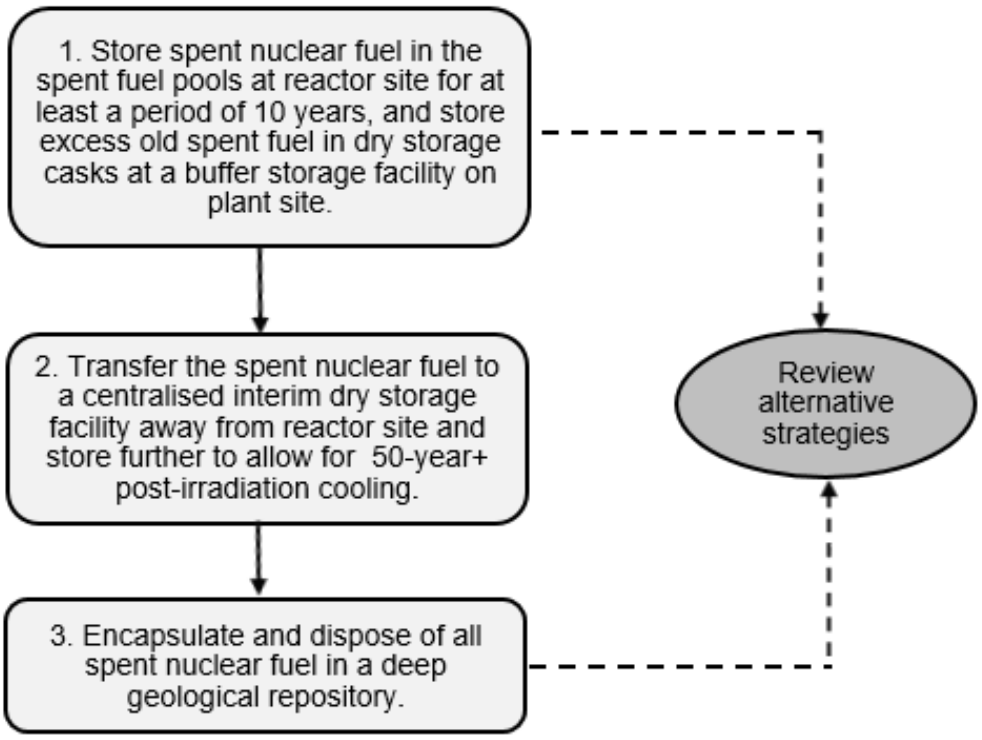

Figure 1: Implementation process of the spent fuel management strategy.

In order to realise this strategy, the following shall apply:

- Eskom will continue to monitor world practice and developments; and will document those factors from which it derives assurance that safe ultimate disposal of spent nuclear fuel and high level waste (HLW) is possible.
- Eskom will prepare technical and financial plans detailing, to the extent possible as they evolve, its plans for the long-term management of spent nuclear fuel. These plans will be reviewed and updated at intervals not exceeding three years.
- The Senior Manager (Nuclear Fuel) shall be accountable for the production of technical and financial plans for SFM. These shall be produced in consultation with Eskom stakeholders as necessary.
- The Finance Business Partner shall ensure that financial provision for SFM based on this strategy and its associated plans is provided for in accordance with Eskom policies and procedures.
- Statutory responsibility for the pre-disposal storage (CISF) and disposal of spent nuclear fuel and for the disposal of HLW rests with the Minister of Energy. Eskom will co-operate with the Minister, NRWDI, the National Nuclear Regulator (NNR) and other governmental departments and organisations, as appropriate, to assist in ensuring that suitable and cost-effective disposal methodologies and a suitable disposal site (or sites) is available when required.

- Until NRWDI establishes the CISF, Eskom will ensure the availability of safe transient interim storage facilities on site, approved by the NNR, to cover the period up to the commissioning of the CISF.
- Eskom will assist and co-operate with the Department of Mineral Resources and Energy (DMRE) in establishing a Radioactive Waste Management Fund, as envisaged in the national Radioactive Waste Management Policy and Strategy [2].
- Eskom will engage with the public and affected stakeholders during various stages of the SNF management process.
- The requirements of related Eskom directives and policies will be observed.

4. Acceptance

This document has been seen and accepted by:

Name	Designation
Sadika Touffie	Senior Manager: Nuclear Engineering
Nomawethu Mtwebana	Power Station General Manager (Acting): Koeberg Nuclear Power Station
Heinrich Kesonk	Senior Manager (Acting): Nuclear Fuel
Frikkie Ellis	Senior Manager: Nuclear Project Management
Michael Richardson	Senior Manager: FBC Nuclear
Steph Steyn	Corporate Specialist: Nuclear Fuel
Joan Mahlase	Technician: Nuclear Back-End Management

5. Revisions

Date	Rev.	Compiler	Remarks
March 2022	02	P Thauge	Second issue.
July 2019	01	P Thauge	First issue.

Appendix A: Koeberg Radioactive Waste Management Strategies

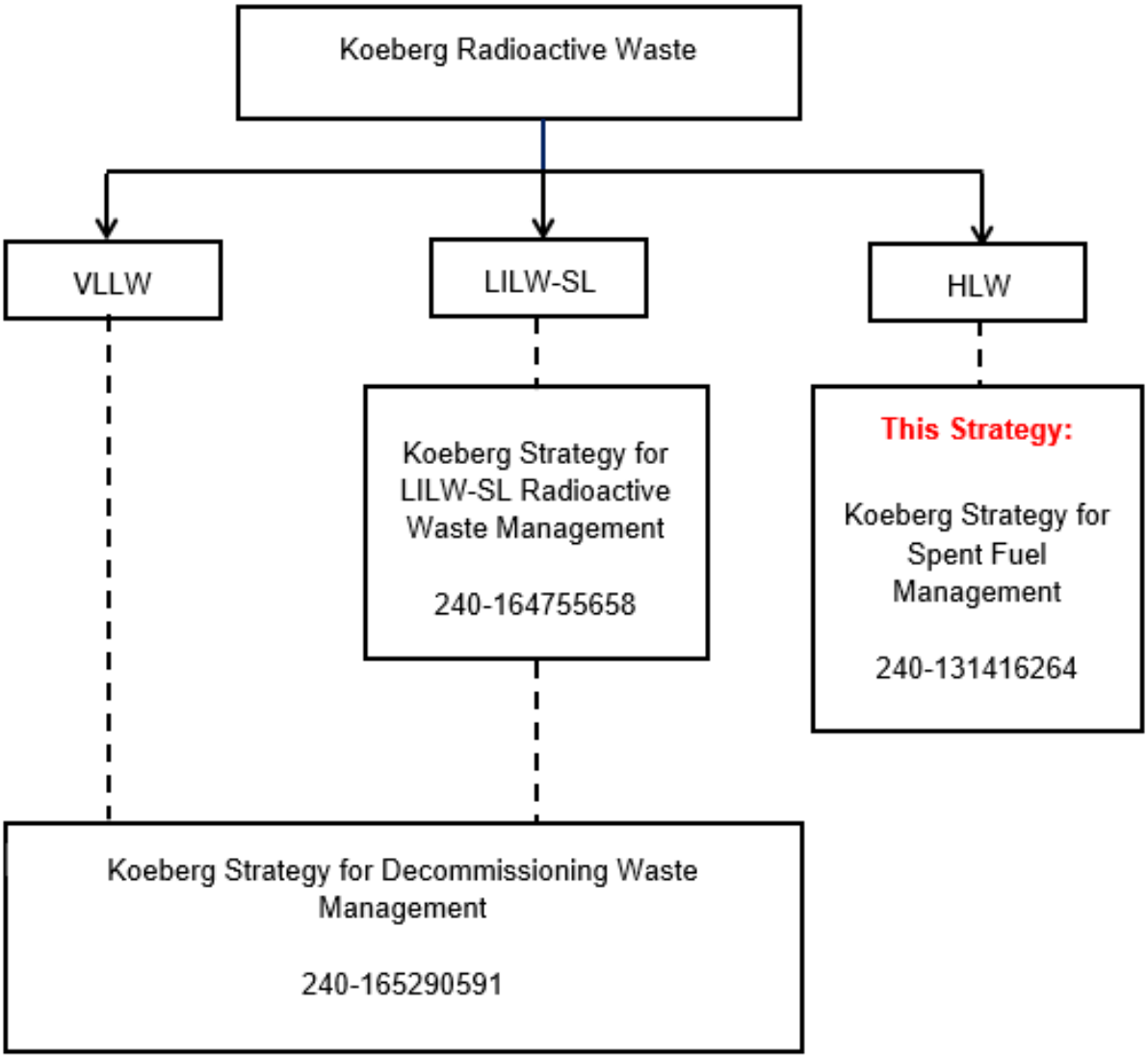

Figure A1: Overview of Koeberg Radioactive Waste Management Strategies.