Spent Fuel Storage
1st NNR Regulatory Information Conference

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How many tennis courts will be covered when placing all Koeberg’s spent FAs, generated by both units since 1984 (2 173 FAs), up-right next to one another?

Only

38%
Project Overview: Challenge

- **Transfer to Spent Fuel Pool**
  - Used Fuel removed from Koeberg Nuclear Reactors

- **Stored in Spent Fuel Pool**
  - Centralised Interim Storage Facility (Artist’s impression)

- **Transfer to On-site Cask Storage Building**
  - Onsite Cask Storage Building

- **Storage Casks transported to Onsite TSIF**
  - Onsite Transient Interim Storage Facility (Photo: Maine Yankee)

- **Onsite Transient Interim Storage Facility**
  - Offsite Transient Interim Storage Facility

- **Used Fuel removed from Koeberg Nuclear Reactors**

- **Transfer to Spent Fuel Pool**
  - Centralised Interim Storage Facility (Artist’s impression)

- **Onsite Transient Interim Storage Facility**
  - Offsite Transient Interim Storage Facility

- **Transfer to On-site Cask Storage Building**
  - Offsite Transient Interim Storage Facility

- **Storage Casks transported to Onsite TSIF**
  - Offsite Transient Interim Storage Facility

- **Onsite Cask Storage Building**
Project Overview: Challenge

Transport to CISF

Centralised Interim Storage Facility (Artist’s impression)

Transport to Reprocessing facility

Deep Geological Repository (Artist’s impression)

Onsite Transient Interim Storage Facility
(Photo: Maine Yankee)

Reprocessing Facility (Schematic)
Project Overview: Challenge

Eskom currently has 112 spent fuel assemblies in dry storage inside four Castor X/28F casks which are stored inside the Cask Storage Building (CSB) on the Koeberg Nuclear Power Station site.

Koeberg unit 1 and unit 2 will have filled its Spent Fuel Pool (SFP) by March 2018 (Outage 123) and September 2018 (Outage 223) respectively.

Additional storage space will be required to accommodate any further spent fuel assemblies generated during production.

If no additional storage space is created in the SFP’s, this would lead to the premature shutting down of Koeberg units 1 and 2.
Project Overview:
Spent nuclear fuel storage technologies considered

Dry Storage

Wet Storage

Conceptual Phase

Reprocessing of Spent Fuel
Project Overview: Spent nuclear fuel storage technologies considered

Metal Casks

Concrete Casks

Definition Phase (Dry Storage)

Concrete Modules

Photo Source: Onsite spent fuel metal casks storage system - GNS

Photo Source: Spent fuel horizontal concrete storage system - Areva

Photo Source: Spent fuel vertical concrete storage system – NAC International
**Project Introduction: Project Phases**

**Phase 1**
**Short Term**

- **Phase 1 A**
  - Procure 7 Metal casks
  - Modify CSB

- **Phase 1 B**
  License and use of spent fuel inserts in the spent fuel pools

- **Phase 1 C**
  - Procure 7 Metal casks

**Phase 2**
**Medium Term**

- Procure an additional 30 – 40 metal or concrete casks

**Phase 3**

- Establish TISF
Authorisation received from DoE:

- Onsite storage of spent fuel
- Transfer of spent fuel between SFP and storage facility
- Construction of TISF on the Koeberg site

National Nuclear Regulator

- Conditional concurrence from the National Nuclear Regulator of the Koeberg spent fuel storage strategy
- Licensing Framework approved
  - RD-0034
  - PP-0012
  - QCPs
  - Audits
**Project Overview: Status**

### Phase 1 (Short term)

- **Phase 1 A**
  - 7 Casks Before Outage x23
  - Contract placed with Holtec

- **Phase 1 B**
  - Spent Fuel Inserts
  - Negotiations in progress

- **Phase 1 C**
  - 7 Casks Before Outage x24
  - Contract placed with Holtec

### Phase 2 (metal or concrete casks)

- **6-7 Casks Before Outage x25**
  - 180 spent fuel assemblies

- **6-7 Casks Before Outage x26**
  - 200 spent fuel assemblies

- **6-7 Casks Before Outage x27**
  - 220 spent fuel assemblies

- **6-7 Casks Before Outage x28**
  - 180 spent fuel assemblies

### Phase 3 - TISF

- CSB floor excavation
- Artist’s impression
Phase 2
Possible technologies for dry storage systems

Metal Transport and Storage Casks

- AREVA's TN cask

Concrete Storage Casks

- Holtec's concrete casks

Concrete modular storage system

- AREVA's NUHOMS casking system
Metal cask (Chosen for Phase 1A)  
Spent fuel storage technology selected - Metal cask

Metallic Canister system

Photo Source: Holtec's used fuel dry-storage metal casks
Concrete cask
(Multi-purpose canister in concrete over pack)

Photo Source: NAC Magnastore concrete casks
Concrete modular storage system
(Multi-purpose canister in a concrete storage system)

AREVA’s NUHOMS casking system
Primary International Codes and Standards

- **IAEA TS-R-1 2005** (now known as SSR-6) - Regulations for the Safe Transport of Radioactive Material

- **NRC 10 CFR Part 71** - PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIAL

- **NRC 10 CFR Part 72** - LICENSING REQUIREMENTS FOR THE INDEPENDENT STORAGE OF SPENT NUCLEAR FUEL, HIGH-LEVEL RADIOACTIVE WASTE, AND REACTOR-RELATED GREATER THAN CLASS C WASTE

- **Design Code: Primarily ASME Section III**
Project Overview: Phase 3 - TISF site alternatives

- **Alternative 1**: Proposed haul route of casks to preferred site
- **Proposed haul route of casks common to both sites**
- **Proposed haul route of casks to alternate site**

Diagram showing the location of Alternative 1 and Alternative 2 relative to the TISF site.
TISF EIA process & timelines

Pre-Application Phase
- Pre-application consultation
  - Baseline studies
  - Compile Scoping Report

Scoping Phase
- Submit Application Form
- Release Scoping Report
- Submit Scoping Report
- Authority Acceptance

Impact Assessment Phase
- Release EIA Report and EMP
- Submit EIA Report and EMP

Authority Decision and Appeal Process
127 days

- 08-Oct-15 Release BID for I&AP
- 09-Nov-15 Public Comment Period
- 27-Oct-15 Public Open Day
- 25-Apr-16 Public Comment Period
- 08-Jul-16 Submit Application Form
- 21-Jul-16 Public Open Day
- 23-Aug-16 Submit Scoping Report
- 07-Oct-16 Authority Acceptance
- 25-Oct-16 Release EIA Report and EMP
- 18-Nov-16 Public Open Day
- 13-Feb-17 Submit EIA Report and EMP
- 31-May-17 Authority Decision
- 12-Sep-17 End of Appeal Process

We are here
Dose rate in context

Steel drum: 0.1 mSv/h average
Concrete drum: < 2 mSv/h average
Cask: 0.2 mSv/h average
Thank you