ANNEXURE A: LOCAL AND INTERNATIONAL STANDARDS

Reference	Title
NIL-01	Koeberg Nuclear Installation Licence, Variation 19, March 2019.
RD-014	Emergency Preparedness and Response Requirements for Nuclear Installations
RD-0022	Radiation Dose Limitation at Koeberg Power Station
RD-0024	Requirements on Risk Assessments and Compliance
RD-0025	Emergency Communication with the NNR
RD-0034	Quality and Safety Management Requirements for Nuclear Installations
LD-1000	Notification Requirements for Occurrences Associated with Koeberg Nuclear Power Station
LD-1012	Requirements in Respect of Proposed Modifications to the Koeberg Nuclear Power Station
LD-1077	Requirements for Medical and Psychological Surveillance and Control
LD-1079	Requirements in Respect of Licence Change Requests to the National Nuclear Regulator
LD-1081	Requirements for Operator Licence Holders at the Koeberg Nuclear Power Station
LD-1092	Requirements for Initial Operator Licensing at Koeberg Nuclear Power Station, with k10805
LD-1093	Requirements for the Full Scope Operator Training Simulator at Koeberg Nuclear Power Station
RG-0006	Guidance on Physical Protection Systems for Nuclear Facilities
RG-0007	Management of Safety
RG-0008	General Transport Guidance
RG-0011	Guidance on Siting
RG-0012	Guidance on Construction Management
RG-0013	Training and Recognition of Appointed Medical Practitioners
RG-0014	Guidance on Implementation of Cyber or Computer Security for Nuclear Facilities
RG-0015	Guidance on the Registration of Nuclear Power Plant Reactor Operators
RG-0016	Guidance on the Verification and Validation of Evaluation and Calculation Models used in Safety and Design Analyses
RG-0017	National Dose Register
RG-0019	Guidance on the Safety Assessment of Nuclear Facilities
RG-0020	EPR Nuclear and Radiological Emergencies
RG-0021	Security during Transport (This is referenced in KLBM comments but not on website yet)

RG-0023	Conduct and Re-registration of NPP Operators
RG-0027	Ageing Management and Long-Term Operations Of Nuclear Power Plants
RG-0028	Periodic Safety Review of Nuclear Power Plants
LG-1041	Licensing Guide on Safety Assessments of Nuclear Power Reactors
LG-1045	Guidance for Licensing Submissions involving Computer Software and Evaluation Models for Safety Calculations
PP-0008	Design Authorisation Framework
PP-0009	Authorisations for Nuclear Installations
PP-0012	Manufacturing
PP-0014	External Events for Nuclear Installations
PP-0015	Emergency Technical basis for New Nuclear Installations P1 and P2
PP-0016	Conformity Assessment Framework in South Africa
PP-0017	Design and Implementation of Digital Instrumentation and Control for Nuclear Installations

Reference	Title	Issued
SF-1	Fundamental Safety Principles	(2006)
GSR Part 1 (R1)	Governmental, Legal and Regulatory Framework for Safety	(2016)
GSR Part 2	Leadership and Management for Safety	(2016)
GSR Part 3	Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards	(2014)
GSR Part 4 (R1)	Safety Assessment for Facilities and Activities	(2016)
GSR Part 5	Predisposal Management of Radioactive Waste	(2009)
GSR Part 6	Decommissioning of Facilities	(2014)
GSR Part 7	Preparedness and Response for a Nuclear or Radiological Emergency	(2015)
GSG-12	Organization, Management and Staffing of the Regulatory Body for Safety	(2018)
GSG-13	Functions and Processes of the Regulatory Body for Safety	(2018)
GS-G-2.1	Arrangements for Preparedness for a Nuclear or Radiological Emergency	(2007)
GSG-2	Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency	(2011)

GS-G-3.1	Application of the Management System for Facilities and Activities	(2006)
GS-G-3.3	The Management System for the Processing, Handling and Storage of Radioactive Waste	(2008)
GSG-1	Classification of Radioactive Waste	(2009)
GSG-3	The Safety Case and Safety Assessment for the Predisposal Management of Radioactive Waste	(2013)
RS-G-1.8	Environmental and Source Monitoring for Purposes of Radiation Protection	(2005)
RS-G-1.9	Categorization of Radioactive Sources	(2005)
GSG-9	Regulatory Control of Radioactive Discharges to the Environment	(2018)
WS-G-3.1	Remediation Process for Areas Affected by Past Activities and Accidents	(2007)
WS-G-5.2	Safety Assessment for the decommissioning of Facilities using Radioactive Material	(2008)
WS-G-6.1	Storage of Radioactive Waste	(2006)
GSG-5	Justification of Practices, Including Non-Medical Human Imaging	(2014)
GSG-6	Communication and Consultation with Interested Parties by the Regulatory Body	(2017)
GSG-7	Occupational Radiation Protection	(2018)
GSG-11	Arrangements for the Termination of a Nuclear of Radiological Emergency	(2018)
GSG-8	Radiation Protection of the Public and the Environment	(2018)
GSG-10	Prospective Radiological Environmental Impact Assessment for Facilities and Activities	(2018)
SSR-1	Site Evaluation for Nuclear Installations	(2019)
SSR-2/1 (R1)	Safety of Nuclear Power Plants: Design	(2016)
SSR-2/2 (R1)	Safety of Nuclear Power Plants: Commissioning and Operation	(2016)
GS-G-3.5	The Management System for Nuclear Installations	(2009)
GS-G-4.1	Format and Content of the Safety Analysis report for Nuclear Power Plants	(2004)
SSG-30	Safety Classification of Structures, Systems and Components in Nuclear Power Plants	(2014)

SSG-39	Design of Instrumentation and Control Systems for Nuclear Power Plants	(2016)
NS-G-1.4	Design of Fuel Handling and Storage Systems for Nuclear Power Plants	(2003)
NS-G-1.5	External Events Excluding Earthquakes in the Design of Nuclear Power Plants	(2003)
NS-G-1.6	Seismic Design and Qualification for Nuclear Power Plants	(2003)
NS-G-1.7	Protection against Internal Fires and Explosions in the Design of Nuclear Power Plants	(2004)
SSG-34	Design of Electrical Power Systems for Nuclear Power Plants	(2016)
NS-G-1.9	Design of the Reactor Coolant System and Associated Systems in Nuclear Power Plants	(2004)
NS-G-1.10	Design of Reactor Containment Systems for Nuclear Power Plants	(2004)
NS-G-1.11	Protection against Internal Hazards other than Fires and Explosions in the Design of Nuclear Power Plants	(2004)
NS-G-1.12	Design of the Reactor Core for Nuclear Power Plants	(2005)
NS-G-1.13	Radiation Protection Aspects of Design for Nuclear Power Plants	(2005)
NS-G-2.1	Fire Safety in the Operation of Nuclear Power Plants	(2000)
NS-G-2.2	Operational limits and Conditions and Operating Procedures for Nuclear Power Plants	(2000)
NS-G-2.3	Modifications to Nuclear Power Plants	(2001)
NS-G-2.4	The Operating Organization for Nuclear Power Plants	(2001)
NS-G-2.5	Core Management and Fuel Handling for Nuclear Power Plants	(2002)
NS-G-2.6	Maintenance, Surveillance, and In-Service Inspection in Nuclear Power Plants	(2002)
SSG-40	Predisposal Management of Radioactive Waste from Nuclear Power Plants and Research Reactors	(2016)
SSG-41	Predisposal Management of Radioactive Waste from Nuclear Fuel Cycle Facilities	(2016)
NS-G-2.8	Recruitment, Qualification and Training of Personnel for Nuclear Power Plants	(2002)
SSG-38	Construction for Nuclear Installations	(2015)
SSG-28	Commissioning for Nuclear Power Plants	(2014)
SSG-25	Periodic Safety Review for Nuclear Power Plants	(2013)
SSG-50	Operating Experience Feedback for Nuclear Installations	(2018)

SSG-48	Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants	(2018)
NS-G-2.13	Evaluation of Seismic Safety for Existing Nuclear Installations	(2009)
NS-G-2.14	Conduct of Operations at Nuclear Power Plants	(2008)
SSG-54	Accident Management Programmes for Nuclear Power Plants	(2019)
SSG-13	Chemistry Programme for Water Cooled Nuclear Power Plants	(2011)
NS-G-3.1	External Human Induced Events in Site Evaluation for Nuclear Power Plants	(2002)
NS-G-3.2	Dispersion of Radioactive Material in Air and Water and Consideration of Population Distribution in Site Evaluation for Nuclear Power Plants	(2002) (under revision)
SSG-9	Seismic Hazards in Site Evaluation for Nuclear Installations	(2010)
SSG-18	Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations	(2011)
SSG-21	Volcanic Hazards in Site Evaluation for Nuclear Installations	(2012)
SSG-35	Site Survey and Site Selection for Nuclear Installations	(2015)
NS-G-3.6	Geotechnical Aspects of Site Evaluation and Foundations for Nuclear Power Plants	(2005)
SSG-2 (R1)	Deterministic Safety Analysis for Nuclear Power Plants	(2019)
SSG-51	Human Factors Engineering in the Design of Nuclear Power Plants	(2019)
SSR-6 (R1)	Regulations for the Safe Transport of Radioactive Material	(2018 Edition)
SSG-26	Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material	(2014)
TS-G-1.2	Planning and Preparing for Emergency Response to Transport Accidents Involving Radioactive Material	(2002)
TS-G-1.3	Radiation Protection Programmes for the Transport of Radioactive Material	(2007)
TS-G-1.4	The Management System for the Safe Transport of Radioactive Material	(2008)
TS-G-1.5	Compliance Assurance for the Safe Transport of Radioactive Material	(2009)
SSG-33	Schedules of Provisions of the IAEA Regulations for the Safe Transport of Radioactive Material (2012 Edition)	(2015)
SSG-27	Criticality Safety in the Handling of Fissile Material	(2014)

ANNEXURE B: IGALL TLAA COMPLIANCE

IGALL TLAA list SRS-82 - 2018 (PWR)	Final AM report	L1124-GN-RPT-028	NNR confirmation
TLAA101 Low-Cycle Fatigue Usage	X	X	Confirmed
TLAA102 RPV Neutron Embrittlement	X	X	Confirmed
TLAA103 Crack Growth Analyses for Flaws Detected in Service	X	X	Confirmed
TLAA104 Corrosion Allowances	X	X	Confirmed
TLAA106 Environmentally Assisted Fatigue	X	X	Confirmed
TLAA107 High-cycle Fatigue for Steam Generator Tubes	X	X	Confirmed
TLAA108 Fatigue of Cranes	X	X	Confirmed
TLAA109 PWR RPV Internals Swelling	X	X	Confirmed
TLAA110 Thermal Ageing of Cast Austenitic Stainless Steels	X	X	Confirmed
TLAA112 Main Circulation Pump Flywheel	X	X	Confirmed
TLAA113 Thermal Stratification	Not applicable	Not applicable	Confirmed
TLAA114 Flaw Tolerance Calculation due to Thermal Ageing and Fatigue	Not applicable	Not applicable	Confirmed
TLAA115 Fatigue and Thermal Ageing Analysis of Manufacturing Flaws	X	X	Confirmed
TLAA116 Thermal Ageing of Low Alloy Steels	X	X	Confirmed
TLAA117 Underclad Cracking	X	X	Confirmed

TLAA118 Components with Undocumented Restrictions that have no Documented Safety Analyses	X	Justified as not applicable	Confirmed
TLAA119 High-Cycle Thermal Fatigue	X	Justified as not applicable	Confirmed
TLAA120 PWR RPV Internals Vibrations	X	X	Confirmed
TLAA121 IASCC Fluence Limit for Stainless Steel	X	X	Confirmed
TLAA122 Thermal Ageing of Martensitic Stainless Steels	X	Justified as not applicable	Confirmed
TLAA201 Environmental Qualification of Electrical and I&C Components	X	X	Confirmed
TLAA301 Concrete Containment Tendon Prestress	X	X	Confirmed
TLAA302 Effects of Creep and Shrinkage on Performance of Concrete Structures	Justified as not applicable under TLAA 304	Not applicable	Confirmed
TLAA303 Cumulative Fatigue Damage of Containment Liners and Penetrations	X	X	Confirmed
TLAA304 Foundation Settlement Due to Soil Movement	X	X	Confirmed

ANNEXURE C: ASSESSMENT OF COMPLIANCE WITH LTO REGULATION

Regulation 4 (a) Safety case for long term operation

- **Requirement**

The safety case for Long Term Operation shall demonstrate compliance with relevant regulatory safety criteria and requirements.

- **Assessment of Compliance**

The safety case demonstrated the extent of compliance with the NNR Dose Limits, Risk Limits, LTO regulations, conditions in NIL-01 and followed the guidance provided in RG-0027 and RG-0028.

The information is predominantly contained in Section 9.2 Compliance with Safety Criteria and Requirements and extracted information from the PSR where the verification of compliance with the safety criteria and requirements are concluded.

The compliance with radiological risks limits is confirmed with reference to the station risk profile, updated to reflect latest modifications, updated source terms methodology and with information from updated accident analyses.

- **Assessment Outcome 1**

The application was verified to be compliant with regulation 4(a) as it was demonstrated in the safety case that there is for the period of LTO compliance with relevant regulatory safety criteria and requirements.

Regulation 4 (b) Safety case for long term operation

- **Requirement**

The safety case for Long Term Operation shall be prepared using the results of safety analyses, with due consideration of the ageing of structures, systems and components and the periodic safety review.

- **Assessment of Compliance**

The structure and content of the safety case was accepted by the NNR prior to the drafting of

the safety case by Eskom. The pre-approved structure contained as a minimum information related to safety analyses, ageing and periodic safety review. The submitted safety case integrates information and results from the major areas depicted below that envelope the minimum information required:

Major Modifications	Ageing Management	Safety Assessments (SALTO)	Periodic Safety Review	Other Inputs
• PTR Tank • RPVH • SGR • Fukushima Mods • Containment • SFSP	• Scoping • AMR's • AMP's	• Revalidation of TLAA's • TLAA re-analyses • Programme and systems update	• Review of EPTB • SSHAC • 14 Safety Factors • Improvement Plans	• Review of Safety Related Programmes • Waste Management

- **Assessment Outcome 2**

The application was verified to be compliant with regulation 4(b) as it was prepared using the results of safety analyses with due consideration of the ageing of SSC's and 3rd PSR results.

Regulation 4 (c) Safety case for long term operation

- **Requirement**

The safety case for Long Term Operation shall provide an overall assessment of the safety of the nuclear installation and justification for continued safe operation for the intended period of Long-Term Operation

- **Assessment of Compliance**

The safety case information presented demonstrated that KNPS can continue to operate safely. This conclusion is based on the outcome of the PSR global assessment and suitability for continued operation. The information used to provide such demonstration is predominantly contained and summarised in Section 10.0 "Why it is Safe to Continue Operation (Overall Assessment for Additional 20 Years)".

The information credited to formulate the overall assessment is obtained from the 3rd PSR, SALTO assessments, KNPS design, demonstrated management of ageing, adequacy of operational programmes, impact from external hazards, adequacy of emergency planning, availability of resources, knowledge management and mature integrated management system.

- **Assessment Outcome 3**

The application is compliant with regulation 4(c) as it was verified that the safety case provides an overall assessment of the safety of the nuclear installation and justification for continued safe operation for the intended period of Long-Term Operation.

Regulation 4 (d) Safety case for long term operation

- **Requirement**

The safety case for Long Term Operation shall demonstrate availability of financial and human resources as well as knowledge management for the period of Long-Term Operation, which knowledge management shall include an integrated, systematic approach to identifying, managing and sharing an organisation's knowledge and enabling groups of people to collectively create new knowledge to help achieve the organisation's objectives.

- **Assessment of Compliance**

The intention of the LTO safety case is to demonstrate that organisational provisions is adequate to support the extended period of LTO. These include aspects of policies, human resources, competency management, knowledge management and financial resources. New policies were drafted for the period of LTO, this ensures the correct placement and alignment of the organisation to support the management of ageing. It also lays the groundwork for the establishment of the resource needs for the period of LTO.

The availability of financial and human resources for the period of LTO is demonstrated through safety case information contained and referenced in the safety case sections related to Plant Life Extension Feasibility Study (7.1), Organisational Provisions for Long Term Operation (9.7.5) and Arrangements for Financial Resources (9.7.5.6).

The periodic safety review under SF-10 evaluated whether existing policies and business objectives are adequate and are implemented in a safe and effective manner. Whether the

existing organisation, management system, and safety culture meet current requirements, and that they are adequate and effective for ensuring the safe operation of the KNPS. None of the deviations identified were of such a nature that it dispositions the conclusions in the LTO safety case regarding the adequacy of the programme. The NNR review of the 3rd PSR results did not identify any other issues that changes these arguments presented in the safety case. The NNR consider the current organisational provisions adequate to support the period of LTO.

In addition, the SALTO peer review scrutinised human resources from the point of continued management of ageing for the period of LTO.

Knowledge management for the period of LTO is demonstrated through the information in safety case section related to Knowledge Management (9.7.5.5).

The SALTO peer review did identify a weakness in knowledge management. There have been various initiatives implemented to ensure the integrity of identifying, capturing, evaluating, retrieving, and sharing relevant Koeberg information assets (such as databases, documents, policies, procedures, and previously uncaptured expertise and experiences from individual workers). The implementation of the initiatives as committed to be completed by July 2024 has been verified as completed.

- **Assessment Outcome 4**

The application is compliant with regulation 4(d) as it was demonstrated that there is management of financial and human resources as well as knowledge management processes in place.

Regulation 4 (e) Safety case for long term operation

- **Requirement**

The safety case for Long Term Operation shall identify necessary safety improvements which may include, but are not limited to, refurbishment, provision of additional structures, systems and components and additional safety analyses and engineering justifications, to ensure that the licensing basis remains valid during the period of Long-Term Operation.

- **Assessment of Compliance**

The safety case identified safety improvements from the outcome of the 3rd PSR safety factor

reviews and conclusion of the global assessment. The validity of the current licensing basis is confirmed and where gaps have been identified, actions to be taken is documented in the 3rd PSR integrated implementation plan (IIP) and the LTO integrated implementation plan, documented and referenced in the safety case in the sections related to Summary of the 3rd PSR (9.1), 3rd PSR Safety Improvements (9.1.3) and Long-Term Operation Integrated Implementation Plan (14).

The 3rd PSR also provided information of operational experience feedback, research activities and KNPS improvements, documented and referenced in the sections related to Specific Site Characteristics (9.3), PWR Design Features (9.4.2), Incorporation of Operating Experience for Continuous Improvement of KNPS Safety (9.8) and Long-Term Operation Integrated Implementation Plan (14).

The resultant list of safety related modifications or improvements for LTO is included in the safety case. The applicant will be directed to implement all IIP commitments.

- **Assessment Outcome 5**

The application was verified to be compliant with regulation 4(e) as it was verified that the safety case identified safety improvements which may include, but are not limited to, refurbishment, provision of additional structures, systems and components and additional safety analyses and engineering justifications, to ensure that the licensing basis remains valid during the period of Long-Term Operation.

Eskom is required to implement the safety improvements if the LTO application is granted in accordance with an agreed timeframes commensurate with the importance to safety.

Regulation 5 (a) Factors related to safety related programmes.

- **Requirement**

Factors to be considered in evaluating an application for Long Term Operation will include the safety related programmes relevant for ensuring the safe Long-Term Operation of the nuclear installation beyond the timeframe established by the current licensing basis or the nuclear installation licence.

- **Assessment of Compliance**

The safety case demonstrated that safety related programmes have been evaluated and it was found to be adequate. These safety related programmes include Maintenance, Equipment Qualification, In Service Inspection, Surveillance, Chemistry, Compliance Assurance Programmes. This is demonstrated and referenced in the safety case in the sections related to Summary of the 3rd PSR (9.1), Ageing Management Risk Items (9.5.2), Ageing Management of SSCs Supporting Licence Binding Programmes (9.5.3) and Incorporation of Experience for Continuous Improvement of Plant Safety (9.8).

Other operational safety related programmes evaluated are covered in the safety case in the sections related to Impact of Long-Term Operation on Nuclear Security (9.7.1), Impact of Long-Term Operation on Emergency Planning (9.7.2), Impact of Long-Term Operation on Radioactive Waste Management (9.7.3), Impact of Long-Term Operation on the Environment (9.7.4) and Organisational Provisions for Long-Term Operation (9.7.5).

- **Assessment Outcome 6**

The application was verified to be compliant with regulation 5(a) as it includes and evaluates programmes relevant for ensuring the safe Long-Term Operation of the nuclear installation beyond the timeframe established by the current licensing basis or the nuclear installation licence.

Regulation 5 (b) Factors related to effectiveness of the ageing management programme.

- **Requirement**

Factors to be considered in evaluating an application for Long Term Operation will include the effectiveness of the ageing management programme necessary for ensuring that required safety functions of structures, systems and components are fulfilled over the period of Long-Term Operation of the nuclear installation.

- **Assessment of Compliance**

The adequacy and effectiveness of the ageing management programme necessary stems predominantly from the established organisational structures, processes, standards and individual programmes targeting known degradation or ageing mechanisms. This includes components known with time limited restrictions.

The establishment, integrity of and maintaining of the ageing management programme is the major component of the IAEA SALTO methodology. Measuring effectiveness is based on ensuring that the measures from the IAEA SALTO methodology are entrenched in the station processes, implemented in compliance with the standards adopted and that the results obtained provide credible indications. For LTO it is necessary to ensure that all aspects of the newly established ageing management programme are in place, and it can be demonstrated that the previous programmes were effective in managing KNPS ageing.

The safety case demonstrated that an adequate ageing management programme exists and are implemented in the safety case sections related to Summary of the 3rd PSR (9.1), Ageing Management for Long Term Operation (9.5), Ageing Management Programmes (9.8.3) and Long-Term Operation Integrated Implementation Plan (14).

The SALTO mission and the establishment of an ageing management programme in accordance with the IAEA and NNR guidance were systematically implemented. The results of the various evaluations successfully demonstrated that the safety functions of SSCs are ensured.

- **Assessment Outcome 7**

The application was verified to be compliant with regulation 5(b) related to demonstrating the effectiveness of the ageing management programme necessary for ensuring that required safety functions of structures, systems and components are fulfilled over the period of Long-Term Operation of the nuclear installation.

Regulation 5 (c) Factors related to revalidation of the time limited ageing analyses.

- **Requirement**

Factors to be considered in evaluating an application for Long Term Operation will include the revalidation of the time limited ageing analyses to ensure continued acceptability of the analysed structures, systems or components for the planned period of Long-Term Operation

- **Assessment of Compliance**

TLAAs are plant-specific safety analysis in the plant design basis that considers time and ageing of the SSCs within the scope of ageing management. These time limited assumptions

are typically based on an initially assumed period of operation and/or anticipated operational transients, design considerations, or license terms.

The revalidation process of SSCs within the scope of ageing management for which the plant specific safety analyses consider time and ageing was performed as part of the SALTO process and where appropriate the SGR analyses were credited.

Where original analyses exist, these were studied and where possible, their TLAAs were re-validated and justified for 60 years. The TLAAs that were identified but not re-validated for 60 years were recommended for creation, analysis, or re-analysis. In some cases where revalidation was not possible the process of replacement was initiated.

The safety case demonstrated the acceptability of the analysed SSCs for the planned period of Long-Term Operation through information contained and referenced in the sections related to Outcomes of the Safety Factor Reviews (9.1.1), Ageing Analyses in Design (9.4.6.4), Ageing Management for Long-Term Operation (9.5), Time Limited Ageing Analyses (TLAAs) (9.5.1.4) and Long-Term Operation Integrated Implementation Plan (Section 14).

TLAA 301 related to the adequacy of the revalidation of containment tendon prestress on both units initiated multiple review comments. The majority related to the possible limitation and restrictions in the dome portion of containment. For the final review conclusion, Figure 1, depicting a summary of the results for TLAA-301 has reference:

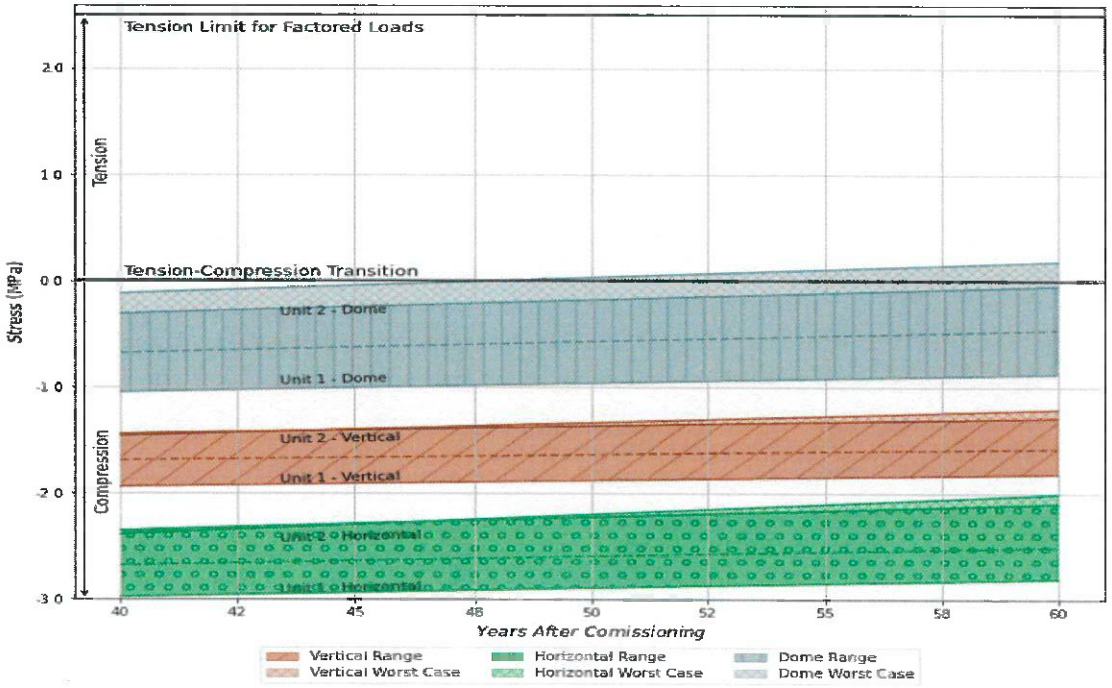


Figure 1: Summary of TLAA Results

As shown in the graph above, the results from the Eskom review identified that safety criteria are met for the different parts of containment and for the containment dome. Safety criteria are however marginally met with very little or no safety margin at 60 years for Unit 2. The calculations performed by Eskom relied on limited quality data as the data originated from the limitation of the monitoring technology available and applicable at the time of design and construction. The data limitations including inconsistencies and gaps prompted Eskom to rely on engineering judgement and data analysis to re-interpret the data. These methods introduced discretionary criteria that are not part of surveillance procedures.

The quality of the data used has a direct influence on the evaluation performed by the NNR and the determination of whether TLAA 301 is validated. Accordingly, this is considered when performing the safety evaluation. The quality of the data used as well as the fact that the structural safety margins for the dome have been eroded to the minimum leads the NNR to arrive at a review conclusion that the safety of the containment building is not fully demonstrated for Unit 2 for the period of LTO. The complete absence of dome data for Unit 2 and the use of dome data for Unit 1 introduced discretionary criteria and interpretation by Eskom. However, the NNR have concluded that from the margins shown in Figure 1 above, there is assurance that TLAA 301 was validated for the containment building of Unit 1,

considering the uncertainties introduced through data analysis and use of engineering judgement.

For the containment building of Unit 2, the margins shown in Figure 1 above, does not provide assurance that TLAA 301 was validated for the complete period of LTO but only for a period of 8 years, considering worst case scenarios, assumptions, uncertainties introduced through data analysis and use of engineering judgement.

This leads to the overall NNR conclusion that TLAA 301 is fully validated for Unit 1 for the proposed 20 years and for Unit 2 for 8 years.

- **Assessment Outcome 8**

The application was verified to be compliant with regulation 5(c) related to the revalidation of time limited ageing analyses for the respective TLAAs for 20 years on Unit 1 and 8 years for Unit 2.

Regulation 5 (d) Factors related to utilisation of the results of the periodic safety review.

- **Requirement**

Factors to be considered in evaluating an application for Long Term Operation will include the utilisation of the results of the periodic safety review to justify Long Term Operation of the nuclear installation.

- **Assessment of Compliance**

The results of the 3rd PSR are contained in the PSR Global assessment report. Deviations have been appropriately graded and identified for resolution prior to the next PSR. The results are integrated throughout the safety case where individual SF review results as well as results from the global assessment were referenced or used to argue or justify LTO.

The 3rd PSR results presented in the global assessment report and the submitted integrated implementation plan were reviewed and there have been no comments generated that invalidate the deviations and conclusions from both the individual SF review reports and the global assessment report. The integrity of the results from the 3rd PSR may therefore be credited or used in the justifications presented in the LTO safety case.

- **Assessment Outcome 9**

The application was verified to be compliant with regulation 5(d) relayed to the utilisation of the results of the periodic safety review to justify Long Term Operation of the nuclear installation.

Regulation 6 (1) Programme for long term operation

- **Requirement**

The licensee shall ensure that an effective ageing management programme is developed, implemented and maintained to ensure that required safety functions of structures, systems and components are fulfilled over the entire operating lifetime of the nuclear installation.

- **Assessment of Compliance**

The ageing management review (AMR) for in-scope SSCs (commodity groups and stand-alone items) was performed by Eskom to demonstrate that ageing management at KNPS is comprehensive and that ageing concerns are effectively managed so that the intended

function(s) of the SSCs is maintained for the period of extended operation through LTO. The ageing management evaluation methodology used to perform the AMR was approved by the NNR and systematically assessed the ageing effects and their related degradation mechanisms that are experienced or are anticipated for specific commodity groups and SSCs.

The outcome of the reviews culminated into:

- Development of new AMP's and the identified outstanding ones are tracked in the SC commitments.
- Update of existing AMP's and the identified outstanding ones are tracked in the SC commitments.
- Performance of one-time inspections were identified, and the outstanding ones are tracked in the SC commitments

The ageing management evaluation reports for Mechanical, Electrical and Civil SSCs concluded that there are gaps in the current ageing management programmes at KNPS, however the assessment did not identify any ageing concerns that would prevent the plant from safely operating into LTO. The effectiveness of the existing plant programmes to manage the identified ageing degradations and their adequacy for LTO was confirmed.

This position was also reflected in the results of the IAEA SALTO peer review.

- **Assessment Outcome 10**

The application was verified to be compliant with regulation 6(1) related to the is development, implementation and maintenance of an effective ageing management programme to ensure that required safety functions of structures, systems and components are fulfilled over the entire operating lifetime of the nuclear installation.

Regulation 6 (2) Programme for long term operation

- **Requirement**

The licensee shall conduct systematic periodic safety reviews of the nuclear installation throughout its operational lifetime, taking into account the actual status of the facility, including the consequences of the cumulative effects of ageing and modifications to the facility, the operating experience and significant new safety information from relevant sources.

- **Assessment of Compliance**

Historically and prior to the establishment of the new regulatory framework for LTO Koeberg conducted safety re-assessments (SRA) under the umbrella of PSR. The first SRA was performed in 1998 and the second in 2011. The 3rd PSR coincided with the pursuit of LTO and the objectives were to demonstrate the extent to which the facility conforms to modern codes, standards, and practices, to ensure that the currently adopted codes, standards and practices, are not obsolete and do not pose nuclear safety risk to the facility for the period of LTO.

The 3rd PSR review was conducted against the national nuclear safety and radiation protection requirements, as stipulated in the relevant acts, associated nuclear regulations, NNR licensing and regulator directives, and Koeberg's Nuclear Installation License.

The review was used to identify any deviations to existing regulations and safety standards. The review was also used to identify changes in any high-level design codes and standards when KNPS was constructed (and/or modified), to the latest revision or equivalent nuclear design codes and standards and other international standards organisations including, but not limited to ANS, ASME, IEEE, IEC, WANO, US-NRC, and INPO on which the current KNPS design and/or operation is based. The review against local SANS standards and other standards was limited to those standards incorporated into the national regulations that are applicable to the nuclear safety at KNPS. An assessment of the Occupational Health and Safety Act regulations and the National Environmental Management Act regulations was conducted.

As per the guidance in RG-0028 the NNR accepted the PSR basis and methodology for the performance of the 3rd PSR. This included the list of standards and requirements applicable to the review. Any issues identified with regards the non-conformance to any of the standards is documented as a deviation and appropriately graded and evaluated during the Global Assessment review. The outcome forms part of the PSR final report that is an integral part of the Safety Case.

Following the Fukushima Daiichi accident Koeberg also performed a safety assessment with a scope limited to extreme external events.

- **Assessment Outcome 11**

The application has been verified to be compliant with regulation 6(2) as systematic periodic safety reviews of the nuclear installation were conducted throughout its operational lifetime, taking into account the actual status of the facility, including the consequences of the cumulative effects of ageing and modifications to the facility, the operating experience and significant new safety information from relevant sources.

Regulation 6 (3) Programme for long term operation

- **Requirement**

The licensee shall develop and implement a comprehensive programme for ensuring the safe Long-Term Operation of the nuclear installation beyond the timeframe established by the design limits in the current licensing basis or the nuclear installation licence.

- **Assessment of Compliance**

Eskom programme for LTO contains the elements of SALTO as provided for in RG-0027. The programme was supported by a LTO licensing framework and a subsequent Eskom LTO project plan, used to track and monitor implementation of the programme.

It must be noted that the LTO programme is essentially the IAEA SALTO process with an added full scope PSR. The programme was accepted by the NNR and includes the following elements:

(1) Pre-LTO feasibility study
(2) Evaluation of KNPS documentation and programmes relevant to LTO
(3) Scope setting for LTO
(4) Review of KNPS programmes for LTO
(5) Ageing Management review for LTO
(6) Revalidation of time limited ageing analyses
(7) LTO documentation, other regulatory requirements, i.e. PSR

- **Assessment Outcome 12**

The application is deemed compliant with regulation 6(3) as it was verified that a comprehensive programme for ensuring the safe Long-Term Operation of the nuclear installation beyond the timeframe established by the design limits in the current licensing basis or the nuclear installation licence was developed and implemented.

Regulation 6 (4)(a) Programme for long term operation

- **Requirement**

The comprehensive programme for Long Term Operation shall address relevant plant documentation and safety related programmes.

- **Assessment of Compliance**

The programme was accepted by the NNR and it was verified that it contains KNPS documentation and covers safety related programmes. Updating KNPS documentation is essential for the maintenance of KNPS configuration and to ensure that the design and licencing basis documents are kept current with necessary updates from the SALTO and/or 3rd PSR review. Where required KNPS documentation was updated, it includes the SAR, OTS, SRSM, Maintenance procedures, new AMP's, update AMP's, new standards, new programmes etc. Essentially all KNPS documents were affected.

The intent of the requirement was to ensure that ageing management is correctly incorporated into all KNPS documentation and that the effect on safety related programmes have been evaluated.

Both safety related programmes as well as operational safety related programmes are covered by the LTO programme.

- **Assessment Outcome 13**

The application has been verified to be compliant with regulation 6(4)a as it was verified that relevant plant documentation and safety related programmes are addressed.

Regulation 6 (4)(b) Programme for long term operation

- **Requirement**

The comprehensive programme for Long Term Operation shall consider the relevant scope of systems, structures and components important to Long Term Operation that must be agreed and approved by the Regulator.

- **Assessment of Compliance**

The SALTO scoping methodology documents the Eskom scope setting methodology required to meet the regulatory scope setting expectations. The methodology was initially developed based on the IAEA SALTO guidance and following the issuance of the interim guidance RG0027 the methodology was reviewed and updated to ensure alignment with the guidance in RG-0027.

The scoping methodology is the cornerstone of the ageing management process, and it was reviewed and accepted by the NNR.

- **Assessment Outcome 14**

The application has been verified to be compliant with regulation 6(4)b as the relevant scope of systems, structures and components important to Long Term Operation was agreed and approved by the NNR.

Regulation 6 (4)(c) Programme for long term operation

- **Requirement**

The comprehensive programme for Long Term Operation shall address the review of nuclear installation safety related programmes for Long Term Operation.

- **Assessment of Compliance**

The programme was accepted by the NNR and it was verified that it covers safety related programmes. The extent of the safety related programmes to be reviewed was documented in the structure and content of the safety case.

The structure and content for the safety case was accepted by the regulator.

- **Assessment Outcome 15**

The application has been verified to be compliant with regulation 6(4)c as it has a programme for Long Term Operation addressing the review of nuclear installation safety related programmes for Long Term Operation.

Regulation 6 (4)(d) Programme for long term operation

- **Requirement**

The comprehensive programme for Long Term Operation shall address ageing management review for Long Term Operation, including the review of existing ageing management programmes and development of new ageing management programmes as necessary.

- **Assessment of Compliance**

The programme was accepted by the NNR, and it was verified that it addresses ageing management review. The ageing management review process was documented under the SALTO project and included into the structure and content of the safety case.

The structure and content for the safety case as well as the ageing management review process was accepted by the regulator.

- **Assessment Outcome 16**

The application has been verified to be compliant with regulation 6(4)d as it was verified that the comprehensive programme for Long Term Operation addressed ageing management review for Long Term Operation, including the review of existing ageing management programmes and development of new ageing management programmes as necessary.

Regulation 6 (4)(e) Programme for long term operation

- **Requirement**

The comprehensive programme for Long Term Operation shall address revalidation of time limited ageing analysis.

- **Assessment of Compliance**

The programme was submitted to the NNR, and it was verified that it addresses revalidation of time limited ageing analyses. The time limited ageing analysis is integral and essential part of the SALTO methodology adopted and documented. It is also extensively referenced and documented into the structure and content of the safety case.

The structure and content for the safety case as well as the time limited ageing analysis as part of the SALTO process was accepted by the regulator.

- **Assessment Outcome 17**

The application has been verified to be compliant with regulation 6(4)e as the programme for Long Term Operation includes revalidation of time limited ageing analysis.

Regulation 6 (4)(f) Programme for long term operation

- **Requirement**

The comprehensive programme for Long Term Operation shall address long term operation documentation.

- **Assessment of Compliance**

The results of the LTO assessment were used to update the relevant LTO documentation and influence the plant changes in support of LTO.

Updated documents included as example, SALTO documentation, new process and standards for AM, new and updated AMP's etc. Where applicable some documents were submitted for Regulatory acceptance as dictated by existing licence basis requirements or specific documents required to be submitted related to AM and PSR in RG-0027 and RG-0028.

The accepted licensing framework for LTO complimented the requirements by providing clarity on which documents require Regulatory scrutiny.

Other documentation in support of LTO included the updated SAR, 3rd PSR report and Ageing Management report.

- **Assessment Outcome 18**

The application has been verified to be compliant with regulation 6(4)f as it was verified that the comprehensive programme for Long Term Operation addressed long term operation documentation.

Regulation 6 (4)(g) Programme for long term operation

- **Requirement**

The comprehensive programme for Long Term Operation shall address the implementation programme for Long Term Operation.

- **Assessment of Compliance**

The safety case documented in Section 14 the Long-Term Operation Integrated Implementation Plan (IIP), capturing all the committed actions required prior to and after LTO.

The LTO implementation programme was contained within the LTO Programme Management Manual, originally submitted as part of the LTO application, accepted by the NNR. It contained information on the Risk Management plan, Resource Plan, LTO programme schedule and LTO Programme organisation.

- **Assessment Outcome 19**

The application has been verified to be compliant with regulation 6(4) as it was verified that the comprehensive programme for Long Term Operation addressed the implementation programme for Long Term Operation.

Conditions to Regulatory Decisions:

No	Regulation in R266	Condition	Classification
1	4(a)	None	n/a
2	4(b)	None	n/a
3	4(c)	None	n/a
4	4(d)	None	n/a
5	4(e)	Implement safety improvements identified in review of SC and planned IIP commitments	Condition
6	5(a)	None	n/a
7	5(b)	None	n/a
8	5(c)	None	n/a
9	5(d)	None	n/a
10	6(1)	None	n/a
11	6(2)	None	n/a
12	6(3)	None	n/a
13	6(4)(a)	None	n/a
14	6(4)(b)	None	n/a
15	6(4)(c)	None	n/a
16	6(4)(d)	None	n/a
17	6(4)(e)	None	n/a
18	6(4)(f)	None	n/a
19	6(4)(g)	None	n/a