Eskom	**Directive**	

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1. Introduction

A fundamental of nuclear governance is a set of commonly understood objectives to guide and align strategies and decision making associated with organisational structures, processes and programmes. Establishing high standards for the operation, maintenance and organisational support for all phases of a nuclear project forms an essential part of the drive for continuous improvement in striving for excellence.

This document serves to describe the nuclear objectives of Eskom that support the Eskom Nuclear Management Policy.

2. Directive Content

2.1 Directive Statement

The Eskom Nuclear Objectives are designed to provide a perspective of the expectations that Eskom has with regard to nuclear safety, technical performance, organisational effectiveness and the participation and benchmarking within the nuclear industry. Clear objectives are an important element in promoting improvements in nuclear safety and plant reliability as well as communicating progress and areas where challenges exist.

Eskom operates the Koeberg Nuclear Power Station within a large fleet of fossil power stations, and these high-level nuclear objectives are developed to ensure the performance expectations for the Nuclear Operations are aligned to the Nuclear Industry and exceed regulatory requirements. These objectives exist in addition to the business objectives that are applicable of the whole of Eskom.

Although the objectives are primarily focused on the operational phase of Koeberg Nuclear Power Station, the underlying principals are applicable to any activity associated with potential future nuclear power station as Eskom remains the designated owner operator of nuclear power plants in South Africa according to the Nuclear Energy Policy of 2008.

2.2 Eskom Nuclear Objective Principles

The objectives are developed to be as simple as possible, while still providing meaningful insights and where possible the ability to compare performance trends with international peers, without the need for a detailed knowledge of the nuclear plant, the programmes and the practices.

The supporting objectives have been grouped under the criteria of “Nuclear Safety”, “Operational Focus”, “Organisational Effectiveness”, “Regulations, Public and the Environment”, and “Performance Improvement and Oversight” in support of the overall objective of being world class. For each of these, a high-level objective statement that defines the long-term goal, expectations, and where possible quantitative and qualitative measures that underpin the criteria is provided.

The Eskom objectives incorporate and support the nuclear industry long-term goals that have been collectively established through WANO. They also require the participation in the WANO performance benchmarking programs. Quantitative performance indicators are included where appropriate as they allow relative comparison and trending of performance and the identification of gaps to industry. WANO [Ref 5] suggests the following principles should be applied when using the WANO performance indicators:

- Performance indicators are most appropriately used for trending performance and where needed, adjusting priorities and resources; the relative emphasis to be placed on a given indicator or set of indicators should be an operating line management decision.
- Performance indicators should be used in conjunction with other assessment tools; they should not be used as the sole basis for decisions. Excessive focus on a narrow set of indicators or one indicator can be counter-productive to safety.
- Detailed or process related indicators should only be used by plant staff and should not be used to compare performance between plants.
- Performance indicators alone should not be used for the ranking of plants because they provide only a partial and historical perspective regarding safe and reliable plant operations.

2.3 Main Objective Statement

The main Eskom objective is to ensure that Eskom executes its responsibilities as an accountable Nuclear Utility, driving the continuous improvement in the performance of Koeberg Nuclear Power Station to amongst the top performing international Nuclear Power Stations and recognised as a “World Class Operation”.

In support of this objective:

- Eskom is committed to follow international good practice and apply operational experience (OE) in all related nuclear activities in striving for excellence.
- The Nuclear Operating Unit operates as an integrated unit to centralise the nuclear skills base under a common Management System, thereby strengthening the focus on nuclear safety.
- Eskom is an active member of the WANO Atlanta Centre to benefit from and emulate the good management processes and practices that have enabled the USA nuclear plants to achieve their levels of performance.
- Eskom is committed to continuously improve the safety of Koeberg and adopted the IAEA safety re-assessment process to routinely review the plant against a credible referential, and not to rely on regulatory requirements to drive plant safety improvements. EDF, due to the similarity in design to Koeberg, their rigorous safety improvement programme, and the co-operation between the South African and French Nuclear Regulators, is often referred to as the “technical Safety Reference for Koeberg” and is regularly used to inform the basis for many of the technical decisions and the General Operating Rules employed at Koeberg.
- As Eskom is the designated Owner-Operator of current and future nuclear power plants by the Nuclear Energy Policy, all effort shall be made to ensure that the Owner-Operator activities are performed to fulfil this national policy prescript.
- Eskom has a comprehensive Oversight Strategy to identify gaps in performance, thereby ensuring that Eskom remains abreast of the continuously improving standards and practices within the International Nuclear Industry.
- The Nuclear Management Committee (NMC) is established as a nuclear business oversight committee to keep Eskom executives appraised of the performance against the Eskom nuclear objectives, all nuclear safety issues and concerns, any conflicts between the Nuclear and

Business objectives of Eskom, and any consequences to nuclear safety as a result of new Eskom policies or strategies.

2.3.1 Objective - Nuclear Safety

Nuclear Safety, inclusive of Nuclear Security, is the overriding priority and takes precedence over everything else. Strategic and operational decisions, at all levels; consider the unintended consequences on Nuclear Safety. The plant design, the equipment and the practices at Koeberg are continuously improved to keep the plant as safe and reliable as reasonably achievable, thereby exceeding regulatory requirements. Risk mitigation is treated as a priority as the potential consequences of an event is unacceptably catastrophic, regardless of the improbability of occurrence.

A perspective on how well the Nuclear Safety objective is being achieved can be inferred from items such as the following:

- The trends of the following Probabilistic Safety Assessment outputs:
  - The likelihood of a Core Damaging Event Occurring measured through the Core Damage Frequency (CDF) and the percentage composition of the different initiators.
  - The likelihood of a Large Early Release Occurring (LERF), due to the early failure of the containment functions following a core damaging event.
  - The Peak Public Risk due to Koeberg.
- The trends of the availability of the essential and safety systems:
  - The Offsite Electrical Grid and the Dedicated Acacia Gas Turbines
  - The Emergency Backup Power System (Diesel Generators)
  - The Auxiliary Steam Generator Feed-water System
  - The High Pressure Safety Injection System
- The trend in the severity and frequency of the events that have occurred through:
  - The trend in the number of Unplanned Automatic and Manual Reactor Trips
  - The results of the Precursor Analysis of the events that have occurred
- Regular review of the effectiveness of the programs and control measures that provide the assurance that the design safety margins and assumptions remain valid.
- Regular reviews of the Periodic Safety Assessment cycle, to ensure the appropriate resources are being applied to analyse and implement the recommendations within the desired timeframes.
- Regular review of known safety risks, the measures implemented to mitigate the risk, and the progress in implementing the required control measures or actions to remove the risk.

In cases where the trends are in the wrong direction and/or gaps are considered significant, the regular review of plans and actions identified to recover the situation to desired levels should be performed.

2.3.2 Objective - Operational Focus

Plant Performance is reliable and predictable in accordance with the approved production plan, and future generation from the units is sustainable and economically viable for at least 60 years. All activities are conducted in a controlled manner that is consistent with plant design and licensing basis that ensures predictable results and high equipment reliability. Operational risks are identified, prioritized and resolved using existing processes and the operational decision making considers the relevant issues such as the operating, design, and safety margins.

A perspective on the how well the Operational Focus objective is being achieved can be inferred from items such as the following:

- The trend in the following standard technical indicators indicative of plant reliability:
  - Unit Capacity Factor (UCF)
  - Forced Loss Rate (FLR)
  - Unplanned Capacity Loss Factor (UCLF)
  - Planned Capacity Loss Factor (PCLF)
- The following trends and indicators associated with the ongoing sustainability of the plant:
  - The duration of the different types of outages (planned vs achieved)
  - The trend in the occurrence of fuel cladding failures and their causes. (FRI)
  - The trend of the effectiveness of the control of Plant Chemistry (CPI)
- Regular reviews of the System Health reports, the Work Management compliance indicators and the identified business risks, to ensure the plant is being maintained in an appropriate condition.
- Regular reviews of the Station Life of Plant Plan to ensure the appropriate resources are being applied to address the identified improvements or equipment related issues needed to ensure reliable and sustainable operation.
- Regular reviews of those strategic projects that if not implemented within a certain timeframe will result in the extended shutdown of the station, to ensure the appropriate resources are being applied to complete the required tasks within the desired timeframes.

In cases where the trends are in the wrong direction and/or gaps are considered significant, the regular review of plans and actions identified to recover the situation to desired levels should be performed.

2.3.3 Objective – Organisational Effectiveness

Personnel involved in all nuclear activities are trained and competent to perform their assigned tasks and apply the essential knowledge, skills, behaviours, and practices needed to conduct their work safely and reliably in a safe manner. Leadership and management ensure the availability of adequate resources, foster an open trusting environment that promotes a healthy Nuclear Culture (Safety and Security), the use of error prevention tools and encourage continuous improvement.

A perspective on the how well the Organisational Effectiveness Focus objective is being achieved can be inferred from items such as the following:

- The trend in the following indicators that are reflective of human performance:

- Industrial Safety Incident Frequency Rate (LTIFR)
- The Collective Radiation Exposure Rate (CRE)
- The Corrective Action Program Index,
- The number of incidents per event category
- The time between station clock resets.
- The Nuclear Compliance Index

- The regular monitoring of staffing strategies, organisational vacancies, core and critical skills compliment, the plans to address any negative trends when compared to the workforce skills plan, the current staff complement, the state of the pipelines and the projected staff movements.
- Insights gained from the annual Nuclear Culture assessment which provides an indication of the prevailing organisational culture, and the resultant enhancement plan.
- Regular review of the effectiveness of the industrial radiography controls being applied at Eskom operational and construction sites.

In cases where the trends are in the wrong direction and/or gaps are considered significant, the regular review of plans and actions identified to recover the situation to desired levels should be performed.

2.3.4 Objective – Regulations, Public and the Environment

Regulations, Nuclear Installation Licence conditions, all permit limits and radiological release limits are always respected. Processes and practices ensure compliance to the regulations and the practicable minimisation of all radiological and industrial releases. Events that challenge a regulatory requirement, could influence the public perception or have an impact on the environment are treated appropriately. The public are actively engaged on safety matters. Full compliance to the requirements on Eskom contained in the NNR Act associated with Emergency Planning, Nuclear Liability Insurance, Decommissioning and Used Fuel plans and their financing.

A perspective on the how well the Regulations, Public and the Environment objective is being achieved can be inferred from items such as the following:

- The Eskom Level 2 nuclear compliance assurance reports generated as part of the Eskom Group Compliance Assurance function.
- The risks, implications or challenges to Eskom associated with compliance to Regulatory Requirements.
- The trend and quantity of releases to the environment through the different waste streams.
- The relationship and interaction with the main stakeholders (NNR, DPE, DOE, NRWDI, CoCT, etc.), and the nature of the issues being discussed.
- The review and trend of concerns raised by the public and questions raised and the level of engagement at the Public Safety Information Forums.
- Regular review of the level of Emergency Preparedness, the appropriateness of the plans, the adequacy of the resourcing and the results of internal and external exercises.

- Regular review of the ongoing appropriateness of the Decommissioning and Used Fuel strategies and their financing to ensure the sustainability of the solutions and that they do not pose undue burden on future generations.
- Regular review of the status and activities undertaken in support of the IAEA safeguards program.

In cases where the trends are in the wrong direction and/or gaps are considered significant, the regular review of plans and actions identified to recover the situation to desired levels should be performed.

2.3.5 Objective – Performance Improvement and Oversight

Industry Participation and Benchmarking enables Eskom to remain sighted on the continuously improving standards and practices within the International Nuclear Industry. The oversight structures are an integral part of this objective to assist the organisation to continuously improve. [Ref 2]

The ongoing functional area and cross functional area evaluations and the annual assessment reports developed by the Nuclear Safety Assurance Group provide an independent view to management of the areas where there are gaps to industry best practice.

Eskom actively participates in all the WANO programmes (Performance Objectives and Criteria, Performance Indicators, Peer Reviews, Technical Support Missions, Sharing OE and training), and other focused industry working groups to gain knowledge and insight on industry trends and to benefit from the available operating experience.

As part of the participation in the WANO Performance Indicator Programme, the performance results of each of the Koeberg Units are individually benchmarked on a quarterly basis against the industry performance for each of the individual WANO Performance Indicators.

WANO has developed a composite index which is a single value calculated from all ten of the individual performance indicators, referred to as the WANO Index. The WANO Index has value in high level trending of the performance of an individual unit as it can be compared against other units through a consistent set of parameters and weightings. The WANO Index for each of the Koeberg Units will be used as one of the benchmarks of performance.

WANO generates an Integrated Performance Station Report (IPSR) based on the five tiles from 19-003 Staying on Top [Ref 5] which provides an independent view of performance.

A perspective on how well the Performance Improvement objective is being achieved can be inferred from items such as the following:

- The WANO IPSR report for Koeberg and the trends in the assessment.
- The trend in the performance of each Koeberg units benchmarked against the industry for each of the individual WANO performance Indicators
- The trend of the WANO Index for each of the Koeberg units
- The organisational response to timeously address the Issues raised through the NSA evaluations.
- The NSA view of the adequacy of the management response to the issues requiring attention (IRAs) that are raised by NSA during their evaluations.

- The feedback of any concerns raised in any of the oversight committees and the manner and urgency in which they were resolved.
- The trends year-on-year of the NSA annual report which provides an overview of the different functional areas and identifies those where there are gaps to industry best practice.
- The results of WANO and IAEA peer reviews (station and corporate) and the appropriate organisational response to timeously address the areas for improvement (AFIs) identified.

In cases where the trends are in the wrong direction and/or gaps are considered significant, the regular review of plans and actions identified to recover the situation to desired levels should be performed.

2.4 Industry Goals

The Operational Health Dashboard (OHD) was developed inside Eskom to provide a graphical view to management of a possible sustainability concern. The Operational Health Dashboard is not designed as a performance measure, but as a method of providing a warning flag for the declining performance of a particular parameter from the expected normal operation performance band. The OHD parameters and thresholds have been selected based on Koeberg specifics.

The long-term industry goals for each of the parameters monitored by WANO for the industry are reflected by the point at which score loss commences in the composite WANO Index. The aim being that all plants will strive to operate with as high a rating on the WANO Index as possible, thereby improving the overall performance of the industry.

The OHD parameters and their associated alarm and critical thresholds together with the composition of the WANO Index, weighting of each parameter and the score loss range are reflected in Table 1.

Performance Indicator	Unit	WANO Goal (no score loss)	WANO Index - full score loss	WANO Index weighting	OHD alarm threshold	OHD critical threshold
Unit Capability Factor (UCF)	%	92	80	15%	Note 1	
Forced Loss Rate (FLR)	%	1	8	15%	Note 2	
Unplanned Capability Loss Factor	%	N/A	N/A	N/A	4	6
Unplanned Auto SCRAMS	No.	0.5	1.5	10%	1.0	1.5
High Pressure Safety Injection (RIS) system unavailability	Ratio	0.02	0.03	10%	0.001	0.027
Auxiliary Feed water system unavailability	Ratio	0.02	0.03	10%	0.001	0.018

Performance Indicator	Unit	WANO Goal (no score loss)	WANO Index - full score loss	WANO Index weighting	OHD alarm threshold	OHD critical threshold
Emergency AC Power unavailability	Ratio	0.025	0.035	10%	0.004	0.012
Fuel Reliability Index	Bq/g	18.5	185	10%	18.5 Note 3	111
Chemistry Index	Ratio	1.01	1.2	5%	1.2	1.4
Collective Radiation Exposure (CRE)	Sv/unit	0.6	1.2	10%	1.1	1.2
Industrial Safety (LTIFR)	Ratio	0.2	1.0	5%	0.4 Note 4	0.6
Nuclear Compliance Index	No.				30 Note 5	70

Note 1 – Focus is on UCLF which is a measure on the deviation from the production plan

Note 2 – Focus is on UCLF as it includes FLR

Note 3 –FRI is not a reliable indicator to confirm a fuel cladding defect, Koeberg uses radio-isotopic analysis of the primary water to define fuel cladding defects irrespective of the FRI value.

Note 4 – Report on Eskom only incidents as per Eskom reporting criteria. (Have to reflect different stats when reporting to WANO – due to the different criteria)

Note 5 – Based solely on the indication derived from the initial event classifications

Table 1 : WANO Index and OHD thresholds

3. Supporting Clauses

3.1 Scope

This document defines the Eskom nuclear objectives applicable to all nuclear activities within Eskom. They are in addition to any Eskom wide business objectives and focus on the characteristics that are unique and important to the nuclear industry. They are intended to focus activities supporting Koeberg and any other nuclear related activities in line with the Eskom Nuclear Management Policy.

3.1.1 Purpose

The nuclear objectives contain the high-level aspirations and expectations of Eskom with regards to its nuclear activities. They are intended to be used to set challenging goals for improvement, to adjust priorities and resources in support of the desired objectives, to gauge performance and progress, and to gain perspective on performance relative to that of other plants.

3.1.2 Applicability

These objectives are applicable to all Eskom functions dealing with nuclear matters throughout the Eskom Holdings Group.

3.1.3 Effective date

The document is effective from the authorisation date.

3.2 Normative/Informative References

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

3.2.1 Normative

[1] 32-83 Eskom Nuclear Management Policy.

3.2.2 Informative

[2] 36-1518 Nuclear Safety Oversight within Eskom.

[3] WANO Principles for Strong Governance and Oversight of Nuclear Power Organisations

[4] WANO Performance Indicator Programme Reference Manual (MN / 2014-2)

[5] INPO 19-003 (August 2019) Staying on Top

3.3 Definitions

N/A

3.4 Abbreviations

Abbreviation	Explanation
EDF	Electricity De France – French power utility
IAEA	International Atomic Energy Agency
INPO	Institute of Nuclear Power Operators
IPSR	INPO Plant Summary Report
NMC	Nuclear Management Committee
NSA	Nuclear Safety Assurance
OHD	Operational Health Dashboard
WANO	World Association of Nuclear Operators

3.5 Roles and Responsibilities

N/A

3.6 Process for Monitoring

Both quantitative and qualitative Key Performance Indicators are routinely presented to the Eskom Executives at each Nuclear Management Committee meeting.

A Nuclear Oversight Report is generated to provide the Board Social Ethics and Sustainability Committee with a summary of the information presented to the Nuclear Management Committee and any actions taken or conclusions drawn by the Nuclear Management Committee.

The performance assessment of the different Nuclear Objectives is performed in a graded approach that ensures:

- The ability of executive leadership to efficiently and effectively conduct oversight and challenge performance by focusing more on the areas with declining performance.
- The manner in which the information is transferred to the executive leadership includes an appropriate level of detail that is commensurate with the significance, and a periodicity that is based on the performance trend.
- A self-critical assessment process capable of identifying signs of performance decline.
- The appropriate integration of risk awareness and mitigation.
- A strong nuclear safety culture and a healthy technical conscience at all levels.

4. Authorization

This document has been seen and accepted by:

Name	Designation
Eskom Nuclear Management Committee	Tabled at the September 2022 committee meeting
Eskom Nuclear Management Committee	Tabled at the May 2019 committee meeting

5. Revisions

Date	Rev.	Remarks
September 2022	3	Routine three-year review
May 2019	2	Routine review following review of Nuclear Management Policy

Date	Rev.	Remarks
March 2016	1	To enhance the effectiveness of the Eskom Governance Structure and to address issues raised in the WANO Corporate Peer Review Report (2015).

6. Development Team

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

- K Featherstone
- NEXCO members

7. Acknowledgements

N/A.