Eskom	Manual	Nuclear Engineering

Title: **Long-Term Operation Programme Management Manual**

Document Identifier: **240-160692496**

Alternative Reference Number: **N/A**

Area of Applicability: **Eskom Holdings SOC Ltd**

Functional Area: **Nuclear Engineering**

Revision: **2**

Total Pages: **33**

Next Review Date: **N/A**

Disclosure Classification: **Controlled Disclosure**

Compiled by	Functional Responsibility	Authorized by
B Mashele	**S Touffie**	**R Bakardien**
IPD-k Senior Manager	**Nuclear Engineering Manager**	**Chief Nuclear Officer**
Date: 09 May 2021	Date: 09 May 2021	Date: 09 May 2021

Nuclear Additional Classification Information

Business Level:	**3**
Working Document:	**3**
Importance Classification:	**NSA**
NNR Approval:	**No**
Safety Committee Approval:	**No**
ALARA Review:	**No**
Functional Control Area:	**Nuclear Engineering**

Content

Page

Figures

1. Introduction

In order to adequately prepare for Long Term Operation (LTO) a variety of activities must be completed. Due to the number and the complexity of the LTO preparation activities, it was necessary for Eskom to develop a project management manual, to address aspects such as the integration and interfacing of related activities, definition of the programme structures including roles and responsibilities. The LTO activities were grouped into what is called “long-term operations programme”, therefore, LTO activities are managed as a programme, instead of a project. The programme integrates all the activities in order to ensure that their interfaces, interdependences and resources are coordinated and managed to achieve the long-term objective goals.

In accordance with RD 0034 directive 60, it is required for Koeberg to supply the National Nuclear Regulator (NNR) with a project management manual for all activities undertaken as projects. Furthermore, in line with licence variation requirements, the formal application for a variation should be accompanied by a project management manual detailing, inter alia, the project organisation, roles and responsibilities, licensing interfaces and schedule, resources and deliverables. The programme management manual was developed to meet the above stipulated requirements.

2. Supporting Clauses

2.1 Scope

2.1.1 Purpose

The Programme Management Manual defines amongst others the programme organisation, roles and responsibilities, licensing interfaces and schedule, resources and deliverables in accordance with RG-0027.

2.1.2 Applicability

The document content applies to the interventions required to extend the operating life of the Koeberg units from forty to sixty years. This document shall apply throughout the Nuclear Operating Unit.

2.1.3 Effective date

This document shall be effective from the date of authorisation.

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] 238-8 - Nuclear Division Safety and Quality Manual

[2] National Nuclear Regulator Act, Act No. 47 of 1999

[3] NNR Regulations on Safety Standards and Regulatory Practices, No. R. 388

[4] NNR RG-0027 - Interim Regulatory Guide on Ageing Management and Long-Term Operations of Nuclear Power Plants

[5] NNR RG-0028 - Periodic Safety Review of Nuclear Power Plants, Interim Regulatory Guide

[6] NNR RD-0034 - Quality and Safety Management Requirements for Nuclear Installations

2.2.2 Informative

[7] None

2.3 Definitions

2.3.1 Long Term Operation: Operation of the plant beyond an established time frame set forth by, for example, licence term, design, standards, licence and/or regulations, which has been justified by safety assessment, with consideration given to life limiting processes and features of SSCs.

2.3.2 Safety Case: A collection of arguments and evidence in support of the safety of a facility or activity. This will normally include the findings of a safety assessment and a statement of confidence in these findings.

2.3.3 Current licensing basis: The safety case applicable at any time during operation of the plant, comprising applicable regulations and Regulator guidelines and all licence-binding documentation, including project management documentation, safety analysis report, operational limits and conditions, and other safety related programmes applicable during a licensing stage applicable during licensing stages (including modifications), which shall be retained as records.

2.4 Abbreviations

Abbreviation	Explanation
DSSR	Duynefontyn Site Safety Report
EERI	External Events Response Initiative
I&C	Instrumentation and Control
IAEA	International Atomic Energy Agency
LTO	Long Term Operation
NNR	National Nuclear Regulator
NPP	Nuclear Power Plants
OTS	Operating Technical Specifications
PLCM	Project Life Cycle Management
PLEX	Plant Life Extension
PSR	Periodic Safety Review
PTR	Reactor cavity and spent fuel pit cooling system
RCP	Reactor coolant system

Abbreviation	Explanation
RG	Regulatory Guide
RPV	Reactor Pressure Vessel
SALTO	Safe Aspect for Long Term Operation
SAR	Safety Analysis Report
SGR	Steam Generator Replacement
SSC	Systems, structures and components
TLAA	Time Limited Ageing Analyses
SMOC	SALTO Management Oversight Committee

3. Purpose of the Programme or Justification

In order to extend the life of Koeberg, there are several initiatives that complement and build on one another, that require a coordinated and integrated management in order to achieve the larger objective of meeting the regulatory requirements to obtain the licence variation for LTO. Therefore, the objective of the programme is to integrate the relevant projects and activities, for effective management and control.

The purpose of the LTO programme is to collate and bundle the individual projects and activities for them to be managed as a group in order to achieve economies of scales with the benefit of such outweighing management of these as individual units. This will ensure that LTO regulatory requirements are met in their entirety (nothing is missed). The programme is created to ensure that key aspects of the activities such as governance, management, financial management and infrastructure (i.e. creating a conducive work environment by developing a programme plan based on specific projects, timescale and controls) are coordinated to support adequate implementation of the interrelated activities

4. Programme Assumptions

- The submission for the LTO safety case will be completed timely, by 21 July 2022. This will provide the requested 2 year period for the regulator to complete the review and licencing renewal processes by 21 July 2024.
- Adequate skills and resources will remain available for the duration of the programme.
- There will be no technical issue that will preclude the life extension and result in permanent shutdown of Koeberg.
- Safety improvements (such as EERI modifications) that are not linked to end of life, but are required to ensure continued safety of the plant will not be required to be implemented prior entry into LTO but will be included as part of the LTO implementation plan.
- The regulator will accept the updated Safety Analysis Report with marked up changes for the studies that will still be ongoing at the submission of the safety case. A complete updated SAR will be submitted prior to the end of life.
- The equipment qualification (including limited ageing management analyses (TLAAs)) for Unit 2 will remain valid before 40 years of commercial operations are reached on unit 2. The 40-year validity on Unit 2 expires on May 2025.

- It is assumed that following the submission of the safety case, the regulator will engage Eskom should there be any issue of concern that may not have been sufficiently addressed and will jeopardise the approval of the licence.

5. Programme List of Project Details

There are three categories of initiatives that are required to justify the safety of plant for the intended period of LTO, namely, safety assessments, plant modification and other operational plant activities related to LTO. The list of initiatives for LTO was defined utilising the guidance contained in RG-0027 “Ageing management and LTO of NPPs”. Therefore, the list is as follows:

5.1 Safety assessments:

- Ageing Management assessment for LTO. This is conducted under the Safe Aspect for Long Term Operation (SALTO) project.
- Assessment of other safety-related programmes. This includes the water chemistry programme, security programme, and the maintenance and surveillance programmes for some SSCs excluded from the SALTO scope list (i.e. scope excluded from SALTO but linked to other current licence binding programmes).
- Periodic Safety Review (PSR) in accordance with RG-0028 “Periodic Safety Review of NPPs”.
- Duynefontyn specific site characterisation project

5.2 Plant modifications

These are modifications aimed at improving the safety reference and to address the life-limiting features of the plant. The life limiting features of the plant were identified during the feasibility studies and ageing management assessments. Therefore, the modifications are categorised into three, namely,

- Plant modifications relating to the life limiting features of the plant.
- Modifications to manage ageing of the plant for LTO.
- Plant safety improvements modifications.

5.3 Other operational activities

In order to ensure adequate preparation for LTO, some of the gaps identified during the safety assessments require solution prior to entry into LTO. These gaps includes inter alia, plant maintenance, process updates, resolution of current licensing basis deviations, etc.

6. Summary of the LTO Programme Scope

6.1 Description of scope

This section describe the summary of each programme scope category. Also discussed in this section is the timelines associated with the execution of the work and the dependencies of the activities.

6.1.1 Safety Assessments

6.1.1.1 Ageing management assessment

Ageing management assessment is required for all in-scope safety related structures, systems and components (SSCs) of the nuclear facility in order to determine the fitness for purpose to meet design functions and capabilities. Therefore, the ageing management assessment starts with defining the scope of the safety related SSCs to be considered. The approach of the assessment includes performing ageing management review, determination of applicable ageing management programmes and Time Limited Ageing Analyses (TLAAs).

The safety assessment is required to demonstrate that the actual condition of the SSCs will be known throughout the intended period of operation, and to provide confidence that there is and will be adequate processes and programmes in place to manage the effects of ageing throughout the intended period of operations. The ageing management approach considers the current licensing basis general operating rules such as the maintenance, in-service inspections and testing, and safety related surveillance manual requirements. The assessments are undertaken as a project, namely SALTO.

6.1.1.2 Other safety related programmes

In addition to the ageing management programme, there are other safety related programmes that are required for other safety related aspects such as supporting the ageing management efforts, or ensuring that the operations meets the current licensing basis requirements. The other safety related programmes that are considered in the programme include;

- Operating technical specifications
- Nuclear security
- Water chemistry
- The maintenance and surveillance programmes for the SALTO excluded equipment related to other current licence binding programmes.

Programmes such as emergency planning and preparedness, the impact of long term operations on the environment, and the radiation protection and radioactive waste management assessments will be performed as part of the periodic safety review to support long-term operation. These activities are performed by the Nuclear Engineering department.

6.1.1.3 Periodic safety review

The periodic safety review is performed to support long-term operation with the aim of determining the extent to which the current licensing basis remains valid for the intended period of operation, the extent of conformance of the facility to modern codes and standards, and any changes in the design basis of the plant. The assessment will be carried out as a project.

6.1.1.4 Duynefontyn specific site characterisation project

The analysis of the site specific characteristics used for the Koeberg Site Safety Report does not comply with the latest methods and thus requires revision. Therefore, the aim of this project is to perform studies using the latest methodologies. The site specific characteristics are required for assessing the robustness of the facility against internal and external hazards.

6.1.2 Plant modifications

6.1.2.1 Plant life extension modifications

The modifications are divided into three categories as follows;

1. Changes required due to the end of the qualified life of the component. There are three modifications that fall into this category, namely, Pressuriser Heater Replacement, I&C Terminal Penetrations and Unit 2 RCP pyrocontrole RTD replacement. These plant changes are required prior to entry LTO.
2. Changes decided on to effectively manage plant ageing into the intended period of long term operation. There are three modifications that fall into this category, namely, Steam Generator Replacement, Unit 2 Reactor Pressure Vessel Head Replacement, Induced Current Cathodic Protection of Containment Building. The steam generator replacement project has also been utilized as the vehicle to perform most of the safety analyses required in accordance with the ageing management regulatory requirements. The actual plant interventions themselves are not by definition “time limited” nor are LTO-specific requirements but are undertaken as the most effective ageing management treatments to ensure the longer term integrity and reliability of the plant.
3. The scope of the modifications include all the modifications to close the actions to reduce the risks identified in previous safety reassessments or periodic safety reviews. These modifications are not necessarily linked to the end life of the plant but required to ensure that the plant is in line with industry acceptable practices. The list includes;
    - Prioritised actions from the Fukushima response assessment
    - Any other outstanding actions from the second safety reassessment (SRA II)

The modifications not linked to the qualified life of the plant but necessary for safety improvements and ageing management will also be prioritised for implementation as part of the LTO programme. Those still outstanding in 2024 will be implemented as part of the LTO implementation plan.

6.1.3 Other operational activities

The LTO assessments will identify deviations (gaps) and/or other activities to address aspects such as non-compliance to the current licensing basis, inspections and maintenance to support the conclusions of the ageing management evaluations (AMR or TLAAs), etc. There will be gaps linked to the 40-year end of life, which will require resolution prior to entry into LTO, and/or those that can be resolved during the LTO period.

Deviations linked to the end of life will be addressed as part of the LTO preparation activities. Gaps not linked to 40 years will be addressed as part of the LTO implementation plan. The relevant departments in the Nuclear Operating Unit will perform these activities.

6.2 Interdependencies of programme scope

In order to extend the life of Koeberg, there are several interdependent and interrelated activities that require coordination and integrated management, including integrated implementation oversight in order to achieve the deliverable of meeting the regulatory requirements for LTO. As a result, the LTO programme exists for the preparation activities. The relationship between the activities is depicted in Figure 1.

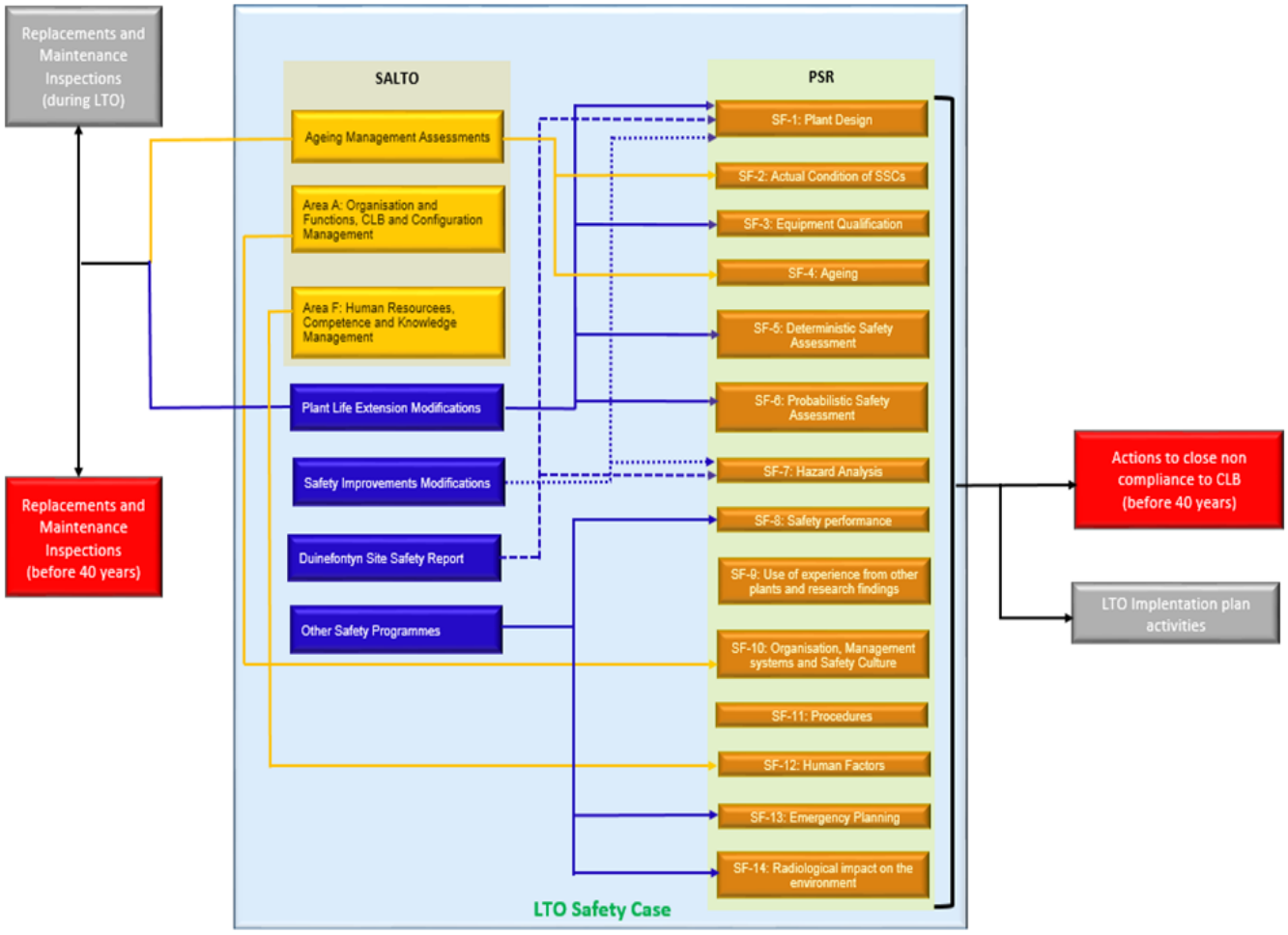


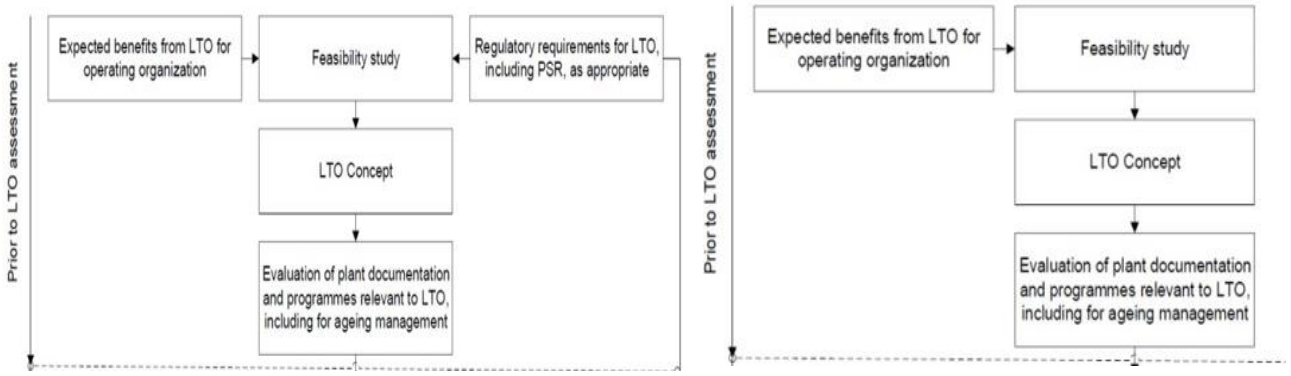
Figure 1 : Interdependencies in LTO Scope

7. Long Term Operation Regulatory Requirements

The economic requirements for the extension of the life of Koeberg are in accordance with Eskom corporate objectives of supplying power to the grid. The regulatory requirements to be achieved in order to extend the life of Koeberg for the additional 20 years are contained in the NNR interim regulatory guidance document RG 0027 ' Ageing management and long term operations of nuclear power plants'. This section focuses on detailing how the requirements of the interim guidance were applied for the Koeberg context.

The Koeberg safety analysis report which is a subset of the current licensing basis and safety case assumes a design life of 40 years for the plant, therefore had to be updated to include the intended period of operation. Since the issuance of NIL-001 variation 19 which reflects an end date for Koeberg Operations and the regulatory guidance for long term operations, the Koeberg bespoke LTO concept has been modified to include all the requirements of the regulatory guidance and to request a variation to NIL-001.

7.1 Requirement Prior to LTO assessments



RG 0027 Requirement

Koeberg Adapted Requirement

The LTO preparation activities which commenced around 2010 were bespoke activities developed to meet the then international guiding requirements as the national guiding requirements were issued only during 2019. Since the issuance of the regulatory guidance for long term operations, the Koeberg the LTO concept had to be modified to include all the requirements of the regulatory guidance. This section (§ 7.1) addresses the impact of these differences and reflects how they have been incorporated, although at a later stage in the process.

7.1.1 Feasibility study

A feasibility study was completed in 2010, and concluded that there was no issue that would preclude the plant life extension of Koeberg nuclear power plant and that there were benefits to justify a proposal for long term operations. The feasibility study is documented in K08016VAR 'Koeberg Plant Life Extension' document.

In accordance with the guidance provided by the National Nuclear Regulator in 2019, it is required as part of the feasibility study to perform a periodic safety review in support of long-term operations. This was not performed as part of the feasibility phase, but has been incorporated as part of the overall LTO scope.

7.1.2 LTO Concept (strategy)

RG-0027 (Issued in 2019) states that LTO Concept should address basic goals and objectives, milestones, activities, organisational roles and responsibilities, interactions with other major projects, and interactions with external organisations.

A plant life extension strategy was developed in 2010 that focussed on establishing the structures required to perform the major plant component replacements identified during the feasibility study. The plant life extension strategy is documented in K08016VAR. The implementation of the strategy was divided into three phases. Phase 1 consisted of the replacement of the steam generators, phase 2 was aimed at replacing the refuelling storage water tanks and phase 3 was aimed at replacing the unit 2 reactor pressure vessel head and control rod drive mechanism.

Due to limited licensing requirements regarding Long term Operation at the time, Eskom in line with industry practices, performed a self-assessment in 2014 utilising the IAEA NS 57 guidance, to assess the adequacy of plant policies and processes for long term operation. This was followed by two Safe Aspects for Long Term Operations peer review missions in 2015 and 2019. The outcome of the self-assessment and the SALTO peer review missions was utilised to determine the scope of the LTO assessments (the assessment focussed specifically on aspects linked to IAEA NS 57 guidance). In 2017, the LTO strategy was revised to support the performance of this work. Subsequently, additional licensing requirements have been issued and the RG-0027 requirement relating to the LTO concept is detailed in the SALTO licensing documentation.

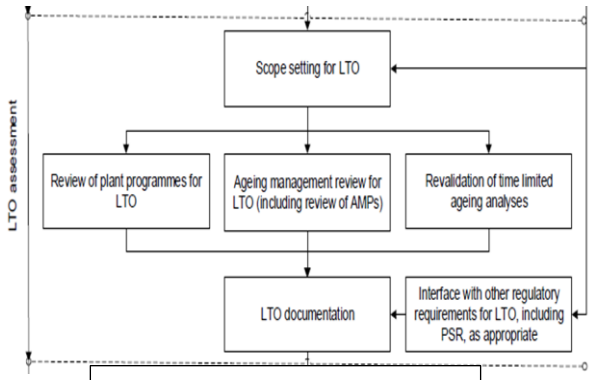
In accordance with the regulatory guidance for long term operations, the outcomes of the periodic safety review are expected to be considered in the LTO concept. In terms of Koeberg Long-Term Operation Programme, the performance of the periodic safety review will be conducted as part of the LTO assessments and is discussed in detail below.

7.1.3 Evaluation of documentation and programmes relevant to LTO, including for ageing management

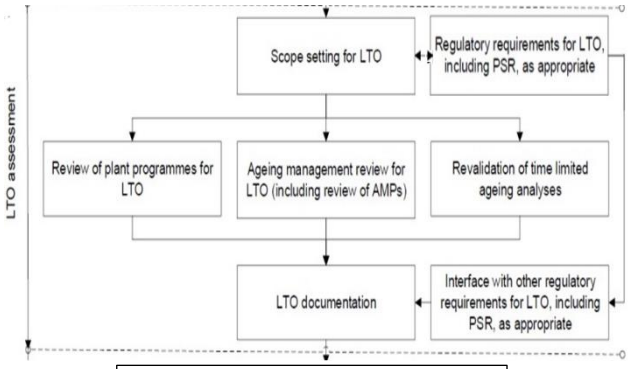
The bespoke evaluation of plant documentation and programmes relevant to LTO performed by Eskom was limited to the safety aspects contained in IAEA Safety Series Report No. 57 guidance and the review of the life of plant plans and programmes used in the feasibility study. In the absence of local requirements, this was deemed adequate at the time.

7.2 Requirements for LTO assessment phase

1) In order to adequately assess the plant for long term operations, the activities shown in the figure below will be carried out.



RG 0027 Requirement



Koeberg Adapted Requirement

2) Scope setting for LTO, ageing management review for LTO (including a review of ageing management programmes) and the revalidation of TLAAs; these activities are performed in accordance with the regulatory requirements as part of the SALTO project.

3) Review of other safety related plant programmes for LTO

   The plant programmes that have been identified as part of the long term operation will either be reviewed as stand-alone reviews or as part of the periodic safety review.

4) The periodic safety review

   The periodic safety review is performed as part of the LTO assessments. This is a deviation from the guidance provided.

5) LTO documentation

   The results of the assessments above will be used to update the relevant documentation and influence the plant changes in support of LTO.

7.3 LTO approval and implementation

The regulatory approval and implementation is divided into two steps as detailed below;

a) Regulatory review and approval

   The NNR requires that a comprehensive safety case be submitted for approval 24 months prior to entry into LTO. The regulator will review the submission and grant licence approval prior to expiry of Nuclear Installation Licence in July 2024.

b) LTO commitments

   During the NNR review of the safety case, Koeberg will be concluding the activities that would have been submitted as commitments to be performed prior to end of life. A report detailing these commitments will be submitted with the safety case in 2022.

c) Implementation of LTO programme

   Following licence approval, Koeberg will enter into the LTO period and will be required to implement LTO commitments as contained in the LTO implementation plan.

8. Acceptance Criteria for LTO

Eskom should meet the NNR requirements for LTO as detailed in RG 0027 chapters 5, 6 and 7. Additionally, Eskom should meet the requirements of any other applicable acts and regulations related to operating such a facility.

The acceptance criteria will be met through submission of the following deliverables to the regulator:

- A periodic safety review (PSR)
- A comprehensive safety case that meets requirement 5.3.1.3 of RG-0027
- Completion of actions to address the deviations linked to the end of life.

Documentation in support of LTO (including the updated SAR, PSR report, Ageing management assessment report, etc.).

9. Programme Governance Plan

The purpose of the Governance Plan is to describe the applicable policies and procedures, meetings and delegations of authority, in order to inform programme stakeholders of the governance requirements pertaining to the programme. The chapter describes the high-level governance structures for LTO. The details are contained in the relevant individual project management manuals. The governance for LTO related activities that are not executed as projects, follow the Nuclear Operating Unit (NOU) organisational governance structures.

There are three main departments tasked with performing the LTO Programme activities, namely, Nuclear Engineering performing all the safety assessment and engineering studies, Nuclear Project Management tasked with the implementation of all the plant modifications related to LTO, and Koeberg Nuclear Power Station responsible for executing maintenance, inspections and testing required for LTO. Therefore, all the activities are carried out in accordance with the relevant department's policies, procedures, and quality management systems. The LTO project facilitation and coordination is positioned in the nuclear engineering business, and this is the main organisational business area responsible for achieving LTO.

The governance for the LTO programme has taken the following into account:

- Due to the complexity of the LTO programme, a combination of operational NOU governance structures and specific project and programme related governance structures was utilised.
- Utilisation of existing governance institutions (Investment committees, tender committees, modifications committee and technical committees), policies, processes, procedures, guides and work instruction.
- Identification and distribution of communication requirements for all stakeholders.

9.1 Related/Supporting Documents

The applicable policies and procedures are listed in Appendix A– Applicable Policies and Procedures.

9.2 LTO Governance Meetings and Oversight

The approach to governance meeting and oversight is shown in Figure 2 below.

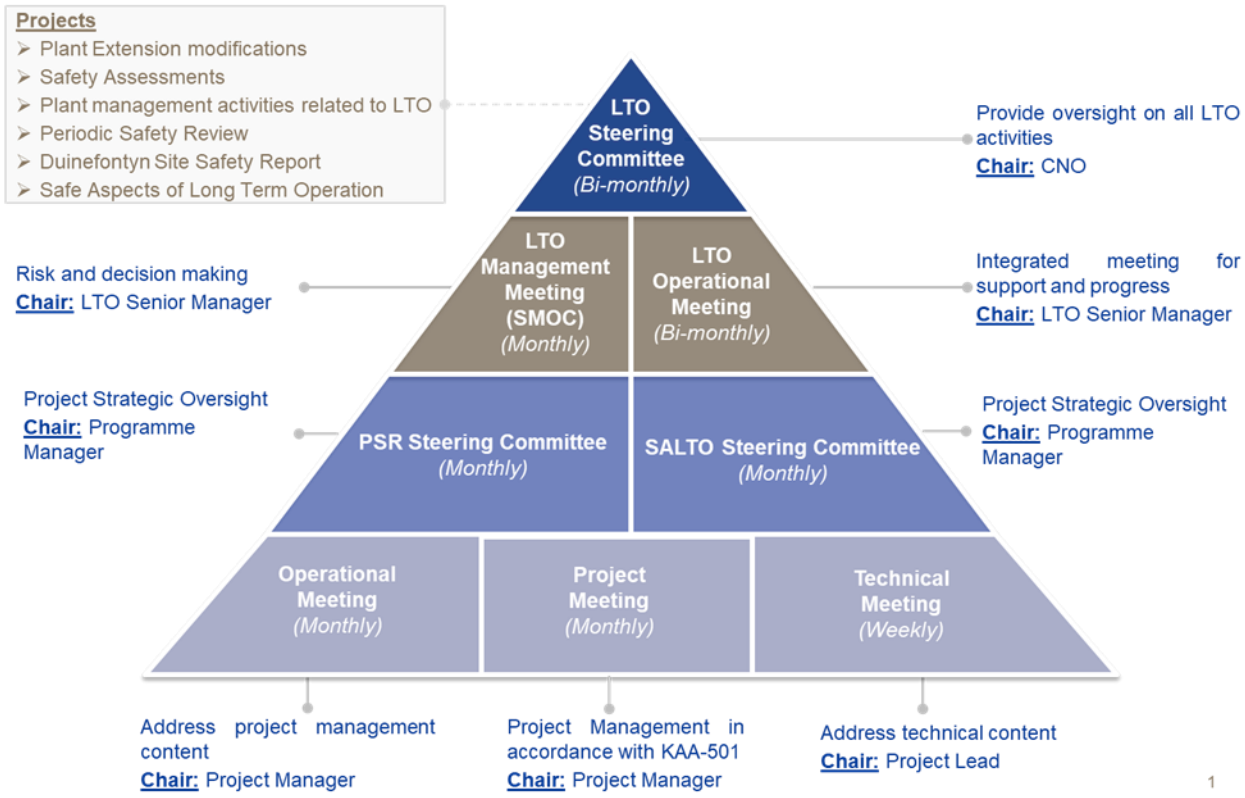


Figure 2 : Meeting Hierarchy

10. LTO Programme Schedule

A LTO Programme schedule was developed and the management of the schedule is discussed in this chapter.

10.1 Scope management plan

- The Nuclear Engineering Department have identified the scope of works and the inter relationships between activities, based on the licensing basis and regulatory requirements for LTO.
- The scope of work for each initiative is reviewed monthly within each initiative governance framework to verify if it is still in line with the original scope or if any changes are required for approval.
- Any changes to the scope will follow an approved change management control process.
- Any changes will be reported through the Nuclear Engineering governance structures and to the regulator.

- In relation to LTO modifications, details of scope management is contained in the relevant PMP, and it follows the KAA 501 process.
- The management of scope is performed by Nuclear Engineering. Any significant scope change is submitted to the Engineering Technical Management Meeting for technical debate and endorsement, and then submitted to the Engineering Strategic Review Meeting for decision making by the Nuclear Engineering Manager. The core scope of LTO is fixed based on the regulatory guidance and the chosen process utilized by Eskom. However, there may be scope changes associated with contingency plans, number of plant modifications required, etc. The approved scope change will be submitted to the NNR through the Licensing department.

10.2 Programme scope baseline schedule

- An integrated LTO programme baseline schedule has been developed. However, due to the volumes of activities associated with the baseline schedule and the requirement for each project to have its own PMP, the integrated schedule contained in this manual shows the activities that require NNR input. Refer to attached Appendix C Schedule
- The schedule will be reviewed and updated on a quarterly basis and will be formally submitted to the NNR through the Licensing Department, in line with the requirements of the Nuclear Licensing Manual, 238-18, and supplemented by KAA-831. The updates will be submitted routinely in February, May, August and November as well as on an ad-hoc basis when material changes to the schedule need to be communicated earlier. Existing forums, in particular the quarterly NNR LTO Workshops that are held in March, June, September and December will be used to interface with the NNR on the LTO programme schedule and the changes that were submitted.

11. Cost Management Plan

The cost is planned, structured, and controlled in accordance with Eskom approved governance processes.

- This includes the effective cost planning of resources (people, equipment, etc.), cost estimating, cost budgeting and monitoring and control of costs;
- Changes to supplier contract costs (Compensation Events) are managed and controlled by Eskom's Procurement and Supply Chain Management procedure 32-1034 and implemented in accordance with the NEC contract specific conditions of contract;
- Monthly projections are compared to the approved investment document. Should the projected investment value be exceeded, a course of action will be determined to either remain within the investment value or submit a revision.

12. Quality Management Plan

Quality management objectives, requirements, assurances and control plans have been identified for each programme component. This has been documented in accordance with each LTO programme component or project management plan. For activities undertaken within Eskom organisational line groups and business areas, the stated organisational quality management processes within the business unit are applicable.

Each programme component ensures that effective quality assurance and control processes are defined and implemented to provide assurance that applicable quality objectives will be achieved. To allow sufficient time to implement any required corrective action, the quality management plans ensure that the frequency of audits and inspections are adequate to enable the early identification of any related quality issues and/or risks. The Quality Management Plan (QMP) for the LTO Programme will remain as provided for in the individual Programme components and projects. The quality management plan details and requirements are summarised below:

- Nuclear projects shall comply with Nuclear Safety and Quality Manual, 238-8.
- Nuclear projects shall identify, document, and map the departmental processes and procedures in accordance with the guidance from 238-5 and nuclear licence requirements where these apply.
- Plant modifications need to adhere to the requirements of KAA-501 and its referenced quality requirements.
- The Quality Management Plan is used to ensure that the requirements, as set out in contracts, are met by the contractors during assessment, design, fabrication, execution and commissioning (whichever is applicable);
- The Quality Management Plans of each programme component and project describes the timetable and arrangements for implementing the quality management strategy.
- The LTO Programme Manager ensures that all the individuals identified in the responsibility matrix and have input to the QMP, are given the opportunity to comment and their requirements included to the plan;
- The programme component managers then collate the comments made by all parties, conveys these requirements to the contractor and ensures that these requirements are incorporated into the QMP;
- The LTO Programme Manager monitors and records quality measures regularly in order to improve the quality of the deliverables;

Where external service providers are contracted to deliver LTO-related outputs, as part of the procurement process, the contracting arrangements will include the quality management requirements as specified in RD-0034. Where there are no contracting arrangements for output deliverables but only for the contracting of a service (i.e. time worked), individually contracted employees will perform work under the Koeberg Quality Management System and according to the approved processes of the department where the work is performed.

13. Document Management Plan

Document management is undertaken in accordance with the relevant Eskom processes. Documents for the individual LTO programme initiatives are managed in accordance with the relevant document management procedures and for initiatives undertaken as projects, the document management plan is detailed in the relevant project PMPs.

- The document management plan describes the documentation management system will be used at a certain sequence, e.g. Hyperwave, SharePoint, TD& RM/ Eskom Documentation System (EDS).
- Project deliverables will be saved on SharePoint and Hyperwave using the Nuclear Engineering Document Records Management system.

14. Programme Human Resources Management Plan

Resource benchmarking was performed at nuclear power plants in the US and Europe. The headcount at Koeberg is higher than the headcount at nuclear power plants of similar design in both the US and Europe, as similar stations have between 800 to 1200 permanent employees, supported by supplemental workers of up to 600 employees. These numbers are for normal operations. During planned unit shutdowns, these numbers may double depending on the type of shutdown.

In recent years, Koeberg has experienced unprecedented skill loss due to high nuclear skills demand, as a result of the global nuclear new build programmes. Although the loss has not affected the headcount, it has significantly reduced the Koeberg skills and expertise pool. Furthermore, some of the activities to be performed for LTO are first of their kind, requiring subject matter expertise, which has been affected by the aforementioned losses. Eskom has managed to retain its Intelligent Customer capability to execute this work.

The performance of the safety assessments for LTO requires that the resources be knowledgeable in specific plant design, policies, processes, procedure, etc. in order to adequately assess the plant. As a result there is a limit to the amount of outsourcing that can be done to support the performance of the activities. Therefore the strategy to resources the LTO activities was optimised to include a hybrid of permanent and supplemental employees and service providers as follows:

- permanent employees partially dedicated to the activities,
- supplemental employees,
- and outsourcing of certain portions of the scope of LTO activities

All employees engaged in LTO assessments (permanent and supplementary) have the required level of experience and those with less experience work under supervision. Each scope of work has been assigned an experienced lead person, at a Chief Engineers' level.

For activities undertaken as projects, the description of roles and responsibilities, reporting relationships, and staff management are detailed in the relevant PMPs and stakeholder matrices. For non-project activities, the description of roles and responsibilities, reporting relationships, and staff management are detailed in the relevant departmental functional organisational structures. Appendix D - Resource Plan for LTO shows the resources plan for LTO.

15. Risk Management Plan

In order to adequately and effectively manage LTO risks, a risk management plan has been developed and it details the approach to be utilised to manage these risks. In line with the risk management plan, each LTO programme initiative will manage the respective risks and maintain an active risk register, a live document containing active, draft and retired risk.

Each programme initiative manages risks in accordance with 238-22. The LTO risks will be a collection of all the risks from the individual programme initiatives that affect the LTO programme timelines, LTO programme schedule and cost, and the quality of deliverables. It is from these that an LTO risk register will be maintained similar to the above mentioned risk register. The LTO risk management plan is attached as Appendix E– Risk Management Plan. The detailed risk management plans for each programme initiative are contained in the relevant project PMPs.

16. Issue Management Plan

The section documents the process for identifying and resolving issues. All LTO related issues such as human resources, suppliers, technical challenges, licensing and regulatory, communication, etc. that might all have a negative impact on the programme will be managed through an issue management plan. The plan is aimed at detailing the process on how these issues will be effectively identified, assessed, and managed (i.e. identifying owners and severity) as they emerge over the course of the LTO preparation period. The LTO issue management plan is attached as Appendix F– Issue Management Plan. The issues management process is as follows:

- Any person may identify LTO issue during any of the LTO engagements (an issue shouldn't be confused with risk; i.e. a risk is a potential event, whilst an issue is an event that has been realised);
- The identified issues will be assigned to the relevant initiative lead by the Senior Manager;
- The issues will be graded by the leads based on its impact to the project;
- The Programme Manager will manage a list of all issues, which are to be looked at all monthly project team meetings;
- The Programme Manager must update the issues list as new issues are identified, or issues are removed;
- The issues should be considered for risk management (See Risk Management Plan) treatment;
- The key issues should be highlighted on the monthly project progress report;
- Complex issues will be escalated to the relevant governance structures (i.e. Steering committees and management committees) for resolution.

17. Organisation for LTO preparation

The Nuclear Engineering department has been tasked with leading the delivery of the licence to operate for an additional 20 years. Based on this, an LTO programme structure has been developed to support the execution of all the LTO related activities. There are four main departments involved with the execution of these activities, namely, Nuclear Engineering department for the safety assessments, Koeberg Power Station business unit for the operational activities, Nuclear Project Management for the implementation of the modifications, and the Nuclear Governance department for all licensing activities.

A senior manager has been appointed to lead the LTO programme organisation, in order to ensure the integrated management and oversight of all the activities. The programme organogram, roles and responsibilities are further discussed below.

17.1 LTO Programme organogram

The high level organogram for the LTO programme is shown in Figure 3 below. The detailed organogram is discussed in Appendix B– LTO Programme Organisation.

Figure 3 : High level organogram for the LTO Programme

17.2 Roles and responsibilities

In order to support the execution of the increased work scope due to LTO preparations, the lead organisations utilise a combination of business as usual structures and special projects to execute the work. Projects undertaken by the power station business unit are managed by the relevant initiating departments. Additionally, the power station has created a Strategic Project Support organization for the purpose of integrating and managing all the activities related to LTO. The Nuclear Engineering department leads all the safety assessment projects with the Nuclear Project Management (NPM) organisation providing project management support. The current NPM structure remains unmodified to support the execution of plant modifications. Therefore, the roles and responsibilities are dependent on the lead organisation for the scope of work. The detailed roles and responsibilities are discussed in Appendix B– LTO Programme Organisation.

18. Stakeholder and Communication Management Plan

A LTO Stakeholder and Communication Plan has been developed in order to provide the communication requirements for the programme activities, for ensuring adequate internal and external stakeholder communication. For the LTO programme, internal and externa stakeholders were identified. A stakeholder management plan was developed in accordance with the relevant Eskom processes. The details of the stakeholder and communication management are contained in the LTO stakeholder and communication management plan document. The document is attached as Appendix G– Stakeholder and Communication Management Plan

19. Training Management Plan

In order to adequately prepare for long-term operation, specific skills and expertise are required. As a result, Koeberg adopted the strategy below for the programme in order to ensure the utilisation of correct skills and expertise.

- All the involved NOU personnel have the required level of experience
- Utilisation of original equipment manufacturers to perform specialised work
- Utilisation of reputable contractors that have performed similar work in the industry

The work activities related to LTO to be performed by the power station is similar to business as usual maintenance, inspection and testing activities. Due to the volume of work, Koeberg will supplement resources to accommodate the increased scope of work. Regarding the plant modifications activities, the practices used by NPM to secure the required skills and expertise are deemed adequate and will be utilised for LTO related plant modifications. Eskom performed a skills and expertise analysis for the projects, mainly the safety assessments. In order to complement the skills needs for the safety assessment the following was adopted to supplement the needs;

- Use of the industry subject matter experts to provide training in a form of workshops for staff involved in safety assessments (subject matter experts provided through the IAEA)
- Included in the contracting terms is for the contractors for the LTO activities to also provide training for Koeberg personnel on the contracted subject
- Use of industry subject matter expert to review the work produced by Eskom personnel.
- The training takes into account nuclear safety culture aspects such as Human Performance training and use of Operating Experience, and 6 monthly refresher training on nuclear safety culture.
- Also included is specific nuclear related topics such as defence in depth, Qualitative Risk Assessments (QRA), etc.

20. Nuclear Regulations and Licensing Management Plan

Licensing activities are managed in accordance with the requirements of the Nuclear Licensing Manual 238-18 supplemented by KAA-831 and/or in accordance with the requirements as stipulated in the communication management plan.

21. Acceptance

This document has been seen and accepted by:

Name	Designation
Keith Featherstone	Senior Manager Nuclear
Frikkie Ellis	Senior Manager Projects
Nomawethu Mtwebana	Senior Manager Nuclear Engineering
Michael Richardson	Senior Manager Finance
Velaphi Ntuli	General Manager Power Station
Frikkie Ellis	Senior Manager

22. Revisions

Date	Rev.	Compiler	Remarks
May 2021	2	B Mashele	Minor updates • Updated text in plant life extension modifications of §6.1.2 • Updated text on §10.2 – LTO programme schedule • Updated text in §15 • Deleted Table 4 in §20
December 2020	1	B Mashele	Initial authorised document
November 2020	0	B Mashele	Draft

23. Development Team

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

24. Acknowledgements

Insert text here.

Appendix A– Applicable Policies and Procedures

Policy and Procedure Description
Nuclear IMS (Integrated Management System) for compliance to RD-0034: • 32-83 Eskom Nuclear Management Policy • 238-6 Nuclear Documentation and Records Management Requirements • 238-8 Nuclear Safety and Quality Manual • 238-14 Nuclear Security Manual • 238-18 Nuclear Licensing Requirements • 238-19 Nuclear Radiation Protection Standard • 238-22 Nuclear Integrated Risk Management Requirements • 238-28 Nuclear Safety Culture Programme • 238-29 Environmental Management
Finance: • 240-69061188 Process Control Manual for Project Accounting (Conceptual) • 240-69061114 Execute Project Accounting for Projects (Basic) • 240-69061140 Initiate Project Accounting for Projects (Basic) • 240-64269415: Service Level Agreement with Group Finance and Generation • 240-76931045: Financial Fixed Assets Gx Plant Components • 240-124830536: Plant Life Cycle Management Work Instruction • 36-30: Generation Delegation Of Approval • 32-1096: Forex
Commercial: • 32-1033 Eskom's Procurement and Supply Chain Management Policy • 32-1034 Eskom Procurement and Supply Management Procedure • KAA 518 Control of Procurement of Goods and Services • 240-81146134: Position Paper PP01 of 04/2015 – Clarifying issues in the Eskom Procurement and Supply Chain Management Procedure (32-1034) • Nuclear Commercial SD&L Practice Note 01 of 2014 – Methodology to include SD&L activities more effectively in KOU • 240-66691800 - Process Control Manual for establish project contract environment

- 240-66691512 - Process Control Manual for execute project contracts
- 238-181: Service Level Agreement between Nuclear Project Sourcing and Nuclear Project Management

Other:

- GGM 0990 - Generation Management Manual and GGS0462: Quality Requirements for Engineering and Construction Works in Generation 238-102 Nuclear Division Supplier Quality Management Requirement;
- DSG-318-087: Quality Requirements for the Procurement of Assets, Goods and Services;
- KAA-501: Project Management Process for Koeberg Nuclear Power Station Modifications
- KAA-560: The Control of Plant Documents as a Result of a Plant Design Change, Plant Anomaly, or Document Anomaly;
- KAA-614: Control of Spares Assessment and New Stock Applications;
- KAA-664: Issuing a Construction Status Certificate/Safety Clearance Certificate;
- KAA-709: Process for Performing Safety Evaluations, Screenings and Justifications;
- KAA-815: Design Changes To Plant, Plant Structure Or Operating Parameters;
- KAA-838: Process & Responsibilities for Approving Non-Destructive Testing Activities;
- KBA0022OTS Current Revision: Operating Technical Specifications;
- KBA-0028 NES MA ISI 01 : ISI Project Requirements;
- KSA-011: The Requirements for Controlled Documents;
- KSA-016: Standard for the Preparation of Technical Specifications;
- KSA-021: Standard for In-service Inspection at KNPS;
- KSA-069: Foreign Material Exclusion;
- KSA-105: The Requirements for Station Cleanliness Control of Systems, Equipment and Components;
- KSA-106: Requirements for Protective Coatings for Use at KNPS;
- KSA-113: Standard for Plant Changes Affecting the Design of Koeberg Nuclear Power Station;
- KSA-119: Contractor Control at Koeberg Nuclear Power Station;

- KSU-002 - Design Control;
- KSU-006: Maintenance Basis Determination, Documentation and Change Control;
- KTA-001: Training and Qualification Requirements for Nuclear Safety Review Committees and Safety Evaluations;
- KWU-DE-014: Acceptance and Independent Review of Detailed Design Change Package;
- OTS 7030 Rev 6: Operating Technical Specifications
- Occupational Health and Safety (OH&S) Act No. 85 of 1993;
- Occupational Health and Safety (OH&S) Act No. 85 of 1993: Construction Regulations 2014;
- 238-11 OH & Safety Requirements;
- Construction Industry Development Board (CIDB) Act No. 38 of 2000;
- KAA-598: SHE Management System; and
- KGA-073: SHE Specification Guidelines.
- National Environmental Management Act 107 of 1998;
- KWA-831 - Koeberg Nuclear Licensing Process
- National Water Act 36 of 1998; and
- 32-94: Safety, health and Environmental (SHE) Policy.
- 240- 64269415: Service Level Agreement with Group Finance and Generation
- 240-76931045: Financial Fixed Assets Gx Plant Components
- 36-1511: Life cycle management (MYPD3)
- 36-30: Gx DOA
- 32-1096: Forex

Appendix B – LTO Programme Organisation

Appendix B, the LTO Programme Schedule is an attachment to this document.

Appendix C- LTO Programme Schedule

Appendix C, the LTO Programme Schedule is an attachment to this document.

Appendix D - Resource Plan for LTO

Item No.	Project Name	Eskom Full Time	Eskom Partial Time	Reviewers Eskom	Supplemental Workers	Outsourced services	Comments
1.	**SALTO**						
1.1	**Assessment Phase**						
1.1.1	Technical Assessments (TLAAs)	**5**		**10**			Framatome/Lesedi Consortium
1.1.2	Technical Assessments (AMR/AME)	**5**	**6**	**10**		√	Framatome
1.1.3	Project Management	**1**			**7**	√	Csquared
1.1.4	Project QA				**1**		Tuv Nord
1.2	**Execution Phase**						
1.2.1	Time Limited Ageing Analyses	**5**	**4**	**3**		√	Framatome
1.2.2	Programme updates	**1**	**5**	**9**		√	RFQ Issued
1.2.3	New programme developments	**1**	**4**	**9**		√	RFQ Issued
1.2.4	Project Management	**1**			**5**		Csquared/Taloc
1.2.5	Project QA				**1**		Tivanathi
2.	**PSR**						
2.1	Design Safety Factor	**1**	**1**	**4**		√	Negotiation in progress
2.2	Actual Condition of SSCs	**3**		**4**	**6,5**		
2.3	Equipment Qualification	**1**	**2**	**2**	**3**		
2.4	Ageing Management	**1**		**2**	**3**		
2.5	Deterministic Assessment	**1**		**2**		√	Tractabel
2.6	Probabilistic Safety Assessment	**1**	**10**	**2**	**1,5**		
2.7	Hazard Analysis	**2**		**3**	**4**		
2.8	Safety Performance	**3**		**2**	**3**		
2.9	External Operating Experience	**1**		**2**	**2**		
2.10	Management Systems	**1**	**3**	**3**	**2,5**		
2.11	Procedures	**1**	**1**	**2**	**3,5**		
2.12	Human Factors	**0**	**1**	**2**	**4,5**		
2.13	Emergency Planning	**0**	**1**	**1**	**1,5**		
2.14	Radiological Impact Environmental	**1**	**1**	**1**	**2**		
2.15	Project Management	**1**			**4**		
2.16	PSR Technical Lead	**1**					
2.17	Global assessment	**12**	**5**	**2**	**7**		
3.	**Other Safety Related Programmes**						
3.1	Nuclear Security Assessment	**1**		**1**			
3.2	Water Chemistry	**1**		**1**			
3.3	Operating Technical Specification			**1**	**1**		EdF engineer
4.	**DSSR**						
4,1	Site specific characterisation studies	**7**		**3**		√	Council for Geosciences
4,1	Project/contract management	**1**			**1**		
5.	**EQ Replacement**						
5,1	EMS	**3**					
6.	**Plant Inspections**						
6,1	IMS	**12**					
6,2	Inspection and Test	**6**			**10**	√	ILRT Contractors
7.	**Safety Modifications**						
7,1	EERI and SRA II Closeout	**20**	**24**		**6**	√	
8.	**PLEX Modifications (exclude RPV head and SG)**						
8.1	I&C Terminals	**2**	**12**	**2**	**10**	√	
8.2	Pressuriser Replacement	**2**	**14**	**3**	**11**	√	
8.3	ICCP	**1**	**3**	**5**	**6**	√	
8.4	Pyrocontrol RCP Narrow range RTDs	**2**	**11**	**2**	**9**	√	
9.	**Commercial Support**						
9,1	Commercial Support	**3**					
10	**Finance**						
10,1	Management Accounting Support	**2**					
Totals		**116**	**108**	**93**	**116**		**433**

Appendix E – Risk Management Plan

Appendix E, the Risk Management Plan is an attachment to this document.

Appendix F – Issue Management Plan

Appendix F, the Issue Management plan is an attachment to this document.

Appendix G – Stakeholder and Communication Management Plan

Appendix G, the Stakeholder and Communication Plan is an attachment to this document.