Eskom	ADMINISTRATIVE PROCEDURE	Allocation Centre 38A	Reference Number KAA-913	Rev 2
NNR: NO No.:	INTEGRATED EQUIPMENT RELIABILITY PROCESS			PAGE 1

KORC	ACCESS	IMPORTANCE CATEGORY	NEXT REVIEW DATE	DATE AUTHORISED
NO	Nuclear Restricted	CSR	2024-02-26	2021-02-26

COMPILED / REVISED	REVIEWED	AUTHORISED
(Sgd) L HUGO	(Sgd) SM VAN WYK	(Sgd) V NTULI
L HUGO	SM VAN WYK	V NTULI
SENIOR ADVISOR RELIABILITY ENGINEERING	MANAGER RELIABILITY ENGINEERING	POWER STATION GENERAL MANAGER
DATE 2021-02-10	**DATE** 2021-02-10	**DATE** 2021-02-26

THIS PROCEDURE HAS BEEN SEEN AND ACCEPTED BY:

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X Booi	Conventional Systems Engineering Manager
S Fisa	Maintenance Execution Manager
G Julius	Operating Manager
N Mabumbulu	Work Management Manager
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FCA	ALARA REVIEW	SUPERSEDES
PLANT ENGINEERING	NO	KAA-913, Rev 1 dd. 2017-06-30 FULL REVIEW

PAGE STATUS INDEX

	REVISION							
Page	2							
1	x							
2	x							
3	x							
4	x							
5	x							
6	x							
7	x							
8	x							
9	x							
10	x							
11	x							
12	x							
13	x							
14	x							
15	x							
16	x							
17	x							
18	x							
19	x							
20	x							
21	x							
22	x							
23	x							
24	x							
25	x							
26	x							
27	x							
28	x							
29	x							
30	x							

	REVISION							
Page	2							
31	x							
32	x							
33	x							
34	x							
35	x							
36	x							
37	x							
38	x							
39	x							
40	x							
41	x							
42	x							
43	x							
44	x							
45	x							
46	x							
47	x							
48	x							
49	x							
50	x							
51	x							
52	x							
53	x							
54	x							
55	x							
56	x							
57	x							
58	x							
59	x							
60	x							

PAGE STATUS INDEX

	REVISION							
Page	2							
61	x							
62	x							
63	x							
64	x							
65	x							
66	x							
67	x							
68	x							
69	x							
70	x							
71	x							
72	x							
73	x							
74	x							
75	x							
76	x							
77	x							
78	x							
79	x							
80	x							
END								

	REVISION							
Page								

CONTENTS **PAGE**

1.0 PURPOSE

1.1 To describe the process and establish the responsibilities for the Integrated Equipment Reliability Process for Koeberg Operating Unit, in order to maintain high levels of safe and reliable plant operation, in an efficient manner.

1.2 To identify, organise and integrate equipment reliability activities into a single efficient and effective process.

2.0 SCOPE

2.1 Applicable to all elements and activities that comprise the Integrated Equipment Reliability Process, which includes:

2.1.1 Scoping and Classification of Components.

2.1.2 Continuing Equipment Reliability Improvement.

2.1.3 PM Implementation.

2.1.4 Long-Term Planning and Life-Cycle Management.

2.1.5 Corrective Action.

2.1.6 Performance Monitoring.

3.0 DEFINITIONS AND ABBREVIATIONS

3.1 Definitions

3.1.1 **ActionWay** – The Corrective Action Management software used to capture, monitor and trend Condition Reports for KOU (module of the DevonWay software).

3.1.2 **Activity** – Any work performed in the maintenance, inspection or testing of equipment.

3.1.3 **Ageing Management** – Engineering, operations and maintenance actions to control within acceptable limits the ageing degradation of SSC's.

3.1.4 **Bridging Strategy** – A plan developed to mitigate the risk to the safe and reliable operation of the station, while an equipment issue is being resolved. Identified risk mitigation actions will be in place until the permanent resolution is implemented.

3.1.5 **Component** – Any item of equipment whose position on the plant is uniquely identified by a trigramme (unit identifier, system-trigramme, numerical identifier and bigramme).

3.1.6 **Controlled Document** – A document that is prepared, reviewed and authorised as defined by regulatory requirements, codes and standards and that is uniquely identified and maintained accurate and current by means of a change control process.

3.1.7 **Corrective Action Process Co-ordinator** – A line group or department representative authorised to manage the corrective action process issues for their group or department.

3.1.8 **Critical (ER Classification Category)** – Critical components are those that can affect nuclear safety, plant reliability or power generation and therefore every effort must be made to maximise the reliability of these components. These components will have the most aggressive PM Strategies.

3.1.9 **Deep-in-Grace PM Task** – A preventive maintenance task that has not commenced before exceeding 50% of its allowable PM Grace Period.

3.1.10 **Deferred PM Task** – A preventive maintenance task that exceeds its allowable PM Grace Period, with a PM Deferral application approved before the PM Grace Period is exceeded.

3.1.11 **Duty Cycle** – The intensity at which the equipment is operated (operating mode, operating hours per time interval, starts/actuations/cycles per time interval).

3.1.12 **Economic (ER Classification Category)** – Economic components are those that will be considered for cost effective preventive maintenance, in order to preserve their integrity and extend their useful life. A cost effective effort should be made to maximise the reliability of these components.

3.1.13 **Equipment Owner** – Equipment Owner is either a Component or System Engineer, depending on the responsibility in KLU-001.

3.1.14 **ER Appointed Approver** – A person appointed in writing by the Programmes Engineering Manager, with delegated authority to approve PM Strategies.

3.1.15 **ER Classification** – Component ER Classification is a structured approach to evaluate the functional importance of each component within a system and forms part of the Integrated Equipment Reliability Process.

3.1.16 **ER Clock Reset** – An event that meets the "Consequential Equipment Failure Criteria" which is used to share and trend operational risk and component failure information. ER Clock resets highlight the learnings and risks related to consequential equipment issues.

3.1.17 **Failure** – Inability or interruption of the ability of a System or Component to function within acceptance criteria.

3.1.18 **Failure Analysis** – Systematic process of determining and documenting the mode, mechanism, causes and root cause of failure of a System or Component.

3.1.19 **Failure Cause** – The underlying or initiating event or condition that produces the failure mode.

3.1.20 **Failure Mode** – The manner or state in which a component fails. A single event, which causes a functional failure.

3.1.21 **First-Time PM Task** – A PM Task that has not been performed previously on the specified component, requires the application of a new technology or requires skills not currently available at KOU.

3.1.22 **General Action (relates to ActionWay Action Type)** – Action taken to improve or enhance a programme, process or procedure. General Actions are not used as corrective actions to address root, apparent or contributing causes.

3.1.23 **GenTLC** – A database developed at corporate level that incorporates both the Life of Plant and Technical Plans into a single platform that should interface with the station outage plan and applicable SAP systems.

3.1.24 **IQReview** – A web-based software application that provides standardisation and automation of Preventive Maintenance programme requirements as PM Strategies. These PM Strategies are justified on a component level and include the required PM Tasks and details, their respective task intervals, implementation recommendations, a justification for PM Template deviations and selected tasks, and PM Basis supporting information.

3.1.25 **Legacy Maintenance Basis** – Maintenance Basis documents that were developed prior to IQReview becoming the preventive maintenance basis repository. The legacy documents are identified typically by a KBA number and stored as records in TD&RM. These documents are no longer updated. Any changes to their requirements are effected by developing a new PM Basis for the affected components in the IQReview Module of the ER Software.

3.1.26 **Maintenance** – Aggregate of direct and supporting actions that detect, preclude, or mitigate degradation of a functioning System or Component, or restore to an acceptable level the design functions of a failed System or Component.

3.1.27 **Plant Document** – A plant document is uniquely identified and maintained accurate and current throughout controlled distribution, which covers the design basis, operating basis and maintenance basis of the KOU.

3.1.28 **PM Basis** – The technical basis for the preventive maintenance regime applied to a specific plant system or component. The association of the component ER Classification with the relevant PM Template, influenced by the component specific OE, results in the PM Strategy, and collectively forms the PM Basis.

3.1.29 **PM Deferral** – An approved engineering evaluation that determines the acceptability for extension to a new due date before the original late date is exceeded.

3.1.30 **PM Grace Period** – The allowable activity float expressed as a percentage of the task interval, which if exceeded constitutes a PM Non-Compliance (previously referred to as the 'tolerance period').

3.1.31 **PM Non-Compliance** – Occurs when a preventive maintenance activity has not commenced prior to its PM Grace Period being exceeded, without approval from the relevant authority.

3.1.32 **PM Strategy** – The PM Strategy identifies and justifies the PM Programme on a component level. It includes the required PM Tasks and details, their respective task intervals, implementation recommendations, a justification for PM Template deviations and selected tasks, and PM Basis supporting information. The association of the component ER Classification with the relevant PM Template, influenced by the component specific OE, results in the PM Strategy.

3.1.33 **PM Task** – A distinct maintenance activity that requires participation by one or more disciplines or groups, performed on one or more components at pre-determined intervals.

3.1.34 **PM Template** – A PM Template is a pre-defined maintenance approach for a particular component type (or family of components) that lists significant failure modes, failure causes and recommended PM tasks and task intervals. PM Templates provide the foundation of the preventive maintenance programme by supporting the PM Strategy.

3.1.35 **Potential PM Non-Compliance** – Occurs when a preventive maintenance activity has not commenced before entering the Deep-in-Grace period.

3.1.36 **Preventive Maintenance** – Actions that either detect, preclude or mitigate degradation of a functional system or component, to sustain or extend its useful life by controlling degradation and failures to an acceptable level.

3.1.37 **Run-to-Maintenance (ER Classification Category)** – RTM components are those where the risks and consequences of failure are acceptable without any preventive maintenance being performed. There is also no simple cost effective method to extend the useful life of the component. These components are run until corrective maintenance is required.

3.1.38 **Service Conditions** – All actual physical states or influences (environmental, functional and operating conditions) that affect an item during its service life.

3.1.39 **Significant (ER Classification Category)** – Significant components are those that can affect personnel, industrial, environmental or radiological safety, plant reliability, power generation or may lead to regulatory or insurance consequences. Substantial effort must be made to maximise the reliability of these components.

3.1.40 **Single Point Vulnerability** – A single component whose failure will result in an immediate automatic reactor trip, or an immediate production loss of greater than 20% power (components with an ER Classification of 'Critical', where the C1 or C2 criteria are met).

3.1.41 **Subject Matter Expert (SME)** – A specialist or a knowledgeable person.

3.1.42 **System** – A collection of components identified by the same three-letter code (system-trigramme) performing a function or part thereof.

3.1.43 **Technical Life of Plant Plan** – A plan compiled by Business Units which depicts the Life Cycle Costs of a power station. It details the cash flow with respect to Routine Maintenance, Planned Maintenance (Outage R&E), GO Capital and the replacement or major repair (Capital and R&E) to plant components over the Life Cycle of the plant.

3.1.44 **Unmitigated SPV** – An SPV that does not have an approved, endorsed and implemented SPV Strategy, or has open design changes without an implemented Bridging Strategy, or has unexecuted First-Time PM Tasks (excluding tasks that are not yet due).

3.2 Abbreviations

3.2.1 **AMM** – Ageing Management Matrix

3.2.2 **CA** – Corrective Action

3.2.3 **CAPco** – Corrective Action Process Co-ordinator

3.2.4 **CF** – Component Failure

3.2.5 **CP** – Current Practice

3.2.6 **CR** – Condition Report (refers to ActionWay)

3.2.7 **CSR** – Critical Safety Related

3.2.8 **CURA** – Integrated Risk Management Database

3.2.9 **DE** – Design Engineering

3.2.10 **DNR** – Do Not Reschedule (code for SAP Notifications/Orders)

3.2.11 **EDF** – Electricité de France

3.2.12 **EPRI** – Electric Power Research Institute

3.2.13 **EQ** – Environmental Qualification

3.2.14 **EQP** – Equipment Performance

3.2.15 **ER** – Equipment Reliability

3.2.16 **ERCR** – Equipment Reliability Change Request (Refers to ActionWay Action Type)

3.2.17 **ERI** – Equipment Reliability Index

3.2.18 **ETMM** – Engineering Technical Management Meeting

3.2.19 **FMA** – Failure Modes Analysis

3.2.20 **GA** – General Action (relates to ActionWay Action Type)

3.2.21 **GENTLC** – Generation Technical Life Cycle (Database)

3.2.22 **GO** – General Overhaul

3.2.23 **INPO** – Institute of Nuclear Power Operations

3.2.24 **IPD(K)** – Integrated Plant Design (Koeberg)

3.2.25 **IQReview** – Module of ER Software

3.2.26 **ISIP** – In-Service Inspection Programme

3.2.27 **ISTP** – In-Service Testing Programme

3.2.28 **KORC** – Koeberg Operations Review Committee

3.2.29 **KOSC** – Koeberg Operability Sub-Committee

3.2.30 **KOU** – Koeberg Operating Unit

3.2.31 **LOPP** – Life of Plant Plan

3.2.32 **MBOM** – Maintenance Bill of Materials

3.2.33 **MS** – Maintenance Strategy

3.2.34 **NNR** – National Nuclear Regulator

3.2.35 **NTP** – Nuclear Technical Plan

3.2.36 **OE** – Operating Experience

3.2.37 **OEM** – Original Equipment Manufacturer

3.2.38 **PHO** – Plant Health Operational

3.2.39 **PHC-S** – Plant Health Committee - Strategic

3.2.40 **PM** – Preventive Maintenance

3.2.41 **PSA** – Probabilistic Safety Assessment

3.2.42 **R&E** – Revenue & Expenditure

3.2.43 **RE** – Reliability Engineering

3.2.44 **RTM** – Run-to-Maintenance

3.2.45 **SAP** – Systems, Applications & Products

3.2.46 **SAP Imp** – SAP Implementation Action (Refers to ActionWay Action Type)

3.2.47 **SHR** – System Health Report

3.2.48 **SME** – Subject Matter Expert

3.2.49 **SPV** – Single Point Vulnerability

3.2.50 **SR** – Safety Related

3.2.51 **SRB** – Scope Review Board

3.2.52 **SRSM** – Safety Related Surveillance Manual

3.2.53 **SSC** – Structure, System, Component

3.2.54 **TD&RM** – Technical Documentation and Records Management

3.2.55 **TRM** – Technical Review Meeting

4.0 REFERENCES

4.1 Referenced Documents

4.1.1 240-149139512, Rev 1: Ageing Management Requirements for Koeberg Nuclear Power Station

4.1.2 331-146, Rev 2: Process for the Technological Obsolescence Management Programme (TOMP)

4.1.3 335-2, Rev 5: Koeberg Nuclear Power Station Management Manual

4.1.4 36-240, Rev 0: Plant Life Cycle Management

4.1.5 AP-913, Rev 6: INPO Equipment Reliability Process Description

4.1.6 CNG-AM-1.01-1000, Rev 00500: Equipment Reliability Process (Constellation Energy)

4.1.7 KGU-034, Rev 2: Guide for Reliability Engineers

4.1.8 KLM-013, Rev 3: Maintenance Process Documentation Listing

4.1.9 KSA-913, Rev 1: Integrated Equipment Reliability Standard

4.1.10 KSM-LIC-001, Rev 2: Requirements for the Control of Maintenance

4.2 Applicable Documents

4.2.1 240-102714621: KOU Portfolio Management Committees – Consisting of KPMC and MRC TORs

4.2.2 240-143604773: Safety Evaluation Process (The Process for Performing Safety Screenings, Safety Evaluations, Safety Justifications and Safety Cases)

4.2.3 240-143696574: Guide for the Single Point Vulnerability (SPV) Listing

4.2.4 240-42362878: Financial Fixed Asset Management Procedure (Property, Plant, & Equipment and Intangible Assets)

4.2.5 32-1050: Financial Fixed, Right-of-Use and Intangible Asset Policy

4.2.6 331-88: Temporary Alteration to Plant, Plant Structures or Operating Parameters that affect the Design Base

4.2.7 36-1143: Technical Planning Process

4.2.8 36-226: Accounting for Property, Plant and Equipment

4.2.9 KAA-500: The Process for Controlled Documents

4.2.10 KAA-501: Project Management Process for Koeberg Nuclear Power Station Modifications

4.2.11 KAA-614: Control of Spares Assessments and New Stock Applications

4.2.12 KAA-647: Control of Non-routine Testing and Infrequently Performed Activities

4.2.13 KAA-648: Administration and Responsibilities for Requalification Testing

4.2.14 KAA-667: Processing a Permit to Work

4.2.15 KAA-688: The Corrective Action Process

4.2.16 KAA-721: Online Work Planning Process

4.2.17 KAA-820: Updating the Work Management Planning Database

4.2.18 KAA-826: Plant Health Committee (PHC) Constitution

4.2.19 KAA-830: Process for Management of Quality Records

4.2.20 KAA-835: Work Activity Monitoring Process

4.2.21 KAA-852: Equipment Reliability Index

4.2.22 KAD-023: Quality Control Function

4.2.23 KAM-113: Classification of Maintenance Activities

4.2.24 KAM-516: Equipment Control in SAP

4.2.25 KFA-089: Work Package Check Sheet

4.2.26 KFM-PS-023: SAP Change Control Form

4.2.27 KFU-016: Mandatory Preventive Maintenance Listing Change Control Form

4.2.28 KFU-038: ER Change Request Form

4.2.29 KFU-039: PM Deferral Request Form

4.2.30 KFU-044: PM Deferral Technical Evaluation Form

4.2.31 KGA-094: Event Investigation Guide

4.2.32 KGA-097 Station Event-Free Clock Program

4.2.33 KGA-124: Guide for Troubleshooting

4.2.34 KGU-002: Guide for System Engineers

4.2.35 KGU-011: Preparation of System, Structure or Component Life of Plant Plans (LOPPs)

4.2.36 KGU-023: Guide for Component Engineers

4.2.37 KGU-029: Monitoring and Trending in Plant Engineering

4.2.38 KGU-031: System Health Reporting Guide

4.2.39 KGU-033: Failure Investigation of Plant Equipment and Evaluation of Experience

4.2.40	KGU-035:	Integrated Equipment Reliability Process: Scoping and Classification of Components
4.2.41	KGU-037:	Integrated Equipment Reliability Process: Developing PM Templates
4.2.42	KGU-038:	Single Point Vulnerability Evaluation Process
4.2.43	KGU-039:	Integrated Equipment Reliability Process: Developing PM Strategies
4.2.44	KGU-040:	Integrated Equipment Reliability Process: Establishing PM Task First Performance Dates
4.2.45	KGU-041:	PM Deferral Guide
4.2.46	KLM-005:	Mandatory Preventive Maintenance Listing
4.2.47	KLU-001:	Listing of Plant Systems and Components
4.2.48	KSA-011:	The Requirements for Controlled Documents
4.2.49	KSA-038:	Requirements for Quality Records
4.2.50	KSA-059:	Control of Temporary Special Devices
4.2.51	KSA-069:	Foreign Material Exclusion
4.2.52	KSA-105:	The Requirements for Station Cleanliness Control of Systems, Equipment and Components
4.2.53	KSA-126:	Control of Statutory and Non-Statutory Work Activities
4.2.54	KSA-145:	Rework
4.2.55	KSA-147:	Investigating, Compiling and Issuing of Work Packages Including Post Maintenance Requalification Identification
4.2.56	KSM-001:	Compilation, Use and Adherence to Maintenance Working Procedures
4.2.57	KSM-002:	Identification and Control of Materials, Parts and Components during Maintenance and Manufacturing
4.2.58	KSM-014:	Requirements of Maintenance Quality Control
4.2.59	KSM-015:	Maintenance History Recording
4.2.60	RG-0027:	Interim Regulatory Guide: Ageing Management and Long Term Operations of Nuclear Power Plants

5.0 RESPONSIBILITIES

5.1 The Programmes Engineering Manager is responsible for:

- Ensuring that the process described in this procedure is correctly implemented and maintained.
- Ensuring that adequate competent resources are available to implement this process.
- Appointing in writing, suitably trained and experienced staff members as 'ER Appointed Approvers'.
- Ensuring that all 'ER Appointed Approvers' have the knowledge and skill to perform their required functions.
- Driving the resolution and prioritisation of long outstanding equipment reliability issues.

5.2 The Reliability Engineering Manager is responsible for:

- Being the custodian of the Equipment Reliability Process and overseeing its effectiveness and continuous improvement.
- Being the custodian of the Equipment Reliability Software suite and managing its implementation, data integrity and effective utilisation.
- Ensuring that 'RE Compilers' (ER Classification / PM Strategy) and 'RE Domain Owners' are selected from suitably experienced staff, are appropriately trained and authorised, and are appointed in writing.
- Establishing and implementing appropriate levels of Equipment Reliability instruction or guidance for plant personnel.
- Ensuring that the PM Basis (ER Classifications, PM Templates and PM Strategies) is technically correct, conforms to set requirements and is ready for implementation.
- Ensuring that ER Classifications are validated, in order to confirm quality and consistency, where large scale ER Classifications are performed.
- Appointing an SPV programme owner.
- Periodically issuing a PM Programme Health report
- Oversight and management of ER Clock process.

5.3 The System Engineering Managers are responsible for:

- Providing technical support to the component ER Classification and SPV identification process, as required.
- Assigning appropriate engineers to review completed ER Classifications.
- Managing the timeous review of component ER Classifications.
- Managing the SPV Evaluation process.
- Driving the resolution and prioritisation of long outstanding equipment reliability issues.

5.4 The Component Engineering Manager is responsible for:

- Providing technical support to the PM Template development process, as required.
- Assigning appropriate Engineering SMEs to review and approve completed PM Templates.
- Assigning Component Engineers to review completed PM Strategies, as appropriate.
- Managing the timeous review and approval of PM Templates and PM Strategies.
- Driving the resolution and prioritisation of long outstanding equipment reliability issues.

5.5 The Reliability Engineering Compiler - ER Classification is responsible for:

- Screening plant components to identify all in-scope equipment.
- Determining the ER Classification of plant components and identifying any potential hidden failures.
- Identifying Single Point Vulnerabilities (SPVs).
- Establishing and documenting the technical basis for the ER Classifications.
- Obtaining and co-ordinating input from the various site technical specialists, as appropriate.

5.6 The Reliability Engineering Compiler - PM Strategy is responsible for:

- Developing and revising PM Strategies for plant components and establishing the PM Basis.

- Establishing and documenting the technical basis for the PM Strategies.
- Obtaining and co-ordinating input from the various site technical specialists, as appropriate.

5.7 The 'RE Domain Owner' is responsible for:

- Developing and revising PM Templates in accordance with the authorised process and applicable requirements.
- Ensuring that input is sought and obtained from the appropriate site technical specialists.
- Ensuring that PM Templates receive appropriate reviews.
- Ensuring that the PM Templates are technically correct and fit for purpose.
- Evaluating PM Deferral requests on First-time PM tasks.
- Reporting any degradation mechanisms identified through daily operations for inclusion into the Ageing Management Matrix (AMM).
- Providing input to the management of ageing and obsolescence issues.
- Developing Bridging Strategies for PM task implementation where PM tasks cannot be implemented in accordance with the results of the risk assessment and the established target start dates.

5.8 The Equipment Owner is responsible for:

- Reviewing PM Templates as appropriate, to ensure that they are appropriate and technically correct.
- Approving completed PM Templates for use.
- Performing component failure investigations, cause determination, extent of condition and corrective action identification.
- Reporting any degradation mechanisms identified through continued improvement, review of OE and component failure investigations, for inclusion into the AMM.
- Recommending changes to the PM Basis as required, in order to optimise the PM Programme.
- Evaluating maintenance feedback (including As Found Condition Results) and reviewing equipment PM task content, potential failure modes and recommending frequency changes to the PM Basis as required, in order to optimise the PM Programme.

- Screening PM Deferral requests.
- Performing PM Deferral technical evaluations (use PM Deferral Technical Evaluation form - KFU-044)
- Reviewing PM Deferral requests on First-time PM tasks.
- Reviewing Bridging Strategies for PM Task implementation.

5.9 The System Engineer is responsible for:

- Reviewing the ER Classifications of components to ensure that they have been appropriately classified and are technically correct.
- Confirming the classification of all components identified as SPVs.
- Performing evaluations of all SPVs, identifying appropriate mitigation or elimination actions, managing implementation of the identified actions and controlling the status of each SPV.
- Establish appropriate performance criteria and monitoring parameters.
- Developing Performance Monitoring Plans for allocated systems and monitoring and trending system performance on a continuous basis.
- Performing system walkdowns in accordance with the walkdown schedule.
- Periodically compiling System Health Reports and communicating results.
- Where applicable, developing System Health Action Plans.
- Identifying, evaluating and developing mitigation strategies for long-term vulnerabilities, including ageing and obsolescence, and compiling and maintaining the resulting Life of Plant Plans.
- Identifying and evaluating design changes to improve system or equipment reliability.
- Assessing relevant Operational Experience and taking any appropriate action, as required.
- Compiling, reviewing and updating Life of Plant Plans (LOPPs) on an annual basis to ensure that they remain accurate and up to date, and ensuring that the Life Cycle Plans are appropriately incorporated into the Nuclear Technical Plan (NTP).
- Performing complex troubleshooting, as required.
- Providing input to the management of ageing and obsolescence issues.

5.10 The Component Engineer is responsible for:

- Reviewing the resulting component PM Strategies, as appropriate, to ensure that they are applicable, effective and technically correct.
- Periodically compiling Component Health Reports and communicating results.
- Where performance has degraded, developing a Component Health Action Plan.
- Evaluating plant and industry operating experience and recommending changes to the PM Basis as required, in order to optimise the PM Programme.
- Identifying and reviewing the latest preventive and predictive maintenance techniques for the various equipment types on the plant, and making recommendations to optimise the techniques employed and resulting maintenance costs.
- Assessing relevant Operational Experience and taking any appropriate action, as required.
- Performing complex troubleshooting, as required.
- Providing input to the management of ageing and obsolescence issues.

5.11 The 'ER Appointed Approver' is responsible for:

- Approving completed ER Classifications and PM Strategies.

  NOTE: *ER Appointed Approvers are appointed in writing by the Programmes Engineering Manager.*

- Ensuring that the compilation, review and approval of ER Classifications and PM Strategies, is performed in accordance with the authorised process and complies with the applicable requirements.
- Ensuring that the ER Classification and PM Strategy compilers are authorised in the relevant function.
- Ensuring that, where appropriate, competent reviewers have been identified, and that appropriate review has taken place for ER Classifications and PM Strategies.
- Ensuring that the quality of the ER Classifications and PM Strategies is appropriate and that they are fit for purpose.

5.12 The KLM-005 Controller is responsible for:

- Managing changes to the 'Mandatory Preventive Maintenance Listing', (KLM-005) controlled document.
- Updating and controlling the electronic KLM-005, 'Mandatory Preventive Maintenance Listing'.
- Ensuring that the listing accurately reflects the approved requirements of the PM Basis.
- Ensuring the data integrity of the listing.
- Transmitting a hard copy of each revision of the listing to TD&RM as a record.
- Informing the NNR of all changes to the listing.

NOTE: *KLM-005 custodian appointed in writing by the Programmes Engineering Manager.*

5.13 The PM Programme Implementation Engineer is responsible for:

- Performing risk assessments and determining first time implementation dates.
- Verifying PM Strategies are fully implemented.
- Coordinating PM Programme implementation and issuing implementation actions (SAP Imp).
- Signing of documents and providing input on matters relating to KAA-835 and KSA-126 processes on behalf of RE.
- Coordinating Engineering proactive reviews of T+3 As-Found report.

5.14 The PM Deferral Custodian is responsible for:

- Providing oversight of the PM Deferral Process.
- Managing the PM Deferral requests and ensuring that the correct information is recorded.
- Ensuring that appropriate Corrective Actions are raised for each PM Deferral.
- Monitoring timeous close out of PM Deferrals.
- Periodically notifying the NNR of all open Mandatory PM Deferrals.

5.15 The Maintenance Execution / Responsible Execution Organisation is responsible for:

- Providing suitably knowledgeable equipment specialists to participate in the development of the PM Basis (ER Classification, PM Templates and PM Strategies), as required.
- Ensuring that the relevant Service Notifications, SAP Change Control Forms, MBOMs and Working Procedures are compiled and updated, in order to implement the PM Programme requirements.
- Utilising the Permit-to-Work process to facilitate the safe execution of PM Programme activities.
- Executing the PMs in accordance with the PM Programme requirements.
- Performing appropriate post maintenance testing.
- Perform first-line troubleshooting for equipment malfunctions.
- Providing accurate equipment condition feedback following preventive maintenance.
- Identifying component failures for investigation and initiating component failure investigation type on ActionWay.
- Supporting component failure investigations, cause determination, extent of condition definition and corrective action identification.
- Preserving relevant component failure evidence to support investigations.
- Ensuring timeous close out of PM Deferrals.
- Providing input to the management of ageing and obsolescence issues.

5.16 The Operating Department is responsible for:

- Providing operating input and support to the Equipment Reliability Process, as required, especially but not limited to ER Classification.
- Performing operator rounds and identifying any system or component abnormalities.
- Facilitating the execution of PM activities through the operation of plant systems, the change-over and releasing of equipment from service, the implementation of the Permit-to-Work system and the restoring of systems and equipment for testing and service.
- Performing Operating Periodic Testing and Requalification Testing, as required.

5.17 Work Management is responsible for:

- Loading and maintaining the PM Programme requirements on the Work Management Database (SAP PM) and Outage Matrix.
- The planning, scheduling and co-ordination of the execution of PM activities.
- Bundling of work activities to optimise the efficiency of the execution of all requirements.
- Ensuring that PM Programme activities are scheduled to meet their required periodicities and do not exceed their allowable grace period, without an authorised PM Deferral, as per KSA-126.
- Providing equipment condition reports, drawn from SAP, to Engineering at T+3 in the work week process.

5.18 Various Nuclear Engineering Groups are responsible for:

- Providing technical support and input to the Equipment Reliability Process, as required (All Nuclear Engineering Groups).
- Providing PSA input to the ER Classification process (Deterministic and Probabilistic Safety Analysis (DPSA) Group).
- Reviewing the ER Classification of components modelled in the PSA, to ensure that they have been appropriately classified (Deterministic and Probabilistic Safety Analysis (DPSA) Group).
- Completing the ER Change Request form (KFU-038) for all design changes that may impact the PM Basis, in order to initiate the revision of the PM Basis, in accordance with plant documents configuration management (Design Engineering and Project Engineering).
- Reviewing PM Deferral technical justification documents (All Nuclear Engineering Groups where applicable).
- Ensuring that design changes do not introduce new single point vulnerabilities (Design Engineering).

5.19 The responsibilities of the Plant Health – Operational and Strategic Committees (PHO and PHC-S) are documented in KAA-826.

5.20 For additional responsibilities and responsibilities for individual activities, refer to the Work Flow Responsibility Matrix, in Appendix 2.

6.0 PROCESS

6.1 The Equipment Reliability Process may be entered by any of the following paths (See Appendix 1):

Start ER Improvement Initiative	This is the entry point for any large scale equipment reliability improvement initiative. To begin the initiative, proceed to: **Appendix 2: Part A, step 1.**
ER Change Request	This is the entry point for any Equipment Reliability change request. To begin evaluation of the ER Change Request, proceed to: **Appendix 2: Part B1, step 1.**
Industry & Plant OE	Equipment Reliability analyses are reviewed and updated based on evaluation of Industry and plant operating experience. To initiate an update, proceed to: **Appendix 2: Part B1, step 1.**
Start PM Deferral Process	This is the entry point to initiate a PM Deferral request for any PM activity that is at risk of exceeding the allowable PM Grace Period. To initiate a PM Deferral request, proceed to: **Appendix 2: Part C4, step 1.**
Start LOPP Development	This is the entry point to develop or revise a system or component long-term strategy by means of a Life of Plant Plan (LOPP). To initiate the development of a new LOPP, proceed to: **Appendix 2: Part D2, step 1.** To revise an existing LOPP, proceed to: **Appendix 2: Part D2, step 5.**
Start Equipment Failure Analysis	When equipment failure occurs, this is the entry point to initiate the investigation of the failure. To initiate the Equipment Failure Process, proceed to: **Appendix 2: Part E1, step 1.**
Start Performance Monitoring	This is the entry point to initiate Performance Monitoring. Begin Performance Monitoring by establishing performance criteria and monitoring parameters. To establish or adjust Performance Monitoring, proceed to: **Appendix 2: Part F, step 1.**

6.2 The Process is described in the Work Flow Responsibility Matrix (Appendix 2) and consists of the following sections:

- Part A Scoping and Classification of Components
- Part B Continuing Equipment Reliability Improvement
  - Part B1 ER Change Control
  - Part B2 PM Strategy Development
  - Part B3 PM Strategy Review and Approval
  - Part B4 PM Template Development
- Part C PM Implementation
  - Part C1 PM Strategy Implementation
  - Part C2 Mandatory PM Listing Change Control (KLM-005)
  - Part C3 Proactive PM Review Process
  - Part C4 PM Deferral Process
- Part D Long-Term Planning & Life-Cycle Management
  - Part D1 SPV Evaluation Process
  - Part D2 Life of Plant Plan Development (LOPP)
- Part E Corrective Action
  - Part E1 Equipment Failure Process
  - Part E2 Top Equipment Reliability (ER) Issue Prioritisation
- Part F Performance Monitoring
  - Part F1 System Health Reporting
  - Part F2 Component Health Reporting
  - Part F3 Equipment Reliability Index (ERI)

6.3 There are instances where ageing of structures or components is managed through the ER process and therefore the PM Programme should be consistent with the nine attributes of an effective ageing management programme in line with RG-0027. Appendix 3 contains a table with the generic attributes of an effective Ageing Management Programme.

7.0 RECORDS

7.1 The following records are generated by this procedure:

- PM Deferral Documents are permanent records and are retained for the life of the plant.
- Component Failure Evaluation Reports are permanent records and are retained for the life of the plant.
- The Mandatory Maintenance Listing (KLM-005) revisions and the associated 'Mandatory Maintenance Listing Change Control Forms' are permanent records and are retained for the life of the plant.
- SPV Evaluations are permanent records and are retained for the life of the life of the plant.
- Bridging Strategies are permanent records and are retained for the life of the life of the plant.

7.2 The following electronic records are generated by this procedure:

- ER Classifications, PM Templates and PM Strategies form the PM Basis and are maintained on the IQReview module of the ER Software.
- System Health Reports are maintained on the SystemIQ module of the ER Software.

7.3 Life of Plant Plans (LOPP) are maintained as controlled documents.

8.0 ATTACHMENTS

Appendix 1 – High Level Flowchart with Entry Paths - Integrated Equipment Reliability Process

Appendix 2 – Work Flow Responsibility Matrix - Integrated Equipment Reliability Process

Appendix 3 – Table of Generic Attributes of an Effective Ageing Management Programme

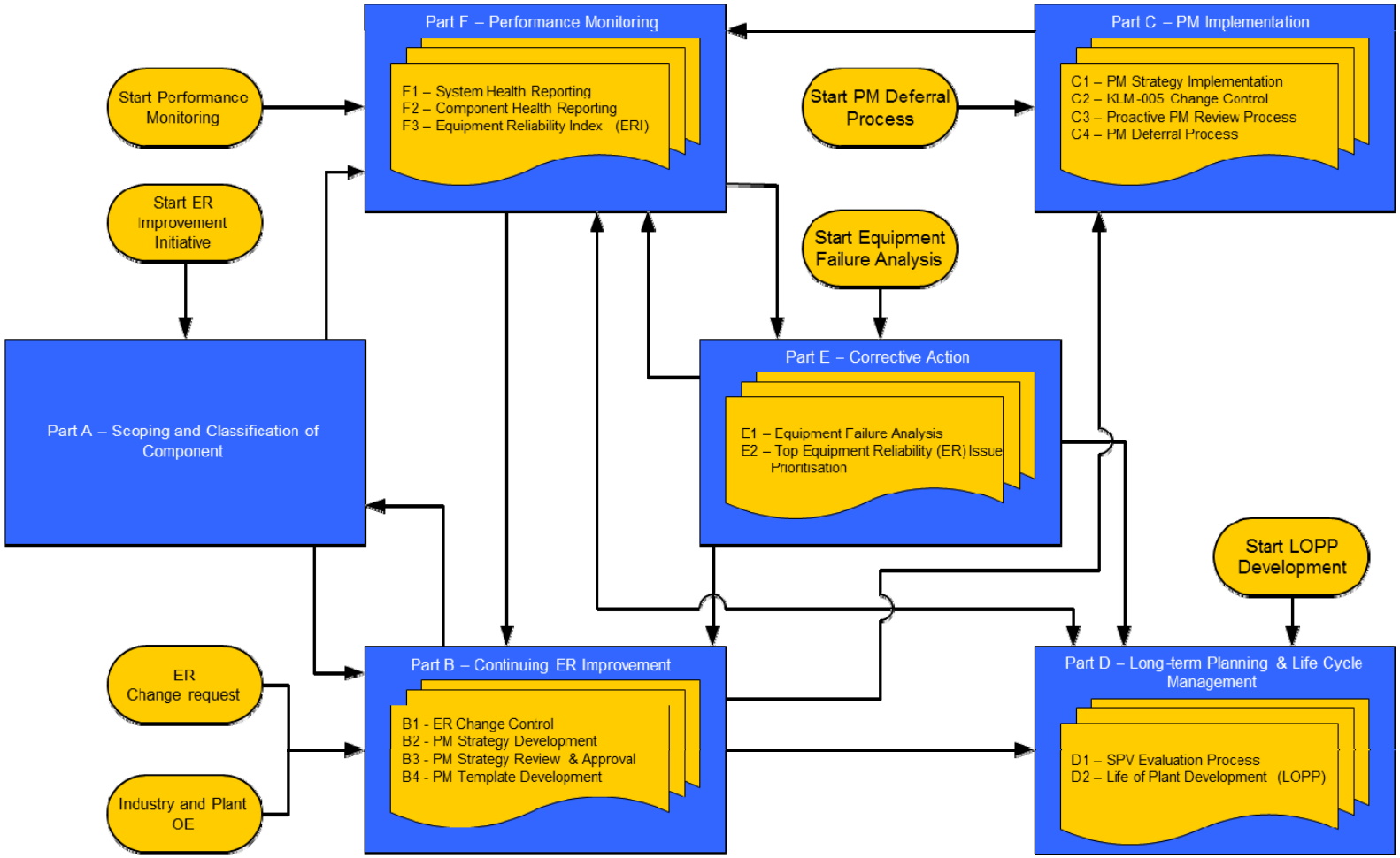
Appendix 4 – List of ER Trend Codes

Appendix 5 – ER Clock Process

Appendix 6 – Justification

APPENDIX 1

HIGH LEVEL FLOWCHART WITH ENTRY PATHS – INTEGRATED EQUIPMENT RELIABILITY PROCESS



WORK FLOW RESPONSIBILITY MATRIX | **APPENDIX 2 - INTEGRATED EQUIPMENT RELIABILITY PROCESS**

R – Responsible
A – Approve
F – File
• – Outside Matrix Scope
Y/N or N/Y – Decision
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[ ] – Mandatory Requirement
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Flow Path:
Main Flow Secondary Flow

INTEGRATED EQUIPMENT RELIABILITY PROCESS

ACTIVITIES	1	2 OPERATING	3	4 COMPONENT ENGINEER	5 SYSTEM ENGINEER	6 RELIABILITY ENGINEERING – COMPILER	7 RELIABILITY ENGINEERING MANAGER	8	9 ER APPOINTED APPROVER	10 MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	11 NUCLEAR ENGINEERING	12 PLANT HEALTH COMMITTEE - STRATEGIC (PHC-S)	NOTES & REFERENCES
A. SCOPING & CLASSIFICATION OF COMPONENTS													See KGU-035, "Scoping and Classification of Components". ***NOTE:*** *ER Component Classification is performed by Reliability Engineering staff authorised to perform this function.*
1. Start ER Improvement Initiative.							[R]						
2. Does the component fall within the scope of the ER Process (apply screening criteria)?						Y/N							From B1, step 11 (ER Change Control). From B2, step 3 (PM Strategy Development). In accordance with the applicable standard. See KGU-035 for guidance.
3. Flag as out of Equipment Reliability Scope.						[R]							Performed on the IQReview Module of the ER Software. Go to B1, step 14 (ER Change Control).
4. Prioritise in-scope components for evaluation.							[R]						
5. Identify important System, Structure and Component functions.		(S)			(S)	[R]					(S)		If a function is required for nuclear or industrial safety, plant reliability or power generation, then it is considered to be an important function. Consult relevant groups for support as required, including Nuclear Engineering – PSA, IPD(K), DE. Go to F, step 2 (Performance Monitoring) Provides an input to Establishing Performance Criteria & Monitoring Parameters.
6. Will component failure degrade or defeat an important function?						N/Y							See KGU-035 for guidance.
7. Will any failure of the component constitute a Hidden Failure?						N/Y							See KGU-035 for guidance.

WORK FLOW RESPONSIBILITY MATRIX | **APPENDIX 2 - INTEGRATED EQUIPMENT RELIABILITY PROCESS**

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Flow Path:
Main Flow Secondary Flow

ACTIVITIES	1	2 OPERATING	3	4 COMPONENT ENGINEER	5 SYSTEM ENGINEER	6 RELIABILITY ENGINEERING – COMPILER	7 RELIABILITY ENGINEERING MANAGER	8	9 ER APPOINTED APPROVER	10 MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	11 NUCLEAR ENGINEERING	12 PLANT HEALTH COMMITTEE - STRATEGIC (PHC-S)	NOTES & REFERENCES
8. Flag component as having Hidden Failures.						[R]							Performed on the IQReview Module of the ER Software.
9. Determine if the component functional importance is "Critical", by answering the series of ER Classification questions.		(S)			(S)	N/Y				(S)	(S)		A "yes" answer to one or more of the questions under the Critical section, results in the component being classified as "Critical". Answer all questions. Consult for support as required, including EDF and Nuclear Engineering – PSA, IPD(K), DE. Performed on the IQReview Module of the ER Software. See KGU-035 for guidance.
10. For "Critical" components, does any component failure constitute a SPV?						N/Y							"Critical" components, where the answer to question C1 or C2 of the series of ER Classification questions is "yes", constitute SPVs. See KGU-035 for guidance.
11. Initiate SPV Evaluation.					[I]	[R]						[I]	The SPV check box on IQReview is automatically ticked for these components. See KGU-035 for guidance. Go to D1, step 1 (SPV Evaluation Process).
12. Is it acceptable for the component to be run until failure occurs?						Y/N							See KGU-035 for guidance.
13. Determine if the component functional importance is "Significant", by answering the series of ER Classification questions.		(S)			(S)	N/Y				(S)	(S)		If the component is not "Critical", a "yes" answer to one or more of the questions under the Significant section, results in the component being classified as "Significant". Answer all questions. Consult for support as required, including EDF and Nuclear Engineering – PSA, IPD(K), DE. Performed on the IQReview Module of the ER Software. See KGU-035 for guidance.

WORK FLOW RESPONSIBILITY MATRIX | **APPENDIX 2 - INTEGRATED EQUIPMENT RELIABILITY PROCESS**

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Main Flow Secondary Flow

INTEGRATED EQUIPMENT RELIABILITY PROCESS

ACTIVITIES	1	2 OPERATING	3	4 COMPONENT ENGINEER	5 SYSTEM ENGINEER	6 RELIABILITY ENGINEERING – COMPILER	7 RELIABILITY ENGINEERING MANAGER	8	9 ER APPOINTED APPROVER	10 MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	11 NUCLEAR ENGINEERING	12 PLANT HEALTH COMMITTEE - STRATEGIC (PHC-S)	NOTES & REFERENCES
14. Determine if the component functional importance is "Economic", by answering the series of ER Classification questions.		(S)			(S)	N/Y				(S)	(S)		If the component is not "Significant", a "yes" answer to one or more of the questions under the Economic section, results in the component being classified as "Economic". Answer all questions. Consult for support as required, including EDF and Nuclear Engineering – PSA, IPD(K), DE. Performed on the IQReview Module of the ER Software. See KGU-035 for guidance.
15. Record the technical basis for the Run-to-Maintenance Classification.						[R]							If the component is not "Critical", not "Significant" and not "Economic", then the functional importance is, by default, "Run-to-Maintenance". Performed on the IQReview Module of the ER Software. See KGU-035 for guidance.
16. Establish the component Duty Cycle.		(S)		(S)	(S)	[R]				(S)	(S)		Categorised as either "high" or "low". Consult for support as required, including Nuclear Engineering – PSA, IPD(K), DE. Performed on the IQReview Module of the ER Software. See KGU-035 for guidance.
17. Establish the component Service Conditions (Operating Environment).		(S)		(S)	(S)	[R]				(S)	(S)		Categorised as either "mild" or "severe". Consult for support as required, including Nuclear Engineering – PSA, IPD(K), DE. Performed on the IQReview Module of the ER Software. See KGU-035 for guidance.

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ACTIVITIES	1	2 OPERATING	3	4 COMPONENT ENGINEER	5 SYSTEM ENGINEER	6 RELIABILITY ENGINEERING – COMPILER	7 RELIABILITY ENGINEERING MANAGER	8	9 ER APPOINTED APPROVER	10 MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	11 NUCLEAR ENGINEERING	12 PLANT HEALTH COMMITTEE - STRATEGIC (PHC-S)	NOTES & REFERENCES
18. Record the technical basis for the ER Component Classification (Functional Importance, Duty Cycle & Service Conditions).						[R]							Performed on the IQReview Module of the ER Software. See KGU-035 for guidance.
19. Once the draft ER Classification is complete, initiate the review and approval process.						[R]							Go to B3, step 1 (PM Strategy Review & Approval) ***NOTE:*** *ER Component Classifications are reviewed and approved as part of the associated PM Strategy.*
20. Perform a validation of the ER Classification results to verify quality and consistency.		(S)					[R]		(S)				During any ER improvement initiatives where large scale ER Classifications are performed, a validation of the results should be performed as follows: • Independent review of a sample of the completed classifications. • Comparison to the EDF results. • Assessment of the consistency of the process results. See KGU-035 for guidance.
21. Address any anomalies detected and document the results of the validation.							[R]						

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Flow Path:
Main Flow Secondary Flow

ACTIVITIES	ORIGINATOR	KLM-005 CO-ORDINATOR	RE ERCR CO-ORDINATOR	COMPONENT ENGINEER	SYSTEM ENGINEER	RELIABILITY ENGINEERING - COMPILER	RELIABILITY ENGINEERING MANAGER	RELIABILITY ENGINEERING – DOMAIN OWNER	ER APPOINTED APPROVER	PM PROGRAMME IMPLEMENTATION ENGINEER	NUCLEAR PROJECT MANAGEMENT	PROGRAMME OVERSIGHT COMMITTEE (POC)	NOTES & REFERENCES
	INTEGRATED EQUIPMENT RELIABILITY PROCESS												
	1	2	3	4	5	6	7	8	9	10	11	12	
B. CONTINUING EQUIPMENT RELIABILITY IMPROVEMENT													
B1. ER CHANGE CONTROL													
1. Initiate an ER Change Request.	(R)		(S)								[•]		ER Change Requests are initiated by raising a General Action (Type ERCR) on ActionWay, supported by one of two documents – ER Change Request Form KFU-038 or CF report. For all Plant Modifications, the Nuclear Engineering Project Manager completes the ER Change Request Form KFU-038. The RE ERCR coordinator raises a General Action (Type ERCR) on ActionWay to track each modification (or part thereof, for complex modifications). ***NOTE:*** *ER Change requests are not raised for work performed during large scale Equipment Reliability improvement initiatives unless required to track batches of changes, e.g. Outage Workscope Reviews.*
2. Is the proposed change a change to a PM Programme requirement (PM Task scope or periodicity) or ER Classification?			Y/N										Notify the originator, record the reason for rejection on the form and close the ER Change Request. Complete and sign 'Part B' of the 'ER Change Request Form' and check "Rejected". Attach completed 'ER Change Request' Form to ERCR on ActionWay. Go to step 17 below

WORK FLOW RESPONSIBILITY MATRIX	APPENDIX 2 - INTEGRATED EQUIPMENT RELIABILITY PROCESS

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Flow Path:
Main Flow Secondary Flow

ACTIVITIES	ORIGINATOR	KLM-005 CO-ORDINATOR	RE ERCR CO-ORDINATOR	COMPONENT ENGINEER	SYSTEM ENGINEER	RELIABILITY ENGINEERING - COMPILER	RELIABILITY ENGINEERING MANAGER	RELIABILITY ENGINEERING – DOMAIN OWNER	ER APPOINTED APPROVER	PM PROGRAMME IMPLEMENTATION ENGINEER	NUCLEAR PROJECT MANAGEMENT	PROGRAMME OVERSIGHT COMMITTEE (POC)	NOTES & REFERENCES
	INTEGRATED EQUIPMENT RELIABILITY PROCESS												
	1	2	3	4	5	6	7	8	9	10	11	12	
3. Assess the proposed change against the ER Process goals.			[R]	(S)	(S)			(S)					Screens the proposed change to determine whether the change is necessary and merits further action. Check existing ERCR actions to prevent initiating duplicate ER change requests. Complete 'Part B' of the 'ER Change Request Form'. Consult for input, as required.
4. Is the proposed change necessary?	[I]		Y/N										If it is concluded that the change is not required, notify the originator, record the reason for rejection on the form and close the ER Change Request. Complete and sign 'Part B' of the 'ER Change Request Form' and check "Rejected". Attach completed 'ER Change Request' Form to ERCR on ActionWay. Go to step 17 below.
5. Accept the request for change, assign a compiler and update trend codes.	[I]		[R]			[I]							Complete and sign 'Part B' the 'ER Change Request Form' and check "Accepted". Attach completed 'ER Change Request' Form to ERCR on ActionWay.
6. Investigate the ER Change Request to identify the full scope of the required change.	(S)		[S]	(S)	(S)	[R]		[C]					Document in IQReview justification field. ERCR Coordinator monitors and provides regular 'age analysis reports' to the RE Manager, for management of the expected completion dates.
7. Is the proposed change permanent in nature?						Y/N							Initiate C4, step 1 (PM Deferral Process)

WORK FLOW RESPONSIBILITY MATRIX | **APPENDIX 2 - INTEGRATED EQUIPMENT RELIABILITY PROCESS**

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Flow Path:
Main Flow Secondary Flow

INTEGRATED EQUIPMENT RELIABILITY PROCESS

ACTIVITIES	1 ORIGINATOR	2 KLM-005 CO-ORDINATOR	3 RE ERCR CO-ORDINATOR	4 COMPONENT ENGINEER	5 SYSTEM ENGINEER	6 RELIABILITY ENGINEERING - COMPILER	7 RELIABILITY ENGINEERING MANAGER	8 RELIABILITY ENGINEERING – DOMAIN OWNER	9 ER APPOINTED APPROVER	10 PM PROGRAMME IMPLEMENTATION ENGINEER	11 NUCLEAR PROJECT MANAGEMENT	12 PROGRAMME OVERSIGHT COMMITTEE (POC)	NOTES & REFERENCES
8. Is the proposed change justified?	(I)		[S]			Y/N	[C]						Where there is an existing PM Basis, determine if the proposed change is justified. If the change is not justified, document the reason, notify the originator and close the 'ER Change Request'. Go to step 17 below. ***NOTE:*** *Legacy Maintenance Basis documents are no longer updated. Any changes to their requirements are effected by developing a new PM Basis for the affected components in the IQReview Module of the ER Software.*
9. Continue with the PM Basis update.						[R]							
10. Is the proposed change a change to a PM Template?						N/Y							Go to B4, step 1 (PM Template Development).
11. Is the proposed change a change to a component ER Classification?						N/Y							Performed by raising a MS Revision Request on the IQReview Module of the ER Software. Go to A, step 2 (Scoping & Classification of Components).
12. Initiate the PM Strategy change.						[R]							Performed by raising a MS Revision Request on the IQReview Module of the ER Software. Go to B2, step 1 (PM Strategy Development).
13. Are PM Strategies approved and ready for implementation						Y/N							From B3, step 13 (PM Strategy Approved) Go to B3, step 6 (PM Strategy Review & Approval)
14. Close ER Change Request.			(S)			[R]				(I)			From A, step 3 (Scoping & Classification of Components). Document the changes made in the "Response" section on ActionWay. Complete the "Respond" ActionWay Workflow step to close ERCR

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Flow Path:
Main Flow Secondary Flow

ACTIVITIES	1 ORIGINATOR	2 KLM-005 CO-ORDINATOR	3 RE ERCR CO-ORDINATOR	4 COMPONENT ENGINEER	5 SYSTEM ENGINEER	6 RELIABILITY ENGINEERING - COMPILER	7 RELIABILITY ENGINEERING MANAGER	8 RELIABILITY ENGINEERING – DOMAIN OWNER	9 ER APPOINTED APPROVER	10 PM PROGRAMME IMPLEMENTATION ENGINEER	11 NUCLEAR PROJECT MANAGEMENT	12 PROGRAMME OVERSIGHT COMMITTEE (POC)	NOTES & REFERENCES
INTEGRATED EQUIPMENT RELIABILITY PROCESS													
15. Periodically review and manage all GAs linked to ERCRs, to monitor implementation progress.			[S]			(S)	[R]	[S]		[S]		[I]	From C1, step 25 (PM Strategy Implementation). POC provides management oversight and monitors progress of PM implementation.
16. Are all required actions complete?			[S]				Y/N						ERCR Coordinator manages the items on ActionWay with trend codes as required.
17. Close ER Change Request.	(I)		[S]							[R]			From step 2, step 4 or step 8 above. Document the changes made in the on ActionWay. Complete the “Review for Closure” ActionWay Workflow step to close the action.

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INTEGRATED EQUIPMENT RELIABILITY PROCESS

ACTIVITIES	1	2	3	4 COMPONENT ENGINEER	5 SYSTEM ENGINEER	6 RELIABILITY ENGINEERING - COMPILER	7 RELIABILITY ENGINEERING MANAGER	8 RELIABILITY ENGINEERING – DOMAIN OWNER	9	10 MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	11	12	NOTES & REFERENCES
B2. PM STRATEGY DEVELOPMENT													See KGU-039, "Developing PM Strategies". ***NOTE:*** *PM Strategies are developed by Reliability Engineering staff authorised to perform this function.*
1. Select & group components for analysis.						[R]		[C]					From B1, step 12 (ER Change Control). From B4, step 26 (PM Template Development). Components can be grouped into bins on the IQReview Module of the ER Software. See KGU-039 for guidance.
2. Assemble & review relevant information & documentation.						[R]							A checklist of relevant information & documents is contained in Appendix 2 of KGU-039.
3. Is the component ER Classification complete?						Y/N							Go to A, step 2 (Scoping & Classification of Components).
4. Does a KOU approved PM Template exist that is applicable to the component/s?						Y/N							
5. Should a new PM Template be developed?						N/Y	[C]	[C]					Where it would be applicable to multiple components, consider if a new PM Template should be developed. See KGU-037 for guidance. Go to B4, step 1 (PM Template Development). Proceed to step 9 below.
6. Is the PM Template approved, up-to-date and ready for template association?						Y/N							If no, go to B4, step 1 (PM Template Development).
7. Associate component/s to the applicable PM Template.						[R]							Performed on the IQReview Module of the ER Software. See KGU-039 for guidance.

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Flow Path:
Main Flow Secondary Flow

ACTIVITIES	1	2	3	4 COMPONENT ENGINEER	5 SYSTEM ENGINEER	6 RELIABILITY ENGINEERING - COMPILER	7 RELIABILITY ENGINEERING MANAGER	8 RELIABILITY ENGINEERING – DOMAIN OWNER	9	10 MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	11	12	NOTES & REFERENCES
8. Select applicable PM Tasks from the associated PM Template.				(S)	(S)	[R]				(S)			Consult relevant groups for support, as required. Performed on the IQReview Module of the ER Software. See KGU-039 for guidance.
9. Identify any component specific PM Tasks required.				(S)	(S)	[R]				(S)			From step 5 above. From B4, step 1 (PM Template Development). These tasks can be in addition to the PM Tasks selected from the applicable PM Template. Where no PM Template will be developed, component specific tasks can be identified in the PM Strategy. Consult relevant groups for support, as required. See KGU-039 for guidance.
10. Establish PM Task Intervals.				(S)	(S)	[R]				(S)			Apply the PM Task Interval prescribed for the specific component ER Classification. Establish an optimised task interval based on the component specific requirements & OE. Consult relevant groups for support, as required. Performed on the IQReview Module of the ER Software. See KGU-039 for guidance.

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ACTIVITIES	1	2	3	4 COMPONENT ENGINEER	5 SYSTEM ENGINEER	6 RELIABILITY ENGINEERING - COMPILER	7 RELIABILITY ENGINEERING MANAGER	8 RELIABILITY ENGINEERING – DOMAIN OWNER	9	10 MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	11	12	NOTES & REFERENCES
11. Identify & justify PM Template deviations.				(S)	(S)	[R]				(S)			Identify whether the PM Strategy Task concurs with, or deviates from the PM Template recommendation. An appropriate technical justification is required for any PM Template deviation. For Statutory or Regulatory tasks, the selected task interval may not exceed the interval specified in the PM Template. For other tasks, any deviation in excess of 25% of the task interval specified in the PM Template is considered a deviation and requires a technical justification. Consult the "PM Template Concurrence Decision Guidance Table" in Appendix 8 of KGU-039. Consult relevant groups for support, as required. Performed on the IQReview Module of the ER Software. See KGU-039 for guidance.
12. Document the PM Basis.						[R]							The PM Basis justifies the PM Strategy for the component. See KGU-039 for guidance.
13. Associate pre-existing Current Practice Tasks to the relevant PM Template Tasks or component specific PM Tasks identified.						[R]							This enables the identification of implementation actions in step 14. Any pre-existing Current Practice Task with no association is identified and considered for exclusion from the PM requirements. Performed on the IQReview Module of the ER Software. See KGU-039 for guidance.

WORK FLOW RESPONSIBILITY MATRIX	APPENDIX 2 - INTEGRATED EQUIPMENT RELIABILITY PROCESS

R – Responsible A – Approve F – File • – Outside Matrix Scope Y/N or N/Y – Decision C – Concur I – Informed S – Service [ ] – Mandatory Requirement ( ) – As Appropriate/Required Flow Path: Main Flow Secondary Flow	INTEGRATED EQUIPMENT RELIABILITY PROCESS												NOTES & REFERENCES
				COMPONENT ENGINEER	SYSTEM ENGINEER	RELIABILITY ENGINEERING - COMPILER	RELIABILITY ENGINEERING MANAGER	RELIABILITY ENGINEERING – DOMAIN OWNER		MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP			
ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11	12	
14. Identify PM Strategy implementation actions.						[R]				(S)			Identify the action required to implement each PM Task on SAP. Include pertinent information regarding implementation constraints. Consult relevant groups for support, as required. Performed on the IQReview Module of the ER Software. See KGU-039 for guidance.
15. Identify all PM Tasks that form part of an SPV strategy.						[R]							Where the component is classified as an SPV and the PM Task forms part of the SPV strategy. See relevant SPV Evaluation for SPV strategy and PM Tasks. Performed on the IQReview Module of the ER Software. See KGU-039 for guidance.
16. Validate CP Task deletions & Task Interval extensions.						[R]							See KGU-039 for guidance.
17. Once the draft PM Strategy is complete, initiate the review & approval process.						[R] →							Go to B3, step 1 (PM Strategy Review & Approval).

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Flow Path:
Main Flow Secondary Flow

INTEGRATED EQUIPMENT RELIABILITY PROCESS

ACTIVITIES	1	2	3	COMPONENT ENGINEER (4)	SYSTEM ENGINEER (5)	RELIABILITY ENGINEERING - COMPILER (6)	RELIABILITY ENGINEERING MANAGER (7)	RELIABILITY ENGINEERING – DOMAIN OWNER (8)	ER APPOINTED APPROVER (9)	MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP (10)	NUCLEAR ENGINEERING (11)		NOTES & REFERENCES
B3. PM STRATEGY REVIEW & APPROVAL													See KGU-039, "Developing PM Strategies". ***NOTE:*** *Component ER Classifications are reviewed and approved as part of the PM Strategy.*
1. Identify & assign the reviewers as appropriate.				(S)	(S)	[R]		[C]					From B2, step 17 (Developing PM Strategies). From A, step 19 (Scoping and Classification of Components). From step 12 below Performed by configuring the Workflow, on the IQReview Module of the ER Software. PM Strategy reviewers are assigned in accordance with the requirements of the applicable standard. ***NOTE:*** *Reviewers need to be assigned for both the ER Classifications and the actual PM Strategy, as required.*
2. Assign an ER Appointed Approver.						[R]	[S]		[S]				Performed on the IQReview Module of the ER Software. ***NOTE:*** *PM Strategies are approved by persons appointed in writing as an "ER Appointed Approver" by the Programme Engineering Manager, in accordance with the applicable standard.*
3. Submit the draft PM Strategy for review.						[R]							Performed by selecting "Start Workflow", on the IQReview Module of the ER Software. Reviews are performed electronically on IQReview.
4. Review the draft ER Component Classifications and return any comments to the compiler for resolution.					[R]						(C)		From step 9 below. Review is performed by the responsible System Engineer. For components modelled in the PSA, review by the PSA Group is required.

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Flow Path:
Main Flow Secondary Flow

ACTIVITIES	1	2	3	4 COMPONENT ENGINEER	5 SYSTEM ENGINEER	6 RELIABILITY ENGINEERING - COMPILER	7 RELIABILITY ENGINEERING MANAGER	8 RELIABILITY ENGINEERING – DOMAIN OWNER	9 ER APPOINTED APPROVER	10 MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	11 NUCLEAR ENGINEERING		NOTES & REFERENCES
5. Review the draft PM Strategy and return any comments to the compiler for resolution.				(R)	(C)			(C)		(C)	(C)		A graded approach to PM Strategy reviews is implemented to streamline the process – see PM Strategy Review table in Appendix 11, KGU-039. The PM Strategy review shall be completed within 30 days of the issue date. Where reviews are required urgently, the due date shall be negotiated with the applicable reviewer.
6. Is the PM Strategy acceptable?						Y/N							From B1, step 13 (ER Change Control)
7. Record relevant review comments & Reject the PM Strategy.				(S)	(S)			(S)		(S)	(S)		Performed by selecting "Reject", on the IQReview Module of the ER Software.
8. Correlate and resolve all comments by all reviewers and revise the draft PM Strategy as necessary.						[R]		[C]					It may be necessary to return to the relevant step in A (Scoping & Classification of Components) or B2 (PM Strategy Development).
9. Re-submit the draft PM Strategy for review.						[R]							Performed by selecting "Re-submit Workflow", on the IQReview Module of the ER Software. Return to step 4 above.
10. Record any relevant review comments & accept the draft PM Strategy.				(S)	(S)			(S)		(S)	(S)		Performed by selecting "Approve", on the IQReview Module of the ER Software.
11. Once all the reviews have been completed, submit the draft PM Strategy to the assigned ER Appointed Approver for approval.						[R]		[C]					Performed by selecting "Submit for Approval", on the IQReview Module of the ER Software.
12. Is the draft PM Strategy ready for approval?									Y/N				ER Appointed Approver confirms that the PM Strategy conforms to the requirements of the applicable standard, that the required reviewers were identified, their review comments were resolved and that they have given their acceptance. Return to step1 above.

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				COMPONENT ENGINEER	SYSTEM ENGINEER	RELIABILITY ENGINEERING - COMPILER	RELIABILITY ENGINEERING MANAGER	RELIABILITY ENGINEERING – DOMAIN OWNER	ER APPOINTED APPROVER	MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	NUCLEAR ENGINEERING		
ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11		
13. Approve the component PM Strategy.									[A]				Performed by selecting “Approve”, on the IQReview Module of the ER Software.
													Proceed to C1, step 1 (PM Strategy Implementation). Proceed to B1, step 13 (ER Change Control) Proceed to C1, step 34 (PM Implementation) Proceed to C2, step1 (KLM-005 Change Control) for Critical PM Strategies. Raise a GA on ActionWay against the relevant ERCR, in order to manage and track the KLM-005 updates.

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Flow Path:
Main Flow Secondary Flow

ACTIVITIES	ORIGINATOR 1	OPERATING 2	3	ENGINEERING SME 4	SYSTEM / COMPONENT ENGINEER 5	6	RELIABILITY ENGINEERING MANAGER 7	RELIABILITY ENGINEERING – DOMAIN OWNER 8	ER APPOINTED APPROVER 9	MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP 10	NUCLEAR ENGINEERING 11		NOTES & REFERENCES
B4. PM TEMPLATE DEVELOPMENT													See KGU-037, "Developing PM Templates". ***NOTE:*** *PM Templates are compiled by Reliability Engineering staff authorised to perform this function.*
1. Confirm the need to compile a new / revise an existing PM Template and identify the component SME.	(I)			(I)			[C]	Y/N					From B1, step 10 (ER Change Control). From B2, step 5 or 6 (PM Strategy Development). Go to B2, step 9 (PM Strategy Development). Notify the originator if it is concluded that a new PM Template will not be compiled.
2. Is the required change to be implemented by revising an existing PM Template?								N/Y					A new PM Template is only developed where no existing PM Template is applicable. Consider revising the scope of an existing PM Template.
3. Assemble and maintain a file of all required changes for each approved PM Template.								[R]					Approved PM Templates are only revised periodically, in accordance with a schedule determined by the RE Manager. ***NOTE:*** *This process has been adopted as the revision of a PM Template results in the review of all associated PM Strategies.* The responsible RE Domain Owner maintains a file for each PM Template within the Domain. Urgent changes to any PM Task requirements are implemented by revising the relevant PM Strategies. In certain circumstances and with the agreement of the RE Manager, the RE Domain Owner may decide to process an ad hoc revision of the PM Template.

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Flow Path:
Main Flow Secondary Flow

ACTIVITIES	ORIGINATOR	OPERATING		ENGINEERING SME	SYSTEM / COMPONENT ENGINEER		RELIABILITY ENGINEERING MANAGER	RELIABILITY ENGINEERING – DOMAIN OWNER	ER APPOINTED APPROVER	MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	NUCLEAR ENGINEERING		NOTES & REFERENCES
	1	2	3	4	5	6	7	8	9	10	11		
4. Initiate development of a new or revision of an existing PM Template.							[C]	[R]					Performed by adding a new PM Template or creating a new draft of an approved PM Template, on the IQReview Module of the ER Software. Revision of approved PM Templates is performed in accordance with the revision schedule, determined by the RE Manager. See KGU-037 for guidance.
5. Establish / revise PM Template scope.								[R]					Determine and record the 'Title', 'Short Description' and categorise the PM Template. PM Templates are categorised by discipline (Domain) and then by sub-category of the component type. Performed on the IQReview Module of the ER Software. See KGU-037 for guidance.
6. Define / revise PM Template boundaries.				(S)	(S)			[R]		(S)	(S)		Used to determine the applicability of the PM Template to specific equipment. Consult relevant groups for input, as required. Performed on the IQReview Module of the ER Software. See KGU-037 for guidance.
7. Gather the relevant input information and reference documents, in order to develop the PM Template.								[R]					Sources include: • EDF PM Templates • EPRI PM Templates • OEM PM Recommendations • Plant OE • Industry OE • Legacy Maintenance Bases • Other KOU Programme Requirements Capture all references. See KGU-037 for guidance.

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Main Flow Secondary Flow

	ORIGINATOR	OPERATING		ENGINEERING SME	SYSTEM / COMPONENT ENGINEER		RELIABILITY ENGINEERING MANAGER	RELIABILITY ENGINEERING – DOMAIN OWNER	ER APPOINTED APPROVER	MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	NUCLEAR ENGINEERING		**NOTES & REFERENCES**
ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11		
8. Populate the PM Template with the tasks required by other KOU programmes.		(S)			(S)			[R]			(S)		Only SRSM, ISIP, ISTP & EQ tasks are included in the PM Template. Requirements are captured under the applicable programme heading. Task intervals are captured as "As Required". See KGU-037 for guidance.
9. Is there a corresponding & applicable EDF PM Template?								Y/N					
10. Compile Failure Mode Analysis (FMA).		(S)			(S)			(R)		(S)			Performed on the IQReview module of the ER Software. Record: • FEG Component • Object/Part • Component Functional Failure • Damage (Failure Mode) • Failure Cause • Probability • Notes See KGU-037 for guidance.
11. Can degradation be detected?								Y/N					***NOTE:*** *Process each failure combination identified in step 10 above, through steps 11 to 14, for PM Task selection.*
12. Prescribe an applicable and effective Condition Monitoring or Predictive PM Task.		(S)			(S)			(R)		(S)			See KGU-037 for guidance.
13. Is there a cost effective Periodic or Planned PM to prevent failure?								Y/N					
14. Can failure or consequences be controlled?								Y/N					Initiate design change (modification) to address potential failure. Initiate configuration change or strategy to control failure.

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Flow Path:
Main Flow Secondary Flow

ACTIVITIES	1 ORIGINATOR	2 OPERATING	3	4 ENGINEERING SME	5 SYSTEM / COMPONENT ENGINEER	6	7 RELIABILITY ENGINEERING MANAGER	8 RELIABILITY ENGINEERING – DOMAIN OWNER	9 ER APPOINTED APPROVER	10 MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	11 NUCLEAR ENGINEERING		NOTES & REFERENCES
15. Cross-reference the corresponding EDF PM Template to the KOU PM Template.								[R]					Reference the EDF PM Template reference number in the Koeberg PM Template Boundary Definition. Performed on the IQReview Module of the ER Software.
16. Select the applicable PM Tasks from the EDF PM Template.		(S)			(S)			[R]		(S)			Where appropriate, if an established EDF PM Template and basis exists, this will be used as an input for the KOU PM template. Validate the applicability to KOU of each EDF Task. Take relevant KOU Operating Experience into consideration. Exclude EDF-specific PM Tasks (not applicable to Koeberg). See KGU-037 for guidance.
17. Identify and justify all deviations from the EDF PM Template, where applicable.		(S)			(S)			(R)		(S)			Where the EDF PM Template forms the technical basis, all deviations to the corresponding EDF Template must be identified and appropriately justified. See KGU-037 for guidance.
18. Develop the PM Template Tasks.		(S)			(S)			[R]		(S)			Group tasks by Task Type. The following task detail is required: • Task Objective • Task Content • Task Interval • Limitations/Conditions • Justification for Deviation (from EDF PM Template) Where a FMA has been developed, associate each identified failure to the PM Task required to mitigate the failure consequences. ***NOTE:*** *Each PM Task may be associated with multiple Failure combinations.* Performed on the IQReview module of the ER Software. See KGU-037 for guidance.

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Flow Path:
Main Flow Secondary Flow

ACTIVITIES	ORIGINATOR (1)	OPERATING (2)	(3)	ENGINEERING SME (4)	SYSTEM / COMPONENT ENGINEER (5)	(6)	RELIABILITY ENGINEERING MANAGER (7)	RELIABILITY ENGINEERING – DOMAIN OWNER (8)	ER APPOINTED APPROVER (9)	MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP (10)	NUCLEAR ENGINEERING (11)		NOTES & REFERENCES
19. Determine appropriate task periodicities for each PM Template Task, for all applicable Criticality, Duty Cycle and Service Condition combinations.		(S)			(S)			[R]		(S)	(S)		***NOTE:*** *Periodicities may vary based on Criticality, Duty Cycle and Service Conditions.* Consider: • Pre-existing CP PM Task Periodicities • Relevant Plant / Industry OE • Alignment to other KOU Programme requirements • Outage Strategy See KGU-037 for guidance.
20. Finalise the draft PM Template, select the relevant Approver and submit for review and approval.								[R]					Performed by selecting "Submit Draft" and selecting the required Approver for the PM Template, on the IQReview Module of the ER Software.
21. Review the draft PM Template and submit any comments to the compiler for resolution.		(C)		[R]	(C)					(C)			From step 25 below PM Templates are reviewed and approved by the relevant Engineering SME, in accordance with the applicable standard. Reviews are performed electronically on the IQReview Module of the ER Software. ***NOTE:*** *Additional supporting reviews may be requested as appropriate, but only the SME can review and approve on IQReview.*
22. Is the draft PM Template acceptable?				Y/N									
23. Reject the PM Template and record relevant review comments.				[R]				(S)					Performed by selecting "Reject" PM Template, on the IQReview Module or the ER Software.
24. Correlate and resolve all comments and revise the draft PM Template as necessary.								[R]					

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INTEGRATED EQUIPMENT RELIABILITY PROCESS												NOTES & REFERENCES
ORIGINATOR	OPERATING		ENGINEERING SME	SYSTEM / COMPONENT ENGINEER		RELIABILITY ENGINEERING MANAGER	RELIABILITY ENGINEERING – DOMAIN OWNER	ER APPOINTED APPROVER	MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	NUCLEAR ENGINEERING		
ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11		
25. Re-submit the revised draft PM Template for review and approval.								[R]					Performed by selecting "Submit Draft" and the required Approver for the PM Template, on the IQReview Module of the ER Software. Return to step 21 above.
26. Approve the PM Template and record any relevant review comments.				[A]									Performed by selecting "Approve" PM Template, on the IQReview Module or the ER Software.
													Proceed to B2, step 1 (PM Strategy Development). ***NOTE:*** *Where a PM Template is revised, all PM Strategies on components linked to that PM Template will have a new draft created automatically.*

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Main Flow Secondary Flow

ACTIVITIES	1 OUTAGE	2 WORK MANAGEMENT	3 ERCR CO-ORDINATOR	4 COMPONENT ENGINEER	5 SYSTEM ENGINEER	6 RELIABILITY ENGINEERING - COMPILER	7 RELIABILITY ENGINEERING MANAGER	8 RELIABILITY ENGINEERING – DOMAIN OWNER	9 PM IMPLEMENTATION ENGINEER	10 MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	11 PROGRAMMES ENGINEERING MANAGER	12 PROGRAMME OVERSIGHT COMMITTEE (POC)	NOTES & REFERENCES
C. PM IMPLEMENTATION													
C1. PM STRATEGY IMPLEMENTATION													
1. Perform a risk assessment on PM revisions and establish appropriate target start dates for each PM task to be implemented.	(S)	(S)			(S)			(S)	[R]	(S)			From B3, step 13 (PM Strategy Review and Approval). Determine or review start dates (first performance date) for both pre-existing tasks as well as first time implementations, based on the results of the risk assessment. See KGU-040, "Integrated Equipment Reliability Process - Establishing PM Task First Performance Dates" For large scale PM revisions, compile a PM Implementation Matrix. Consider the requirements of and alignment to the other Koeberg programmes.
2. Do the approved PM Strategies that require implementation form part of a large scale Equipment Reliability Improvement initiative?									Y/N				***NOTE:*** *For large scale PM revisions, the routine PM implementation process and site resources may be insufficient to accommodate the required change.*
3. Develop and implement a project plan to manage the implementation of the large scale PM revisions.									[R]	(C)		(C)	For guidance consult INPO AP-913 Rev 6, "Equipment Reliability Process Description", Section 3.6.1, "Organisational Approach and Project Plan for Large Scale PM Projects/Revisions.
4. Implementation plan endorsed by the Programme Oversight Committee (POC)?												N/Y	
5. Resolve concerns raised by the Programme Oversight Committee (POC)						[S]		[S]	[R]				

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INTEGRATED EQUIPMENT RELIABILITY PROCESS

	OUTAGE	WORK MANAGEMENT	ERCR CO-ORDINATOR	COMPONENT ENGINEER	SYSTEM ENGINEER	RELIABILITY ENGINEERING - COMPILER	RELIABILITY ENGINEERING MANAGER	RELIABILITY ENGINEERING – DOMAIN OWNER	PM IMPLEMENTATION ENGINEER	MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	PROGRAMMES ENGINEERING MANAGER	PROGRAMME OVERSIGHT COMMITTEE (POC)	**NOTES & REFERENCES**
ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11	12	
6. Will the PM tasks be implemented in accordance with the results of the risk assessment and the established target start dates?									Y/N				The risk assessment performed and start dates established in step 1, above.
7. Develop and implement appropriate risk mitigation / bridging strategies.			(S)	(S)	(S)	(S)	(C)	[R]		(S)		(C)	Risk mitigation actions / bridging strategies are required for high risk items, where PM tasks cannot be implemented in accordance with the results of the risk assessment and the established target start dates. Raise General Actions on ActionWay linked to the relevant ERCR, in order to track implementation of the risk mitigation actions. **NOTE:** *A graded approach is taken to the authorisation of bridging strategies – low and intermediate risk bridging strategies are approved by the Reliability Engineering Manager and high risk bridging strategies are authorised by the Programmes Engineering Manager.*
8. Prioritise PM implementation, assign responsibility and establish appropriate due dates for PM implementation.	(C)	[C]		(C)	(C)		[C]		[C]	[C]	[C]	[R]	The overriding consideration when establishing start dates for PM activities is the reliability of the impacted equipment and the need for timely PM. However, practical considerations (plant needs, available resources, outage schedules, running regimes, etc.) must be managed to implement a batch of PMs successfully, especially for large scale initiatives. Programme Oversight Committee (POC) prioritise and schedule PM implementation in order to manage this risk.

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ACTIVITIES	1 OUTAGE	2 WORK MANAGEMENT	3 ERCR CO-ORDINATOR	4 COMPONENT ENGINEER	5 SYSTEM ENGINEER	6 RELIABILITY ENGINEERING - COMPILER	7 RELIABILITY ENGINEERING MANAGER	8 RELIABILITY ENGINEERING – DOMAIN OWNER	9 PM IMPLEMENTATION ENGINEER	10 MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	11 PROGRAMMES ENGINEERING MANAGER	12 PROGRAMME OVERSIGHT COMMITTEE (POC)	NOTES & REFERENCES
9. Initiate implementation of the revised PM requirements.									[R]	(I)			Raise General Actions (Type "SAP Imp") on ActionWay against the relevant ERCR, in order to track the development and updating of Service Notifications and Working Procedures. Due dates are assigned by POC, as appropriate. Discuss the actions with the Responsible Execution Group. For large scale revisions, raise one ERCR per logical batch of PM Strategies with associated "SAP Imp" actions per line group for implementation.
10. Establish an implementation team with representation from each of the execution groups involved, as appropriate.									[R]	[S]		[I]	POC monitors & supports the management of the integrated implementation effort.
11. Complete SAP Change Control Forms (and Service Notifications) for each SAP PM Task List requiring development or updating, and develop required PM Task detail.										[•]			KFM-PS-023 In accordance with KAA-820. ***NOTE:*** *Maintenance Activity Classification (KAM-113), MBOMs and Spares Assessments (KAA-614) will also need to be addressed.*
12. Compile or revise Maintenance Working Procedures, as required.								(S)		(•)			In accordance with KSA-011, KAA-500 and KSM-001.
13. Establish task acceptance criteria, where required.				(S)	(S)			(S)		(•)			
14. Establish Post Maintenance Requalification Testing requirements.				(S)	(S)					(•)			See KAA-647, KAA-648 and KSA-147.
15. Periodically review and manage all SAP Implementation actions linked to type ERCRs, to monitor implementation progress.			[S]			(S)	[I]		[R]		[I]		From step 21 below. RE Manager reports on progress to Programmes Engineering Manager. The ERCR Custodian manages the items on ActionWay.

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Main Flow ⟷ Secondary Flow

INTEGRATED EQUIPMENT RELIABILITY PROCESS

ACTIVITIES	1 OUTAGE	2 WORK MANAGEMENT	3 ERCR CO-ORDINATOR	4 COMPONENT ENGINEER	5 SYSTEM ENGINEER	6 RELIABILITY ENGINEERING - COMPILER	7 RELIABILITY ENGINEERING MANAGER	8 RELIABILITY ENGINEERING – DOMAIN OWNER	9 PM IMPLEMENTATION ENGINEER	10 MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	11 PROGRAMMES ENGINEERING MANAGER	12 PROGRAMME OVERSIGHT COMMITTEE (POC)	NOTES & REFERENCES
16. Is there a risk that due dates of any PM implementation actions linked to ERCRs will be exceeded?										N/Y			
17. Notify and present to POC the cause of the delay and the proposed recovery plan.									[I]	[R]		[C]	Due dates may only be extended with the prior consent of POC.
18. Has POC consent been obtained to extend the due dates of GAs linked to ERCRs.										N/Y			
19. Review, revise and re-implement the risk mitigation actions / bridging strategies, as required.				(S)	(S)	(S)		[R]		(S)		(C)	The risk mitigation developed in step 6 above. Update GAs for risk mitigation actions.
20. Re-schedule the PM Implementation actions linked to ERCRs in accordance with POC extensions granted.			(S)				[I]		[C]	[R]		[C]	
21. Have all required SAP Change Control Forms and Maintenance Working Procedures been developed/revised and do they accurately reflect the PM Strategy requirements?								(S)	Y/N			(I)	Return to step 15 above.
22. Is the PM Strategy on a component with an ER Classification of "Critical"?									N/Y				
23. Verify the PM Tasks are listed on the "Mandatory Preventive Maintenance Listing"									Y/N				KLM-005 Listing From C2, step 12 (KLM-005 Change Control) Go to C2, step 1 (KLM-005 Change Control) Raise a GA on ActionWay against the relevant ERCR, in order to manage and track the KLM-005 updates.

WORK FLOW RESPONSIBILITY MATRIX | **APPENDIX 2 - INTEGRATED EQUIPMENT RELIABILITY PROCESS**

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Flow Path:
Main Flow Secondary Flow

INTEGRATED EQUIPMENT RELIABILITY PROCESS

ACTIVITIES	1 OUTAGE	2 WORK MANAGEMENT	3 ERCR CO-ORDINATOR	4 COMPONENT ENGINEER	5 SYSTEM ENGINEER	6 RELIABILITY ENGINEERING - COMPILER	7 RELIABILITY ENGINEERING MANAGER	8 RELIABILITY ENGINEERING – DOMAIN OWNER	9 PM IMPLEMENTATION ENGINEER	10 MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	11 PROGRAMMES ENGINEERING MANAGER	12 PROGRAMME OVERSIGHT COMMITTEE (POC)	NOTES & REFERENCES
24. Update the Work Management Planning Database (SAP PM).		[•]										[C]	In accordance with KAA-820, "Updating the Work Management Planning Database". For large scale PM revisions, due dates are established at POC.
25. Does the Work Management Database (SAP) accurately reflect the component PM Strategy requirements.		[S]							Y/N				The Work Management Statutory Controller periodically compiles a report on the alignment between SAP PM & KLM-005. Go to B1, step 15 (ER Change Control) for the closure of the ERCR if appropriate.
26. Plan and Schedule the work in accordance with the Work Management Process.		[•]											See KSA-126, KAA-721 and KAA-835.
27. Perform the PM Tasks in accordance with the Work Execution Processes.										[•]			See KSA-059, KSA-069, KSA-105, KAA-501, 331-88, KAA-667, KSM-002, KSA-147, KSM-014, KAD-023, KSA-145, etc.
28. Has the PM Task been completed, as scheduled?										Y/N			
29. Will the PM Task exceed the allowable Grace Period?		(S)							(S)	N/Y			No periodic work activity shall exceed its grace period without formal approval from the relevant authority. See KSA-126, "Control of Statutory & Non-Statutory Work Activities, and KAA-835, "Work Activity Monitoring Process".
30. Initiate a PM Deferral Request.		(S)								[R]			Go to C4, step 1 (PM Deferral)
31. Perform requalification testing.										[•]			See KAA-647, KAA-648, KSM-001, KSA-147, etc.
32. Capture Equipment / Asset History.										[•]			See KAM-516, 240-42362878, 32-1050 and KSM-015.

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INTEGRATED EQUIPMENT RELIABILITY PROCESS

ACTIVITIES	1 OUTAGE	2 WORK MANAGEMENT	3 ERCR CO-ORDINATOR	4 COMPONENT ENGINEER	5 SYSTEM ENGINEER	6 RELIABILITY ENGINEERING - COMPILER	7 RELIABILITY ENGINEERING MANAGER	8 RELIABILITY ENGINEERING – DOMAIN OWNER	9 PM IMPLEMENTATION ENGINEER	10 MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	11 PROGRAMMES ENGINEERING MANAGER	12 PROGRAMME OVERSIGHT COMMITTEE (POC)	NOTES & REFERENCES
33. Document the As-Found Equipment Condition.										[•]			This is done by recording the 'As-Found Condition Code' in accordance with KSM-015. ***NOTE:*** *The intent of this step is for the worker to capture the extent of degradation observed (worse than or less than expected), in order for Engineering to adjust the PM Task or Periodicity based on actual plant OE.* Input to F, step 1 (Performance Monitoring). Maintenance results provide an input to Performance Monitoring.
34. Do the requirements of this approved PM Strategy supersede any requirements contained in a legacy Maintenance Basis document?			Y/N					(S)	(S)				From B3, step 13 (PM Strategy Review & Approval) ***NOTE:*** *Legacy Maintenance Basis documents are no longer updated, but are retained as they contain the basis for the pre-existing PM Programme requirements.*
35. Have all the requirements contained in the legacy Maintenance Basis document been superseded?			Y/N										Legacy Maintenance Basis documents can only be withdrawn once all prescribed requirements have been superseded.
36. Withdraw the legacy Maintenance Basis document.			[R]					(S)			(C)		In accordance with KAA-500. ***NOTE:*** *The withdrawn legacy document will remain available via the controlled document system, for reference.* Raise General Actions on ActionWay against the relevant ERCR, in order to track the withdrawal of the Maintenance Basis document.

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Main Flow Secondary Flow

INTEGRATED EQUIPMENT RELIABILITY PROCESS

ACTIVITIES	OUTAGE	WORK MANAGEMENT	KLM-005 CONTROLLER	COMPONENT ENGINEER	SYSTEM ENGINEER		RELIABILITY ENGINEERING MANAGER	RELIABILITY ENGINEERING – DOMAIN OWNER	PM PROGRAMME IMPLEMENTAITON ENGINEER	MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP		NATIONAL NUCLEAR REGULATOR (NNR)	NOTES & REFERENCES
	1	2	3	4	5	6	7	8	9	10	11	12	
C2. MANDATORY PM LISTING CHANGE CONTROL													
1. Identify and list all required changes to the "Mandatory Preventive Maintenance Listing", KLM-005, resulting from the approved PM Strategies ready for implementation.			[I]					[R]					From B3, step 13 (PM Strategy Review & Approval) From C1, step 23 (PM Strategy Implementation). All Preventive Maintenance Task requirements on components with an ER Classification of "Critical" are identified in the "Mandatory Preventive Maintenance Listing", KLM-005. PM Task requirements on CSR and SR equipment, prescribed by a legacy Maintenance Basis documents are retained in KLM-005, in the Legacy Listing, until superseded. The "Source" field in KLM-005 references the origin of the requirement. ***NOTE:*** *The actual Mandatory Preventive Maintenance Listing is maintained separately from the KLM-005 controlled document, and is available on the NAL. The electronic listing revision number has a suffix added to the KLM-005 document revision number.*
2. Determine and finalise the scope of changes to be included into the next revision of KLM-005.			[R]				[C]						Updates to the KLM-005 listing are processed periodically, as PM Strategies are approved.
3. Complete the "Mandatory Preventive Maintenance Listing Change Control Form", and detail all changes to be included in the revision.			[R]										KFU-016 See KLM-005.

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Main Flow Secondary Flow

ACTIVITIES	OUTAGE	WORK MANAGEMENT	KLM-005 CONTROLLER	COMPONENT ENGINEER	SYSTEM ENGINEER		RELIABILITY ENGINEERING MANAGER	RELIABILITY ENGINEERING – DOMAIN OWNER	PM PROGRAMME IMPLEMENTAITON ENGINEER	MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP		NATIONAL NUCLEAR REGULATOR (NNR)	NOTES & REFERENCES
	1	2	3	4	5	6	7	8	9	10	11	12	
4. Make an electronic copy of the master KLM-005 listing.			[R]										The master KLM-005 listing is located on the G-Drive and accessed via the NAL for viewing. ***NOTE:*** *The KLM-005 Controller is responsible for controlling the integrity of the data and ensuring that no unauthorised changes are made.*
5. Revise the copy of the KLM-005 listing to reflect all the changes identified on the "Mandatory Preventive Maintenance Listing Change Control Form".			[R]										Where items are to be deleted from the listing, mark them for deletion prior to actual deletion, for review purposes.
6. Review the revised KLM-005 listing and "Mandatory Preventive Maintenance Listing Change Control Form".								[R]					Technical review to confirm that the changes are correct and conform to the PM Basis requirements. Multiple changes and reviews can be documented on a single form. The various reviewers sign against the specific change item.
7. Have all changes been reviewed and confirmed as correct?								N/Y					
8. Authorise the revision of the KLM-005 listing.							(A)						Confirm that appropriate review has been performed and authorise the "Mandatory Preventive Maintenance Listing Change Control Form".
9. Replace the master KLM-005 listing with the authorised new revision.			[R]										Master KLM-005 listing is located on the G-Drive and accessed via the NAL for viewing. Retain electronic copies of all superseded versions of KLM-005 and the associated "Mandatory Preventive Maintenance Listing Change Control Forms".

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Main Flow Secondary Flow

ACTIVITIES	OUTAGE	WORK MANAGEMENT	KLM-005 CONTROLLER	COMPONENT ENGINEER	SYSTEM ENGINEER		RELIABILITY ENGINEERING MANAGER	RELIABILITY ENGINEERING – DOMAIN OWNER	PM PROGRAMME IMPLEMENTAITON ENGINEER	MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP		NATIONAL NUCLEAR REGULATOR (NNR)	NOTES & REFERENCES
	1	2	3	4	5	6	7	8	9	10	11	12	
10. Transmit the "Mandatory Preventive Maintenance Listing Change Control Form" and revised KLM-005 listing to TD&RM as a record.			[R]										In accordance with KSA-038 and KAA-830. See the Reliability Engineering Quality Records List.
11. Inform all stakeholders that a new revision of the "Mandatory Preventive Maintenance Listing", KLM-005 has been approved.	[I]	[I]	[R]	[I]	[I]			[I]	[I]	[I]			
12. Inform the NNR in writing, that the "Mandatory Preventive Maintenance Listing", KLM-005 has been revised.			(S)				[R]					[I]	Within 30 days of authorisation. Copy of KLM-005 with covering letter to be sent via GS&A.
													Go to C1, step 23 (PM Strategy Implementation)

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Flow Path:
Main Flow Secondary Flow

ACTIVITIES	1 SYSTEMS ENGINEERING MANAGER	2 COMPONENT ENGINEERING MANAGER	3 PROACTIVE PM REVIEW COORDINATOR / PM IMPLEMENTATION ENGINEER	4 SYSTEM ENGINEER	5 EQUIPMENT OWNER (SYSTEM OR COMPONENT ENGINEER)	6 PM DOMAIN OWNER	7 WORK MANAGEMENT	8 ERCR COORDINATOR	9	10	11	12	NOTES & REFERENCES
C3. PROACTIVE PM REVIEW PROCESS													
1. Issue executed task report for as-found conditions rated 1, 2 and 4							[R]						As found condition code rating is as per KSM-015, "Maintenance History Records".
2. Perform an initial screening to screen out any PM Tasks not required to be reviewed.			[R]										Proactive PM Review Coordinator to receive the task report from Work Management at T+3. Document the PM Tasks screened out on a weekly basis.
3. Distribute the listing as required to the relevant system, component and reliability engineers as determined by the scope of the listing.	(I)	(I)	[R]	(I)	(I)	(I)							
4. Review and confirm equipment reliability (ER) classification is correct.				Y/N									See KGU-035
5. Review equipment PM task content, potential failure modes and frequency are correct.					Y/N								The equipment owner is the Component or System Engineer, depending on the responsibility in KLU-001.
6. For critical components, review PM strategy (verify whether the complete strategy has been correctly implemented.			Y/N										This step is applicable to critical components only.
7. Initiate PM Implementation Actions (SAP Imp) as required			[R]										Review PM Implementation plan
8. Initiate PM Strategy (task & frequency) or ER Classification update if required by raising an ER Change Request.				(R)	(R)	(I)		(I)					Check for existing open ERCRs to avoid initiating duplicate actions. Discuss findings with other reviewers to ensure alignment. Initiate an ERCR on ActionWay (discuss with ERCR custodian). See Section B1. ER Change Control. If the Approved PM Strategy is correct on IQReview, but just not implemented on SAP, inform the PM Implementation Engineer to process the PM implementation request to maintenance.
9. Complete the PM Proactive Review Spreadsheet and forward to the Proactive PM Review Coordinator			(I)	[R]	[R]								Save the Weekly Review Spreadsheet in the allocated G:Drive Folder / SharePoint where applicable.

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Main Flow ←——→ Secondary Flow

ACTIVITIES	1 ORIGINATOR	2 WORK MANAGEMENT - ONLINE / OUTAGE	3 MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	4 SYSTEM ENGINEER	5 EQUIPMENT OWNER	6 COMPONENT ENGINEERING - REVIEWER	7 COMPONENT ENGINEERING – PM DEFERRAL CUSTODIAN	8 ENGINEERING LINE GROUP MANAGER	9 SSRB	10 SYSTEM ENGINEERING MANAGER	11 OTHER PROGRAMME OWNERS/PM PROGRAMME IMPLEMENTATION ENGINEER	12 PLANT HEALTH COMMITTEE - STRATEGIC (PHC-S)	NOTES & REFERENCES
C4. PM DEFERRAL PROCESS													KSA-126, “Control of Statutory and Non-Statutory Work Activities”. KAA-835, “Work Activity Monitoring process”. KGU-041, ‘PM Deferral Guide’.
1. Initiate a PM Deferral request for any Preventive Maintenance activity that is at risk of exceeding the allowable PM Grace Period.													From B1, step 7 (ER Change Control). From C1, step 30 (PM Strategy Implementation). From KAA-835, “Work Activity Monitoring process”. In accordance with KSA-126. PM Deferral requests to be submitted at least 3 weeks before the end of the PM Grace period. CR to be initiated to investigate the reason why the task cannot be performed (to prevent recurrence) Discuss with the ‘Component Engineering PM Deferral Custodian’ and PM Programme Implementation Engineer, before initiating a request. Complete KFU-039, “PM Deferral Request Form”
2. Confirm the need for the PM Deferral and assign a compiler.					[I]		[S]	[R]					See KGU-041, ‘PM Deferral Guide’. In accordance with KSA-126. ***NOTE:*** *Perform a rigorous challenge of PM Deferral requests on SPV components.*
3. Initiate a Condition Report (Type PM Deferral) on ActionWay to manage and track the PM Deferral request.					[I]		[R]						The PM Deferral Type CR description must be in the following format: “Postponement of [TRIGRAMME], **3RO Pump Overhaul** from Outage 111 to Outage 112”.

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Main Flow Secondary Flow

INTEGRATED EQUIPMENT RELIABILITY PROCESS

ACTIVITIES	ORIGINATOR (1)	WORK MANAGEMENT - ONLINE / OUTAGE (2)	MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP (3)	SYSTEM ENGINEER (4)	EQUIPMENT OWNER (5)	COMPONENT ENGINEERING - REVIEWER (6)	COMPONENT ENGINEERING – PM DEFERRAL CUSTODIAN (7)	ENGINEERING LINE GROUP MANAGER (8)	SSRB (9)	SYSTEM ENGINEERING MANAGER (10)	OTHER PROGRAMME OWNERS/PM PROGRAMME IMPLEMENTATION ENGINEER (11)	PLANT HEALTH COMMITTEE - STRATEGIC (PHC-S) (12)	NOTES & REFERENCES
4. Perform a technical evaluation and risk assessment.					[R]								A technical justification for PM Deferral is required and is based on an assessment of risk. ***NOTE:*** *Where the component is an SPV, this must be clearly identified in the PM Deferral document and an appropriate level of rigor must be applied in the technical evaluation.* Include the Corrective Actions required in order to implement the outcome of the PM Deferral evaluation, in the supporting document. Use KFU-044 "PM Deferral Technical Evaluation Form" See KGU-041 for the PM Deferral document format and for guidance.
5. Is the PM Deferral on a component classified as an SPV?					N/Y								
6. Review and evaluate the impact on the current SPV mitigation strategy.				[R]								(I)	If required, initiate an independent, but related GA to update of the SPV mitigation strategy. Go to D1, step 4 (SPV Evaluation Process).
7. Review the PM Deferral technical justification document.				[S]		[R]			[S]		[S]		Reviewer must ensure that any impact on other programmes is taken into account.
8. Does the task require a deferral or waiver from another programme?						N/Y					[•]		If postponing the task must be approved by a different programme owner (e.g. ISI, IST, SRSM waiver required) terminate the PM Deferral process.
9. Does the Technical Evaluation support the PM Deferral					Y/N								Indicate on the PM Deferral Technical Evaluation Form whether the PM Deferral is supported or rejected.

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INTEGRATED EQUIPMENT RELIABILITY PROCESS

ACTIVITIES	1 ORIGINATOR	2 WORK MANAGEMENT - ONLINE / OUTAGE	3 MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	4 SYSTEM ENGINEER	5 EQUIPMENT OWNER	6 COMPONENT ENGINEERING - REVIEWER	7 COMPONENT ENGINEERING – PM DEFERRAL CUSTODIAN	8 ENGINEERING LINE GROUP MANAGER	9 SSRB	10 SYSTEM ENGINEERING MANAGER	11 OTHER PROGRAMME OWNERS/PM PROGRAMME IMPLEMENTATION ENGINEER	12 PLANT HEALTH COMMITTEE - STRATEGIC (PHC-S)	NOTES & REFERENCES
10. Apply the Safety Evaluation Process.					[R]								In accordance with 240-143604773 (KAA-709).
11. Authorise the PM Deferral document.								(A)		(A)		(I)	See KGU-041 'PM Deferral Guide' for levels of authorisation Authoriser either signs to authorise PM Deferral or to support 'Rejection'.
12. Is the PM Deferral granted?					Y/N								PM Deferral is granted if technical evaluation is supported.
13. Inform all impacted parties that the PM Deferral was not granted and that the PM activity must be started prior to exceeding the allowable Grace Period.	[I]	[I]	[I]	[I]	[R]						[I]		***NOTE:*** *The PM Programme Implementation Engineer to be informed that the PM Deferral was not granted such that the activity is monitored.*
14. Will the PM Deferral 'Rejection' be appealed?			N/Y										If the PM Deferral was not initially granted and the PM Task **cannot** be executed before the last date of grace then the line group can lodge an appeal to senior management (Systems Engineering Manager / SSRB) to override the PM Deferral rejection can be made. Go to Step 19 Return to KAA-835, "Work Activity Monitoring process".
15. Close out the CR (Type PM Deferral) on ActionWay and transmit the PM Deferral package to TD&RM as a record.	[I]	[I]	(I)		[R]								Provide an explanation why the PM Deferral was not granted. Capture in ActionWay. See KSA-038. From step 22 (appeal denied) Attach the completed 'Rejected' PM Deferral Technical Evaluation form to the CR (type PM Deferral) on ActionWay

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INTEGRATED EQUIPMENT RELIABILITY PROCESS

ACTIVITIES	1 ORIGINATOR	2 WORK MANAGEMENT - ONLINE / OUTAGE	3 MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	4 SYSTEM ENGINEER	5 EQUIPMENT OWNER	6 COMPONENT ENGINEERING - REVIEWER	7 COMPONENT ENGINEERING – PM DEFERRAL CUSTODIAN	8 ENGINEERING LINE GROUP MANAGER	9 SSRB	10 SYSTEM ENGINEERING MANAGER	11 OTHER PROGRAMME OWNERS/PM PROGRAMME IMPLEMENTATION ENGINEER	12 PLANT HEALTH COMMITTEE - STRATEGIC (PHC-S)	NOTES & REFERENCES
16. Attach the authorised PM Deferral document to the relevant CR (Type PM Deferral) on ActionWay and load all required CAs/GAs.					[R]								From step 22 (appeal granted) CR (Type PM Deferral) on ActionWay will change Workflow Step to 'Waiting Action Completion' indicating that the PM Deferral is in force.
17. Issue the PM Deferral and transmit the PM Deferral package to TD&RM as a record.	[I]	[I]	(I)	[I]	[R]						[I]		See KSA-038. Return to KAA-835, "Work Activity Monitoring process". ***NOTE:*** *PM Programme Implementation Engineer to be informed that the PM Deferral was granted to ensure that the activity is monitored.*
18. Notify the NNR of all authorised Mandatory PM Deferrals (KLM-005) that are in force							[R]					(I)	CR (Type PM Deferral) with Workflow Step "Waiting Action Completion" on ActionWay. Letter to be sent via Koeberg Nuclear Licensing Department
19. Apply the safety evaluation process					[R]								From step 14 In accordance with 240-143604773 (KAA-709).
20. Present case to senior management		(S)	[S]		[R]								See KGU-041 'PM Deferral Guide' for levels of appeal
21. Authorise the PM Deferral document.									(A)	(A)			In the case of appeals, senior management override the PM Deferral rejection based on a management risk decision. Document decision in the appeals section of the PM Deferral Technical Evaluation Form (KFU-044)
22. Is the original rejection overturned?					N/Y								Go to Step 16 Go to Step 15
23. Periodically review all active PM Deferrals on ActionWay.			[R]										CR (Type PM Deferral) on ActionWay with 'Waiting Action Completion' status. Review to confirm that PM activity is performed before the end of the PM Deferral period.
24. Has the PM activity been completed?			Y/N				[I]						SAP
25. Verify that all required actions have been completed, and follow-up as required.			[R]				[I]						CAs on ActionWay are closed. Once closed, the PM Deferral CR Workflow Step will automatically change to "Close".

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INTEGRATED EQUIPMENT RELIABILITY PROCESS

ACTIVITIES	1	2 OPERATING	3 SPV PRORGRAMME OWNER	4 COMPONENT ENGINEER	5 SYSTEM ENGINEER	6 SYSTEM ENGINEERING – REVIEWER	7 SYSTEM ENGINEERING MANAGER	8 RELIABILITY ENGINEERING – DOMAIN OWNER	9 TECHNICAL REVIEW MEETING (TRM)	10 MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	11 NUCLEAR ENGINEERING	12 PLANT HEALTH COMMITTEE - STRATEGIC (PHC-S)	NOTES & REFERENCES
D. LONG-TERM PLANNING & LIFE-CYCLE MANAGEMENT													
D1. SPV EVALUATION PROCESS													See KGU-038, "Single Point Vulnerability Evaluation Process".
1. Review the initial classification of the component as an SPV.		[S]			[R]								From A, step 11 (Scoping & Classification of Components). See KGU-038 for guidance. ***NOTE:*** *The station SPV list is maintained by the SPV Programme Owner. The IQReview SPV status must be verified against this listing*
2. Is the classification of the component as an SPV correct?					Y/N								Provide any comments to the compiler for resolution.
3. Initiate an ER Change Request, in order to update the ER Classification.			[I]		[R]								Provide information to support the re-classification, with the ER Change Request. Go to B1, step 1 (ER Change Control).
4. Raise a General Action (Type SPV) in ActionWay, in order to track the SPV evaluation.			[I]		[R]								From C4, step 6 (PM Deferral Process). Raise a minimum of one GA (SPV Type) per plant system and identify all system components classified as SPVs in the content.
5. Perform the SPV Evaluation.		(S)		(S)	[R]					(S)	(S)		See KGU-038 for guidance. Use the SPV Evaluation form contained in KGU-038. This step is also the starting point for the Annual SPV Review.
6. Is the classification of the component aligned to the ER classification captured on IQReview?					Y/N								Go to B1, step 1 (ER Change Control)
7. Identify appropriate mitigations and elimination actions and document supporting information and required justifications.		(S)		(S)	[R]					(S)	(S)		See KGU-038 for guidance. Use the SPV Evaluation form contained in KGU-038.

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INTEGRATED EQUIPMENT RELIABILITY PROCESS

ACTIVITIES	1	2 OPERATING	3 SPV PRORGRAMME OWNER	4 COMPONENT ENGINEER	5 SYSTEM ENGINEER	6 SYSTEM ENGINEERING – REVIEWER	7 SYSTEM ENGINEERING MANAGER	8 RELIABILITY ENGINEERING – DOMAIN OWNER	9 TECHNICAL REVIEW MEETING (TRM)	10 MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	11 NUCLEAR ENGINEERING	12 PLANT HEALTH COMMITTEE - STRATEGIC (PHC-S)	NOTES & REFERENCES
8. Review the SPV status, evaluation report and proposed mitigation actions, and return any comments to the compiler for resolution.		(C)		(C)		[R]				(C)	(C)		Compiler to identify additional reviewers, as appropriate.
9. Present SPV evaluation report and proposed mitigation actions to TRM.					[R]				[C]				Discuss any reviewer comments received.
10. Correlate and resolve any review comments and update the SPV evaluation report and proposed mitigation actions.					[R]								Ensure that the Action Plan with the final recommendations is included. See KGU-038 for guidance.
11. Approve the SPV evaluation report and proposed actions.					[F]		[A]						The approved SPV evaluation document is retained as a record.
12. Present the system SPV list, SPV status, evaluation report and proposed mitigation actions to TRM.					[R]			(C)				[I]	
13. System SPV list, SPV status, evaluation report and proposed mitigation actions and due dates, endorsed by TRM?									N/Y				
14. Has the status of the SPV changed or is this a new SPV Evaluation?					Y/N							[I]	PHC provides management oversight Inform PHC-S of the SPV component change.
15. Update SPV Listing			[R]										Update SPV Listing in accordance with 240-143696574
16. Raise GAs (General Type or ERCRs) on ActionWay for all approved SPV actions, with endorsed due dates.					[R]								ActionWay is used to track the status of all SPVs, SPV Evaluations and their associated actions. For changes to PM Strategy, initiate GA Type ERCR.
17. Update the relevant LOPP with the SPV list, SPV status, proposed actions and due dates.					(R)								In accordance with KGU-011, "Preparation of System, Structure or Component Life of Plant Plans (LOPPs)" Go to D2, step 5 (Life of Plant Plan Development).

WORK FLOW RESPONSIBILITY MATRIX | **APPENDIX 2 - INTEGRATED EQUIPMENT RELIABILITY PROCESS**

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INTEGRATED EQUIPMENT RELIABILITY PROCESS

ACTIVITIES	1	2 OPERATING	3 SPV PRORGRAMME OWNER	4 COMPONENT ENGINEER	5 SYSTEM ENGINEER	6 SYSTEM ENGINEERING – REVIEWER	7 SYSTEM ENGINEERING MANAGER	8 RELIABILITY ENGINEERING – DOMAIN OWNER	9 TECHNICAL REVIEW MEETING (TRM)	10 MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	11 NUCLEAR ENGINEERING	12 PLANT HEALTH COMMITTEE - STRATEGIC (PHC-S)	NOTES & REFERENCES
18. Periodically review and manage the SPV mitigation / elimination GAs on ActionWay as well as bridging strategies, and report threats to PHC-S.					[R]		[I]					[I]	PHC-S provides management oversight.
19. Are all SPV elimination actions complete?					N/Y								
20. Close out the GA Type SPV on ActionWay and update LOPP stating that the SPV has been eliminated.					[R]							[I]	
21. Remove eliminated SPVs from SPV Listing			[R]										

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Main Flow Secondary Flow

ACTIVITIES	1 ORIGINATOR	2 KOSC	3 CHEMISTRY	4 SYSTEM ENGINEERING - REVIEWER	5 SYSTEM ENGINEER	6 NUCLEAR SYSTEM ENGINEERING MANAGER	7 CONVENTIONAL SYSTEM ENGINEERING MANAGER	8 ELECTRICAL SYSTEM ENGINEERING MANAGER	9 TECHNICAL REVIEW MEETING (TRM)	10 NUCLEAR ENGINEERING	11 SYSTEMS ENGINEERING MANAGER	12 PLANT HEALTH COMMITTEE (PHC)	NOTES & REFERENCES
D2. LIFE OF PLANT PLAN DEVELOPMENT (LOPP)													See KGU-011, "Preparation of System, Structure or Component Life of Plant Plans (LOPPs)". KGU-002, Guideline 9, "Guide for System Engineers".
1. Identify the need to develop a new LOPP.	(R)												Identified at management level.
2. Confirm the need to develop a new LOPP and assign a compiler.					[I]	(S)	(S)	(S)			[R]		New LOPPs are initiated by the Systems Engineering Manager, as required. See KGU-011 for guidance. Where a new LOPP will not be developed, identify alternative solutions as appropriate. See KGU-002 for guidance.
3. Define the scope of the LOPP and assign unique reference number.											[R]		Reference numbers are obtained from TD&RM.
4. Update the LOPP master list.					(S)						[R]		Update the list in Appendix 4 of KGU-011 on an annual basis, to reflect new LOPPs completed.
5. Develop or revise the system long term strategy.					[R]								From D1, step 17 (SPV Evaluation Process). From F, step 3 (Performance Monitoring). From step 18 below. LOPPs are reviewed on an annual basis, to ensure the NTP update in the upcoming year is current.
6. Quantify the plant risk by assessing the various issues facing the system or component.		(I)			[R]				(I)			(I)	Highlight any new issues identified having a high or medium impact on safety or availability, to the relevant technical committee and record on CURA. See KGU-011 for guidance.

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7. Develop strategies to manage the system, addressing all known issues and ageing mechanisms.					[R]					(S)			See KGU-011 for guidance. Liaise with the Nuclear Engineering Ageing Matrix Programme Engineer to ensure alignment.
8. Quantify the costs and benefits resulting from the different scenarios.					[R]								Classify the intervention costs as: • Capital • GO Capital • Technical Plan Non-Capital • Routine Maintenance • Planned Maintenance (Outage R&E) Refer to 36-226 and 36-1143. See KGU-011 for guidance.
9. Evaluate the alternative scenarios and decide on the optimum scenario for each issue.					[R]								Document all assumptions, references and any special conditions imposed. Where applicable, the selected strategy may need the concurrence of the appropriate Group Technology personnel ("Greybeard"). See KGU-011 for guidance.
10. Finalise the draft LOPP document and submit for review.					[R]								See KGU-011 for LOPP format.
11. Review the draft LOPP document and submit any comments to the compiler for resolution.			(C)	[R]					(C)	(C)			From step 13 below. Include a review by the Nuclear Engineering Ageing Matrix Programme Engineer. A review by Chemistry is required for LOPPs on specific systems operated by Chemistry. See KGU-011 for guidance.
12. Is the draft LOPP document acceptable?				Y/N									
13. Resolve all comments and revise the draft LOPP document, as necessary.					[R]								Re-submit the revised draft LOPP document for review. Return to step 11 above.

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INTEGRATED EQUIPMENT RELIABILITY PROCESS

ACTIVITIES	1 ORIGINATOR	2 KOSC	3 CHEMISTRY	4 SYSTEM ENGINEERING - REVIEWER	5 SYSTEM ENGINEER	6 NUCLEAR SYSTEM ENGINEERING MANAGER	7 CONVENTIONAL SYSTEM ENGINEERING MANAGER	8 ELECTRICAL SYSTEM ENGINEERING MANAGER	9 TECHNICAL REVIEW MEETING (TRM)	10 NUCLEAR ENGINEERING	11 SYSTEMS ENGINEERING MANAGER	12 PLANT HEALTH COMMITTEE (PHC)	NOTES & REFERENCES
14. Approve the draft LOPP document.						(A)	(A)	(A)					Ensure that adequate review has been performed. The LOPP is approved by the responsible System Engineering Manager.
15. Present the final strategy at the relevant forums to keep management informed and to obtain concurrence / agreement, as required.					(R)							(C)	KORC, Outage Meetings, ETMM, SRB, KOSC, PHC-S, etc. See KGU-011 for guidance.
16. Initiate implementation.					[R]								See KGU-002, “Guide for System Engineers”, for guidance on initiating projects.
17. Continuously monitor all aspects of the LOPP to identify if adjustment or revision is required.					[R]								Include an annual review of the predicted expenditure to ensure integration into the NTP and allow adequate time for detailed planning.
18. Does the LOPP require updating?					N/Y								Return to step 5 above.
19. Continuously update the Integrated Station Life of Plant Plan, to ensure that it is current and reflects the system LOPPs.						[S]	[S]	[S]			[R]		The responsible System Engineering Managers ensure that the Integrated Station Life of Plant Plans is kept current. The system LOPPs form the technical and financial basis of the Integrated Station Life of Plant Plan.
20. Schedule approved projects into the Nuclear Technical Plan.						[S]	[S]	[S]			[R]		Interventions are to be entered into GENTLC and SAP-PPM. See 240-102714621, “KOU Portfolio Management Committees – Consisting of KPMC and MRC TORs”.
21. Review the Nuclear Technical Plan.					[R]								Ensure that LOPP Life Cycle Plans have been appropriately incorporated into the NTP window and beyond, up to the expected end of life of Koeberg. Input to F, step 4 (Performance Monitoring). Provides an input to Performance Monitoring.

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ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11	12	NOTES & REFERENCES
				COMPONENT ENGINEER	SYSTEM ENGINEER	COMPONENT ENGINEERING MANAGER	RELIABILITY ENGINEERING MANAGER	RELIABILITY ENGINEERING – DOMAIN OWNER		MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	SYSTEMS ENGINEERING MANAGER	PLANT HEALTH COMMITTEE (PHC)	
E. CORRECTIVE ACTION													
E1. EQUIPMENT FAILURE PROCESS													KGU-033, "Failure Investigation of Plant Equipment and Evaluation of Experience". KGU-023, "Guide for Component Engineers", Guideline 7 – Component Failure Investigations.
1. Identify component failures for investigation.										(R)			In accordance with KSA-147, "Investigating Compiling and Issuing of Work Packages Including Post Maintenance Requalification Identification". The KFA-089 'Work Package Check Sheet, prompts Maintenance to raise a CR (Type Component Failure) on ActionWay.
2. Is resolution of the failure known?				Y/N									
3. Perform troubleshooting to understand the actual failure, so that an effective corrective action plan can be developed.				(R)	(S)								See KGA-124, "Guide for Troubleshooting".
4. Was this an unanticipated failure that should have been prevented?				Y/N									See KGU-033, "Failure Investigation of Plant Equipment and Evaluation of Experience", for guidance.
5. Perform Corrective Maintenance in accordance with the Work Execution Process.										(•)			
6. Determine the appropriate level and type of Component Failure Investigation required.				[R]									In accordance with KGU-033, Appendix 1, "Failure Investigation Decision Criteria".
7. Perform Failure Trending.				(R)									• Categorisation
8. Perform Failure Assessment.				(R)									• Update failure information on ActionWay • Categorisation • Recommendations

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INTEGRATED EQUIPMENT RELIABILITY PROCESS

	1	2	3	4 COMPONENT ENGINEER	5 SYSTEM ENGINEER	6 COMPONENT ENGINEERING MANAGER	7 RELIABILITY ENGINEERING MANAGER	8 RELIABILITY ENGINEERING – DOMAIN OWNER	9	10 MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	11 SYSTEMS ENGINEERING MANAGER	12 PLANT HEALTH COMMITTEE (PHC)	**NOTES & REFERENCES**
ACTIVITIES													
9. Perform Failure Evaluation.				(R)									• Failure evaluation report • Apparent cause analysis • Cause and effect • Consequences • Categorisation • Corrective actions • Recommendations Failure Evaluation reports are permanent records and are transmitted to TD&RM.
10. Initiate appropriate actions as identified in the investigation performed.				[R]									Raise CAs/GAs on ActionWay, in order to track implementation of the actions. ***NOTE:*** *For changes to ER classifications, PM Strategies (task & frequency) or PM Templates, initiate an ERCR.* ***NOTE:*** *Before initiating an ERCR obtain concurrence from either the RE Manager or the ERCR custodian.* Go to B1, step 1
11. Capture component failure information on ActionWay using the WANO cause categories and Equipment Reliability Trend Codes.				[R]									This is performed to enable trending of the failure data. See appendix 4 for list of ER trend codes
12. Perform periodic analysis of the failure data to identify any possible generic concerns or adverse trends.				(R)									See KGA-094, "Event Investigation Guide", Section 23. Also see KGU-033.
13. Adverse trend identified?				Y/N									
14. Perform an adverse trend investigation and determine any appropriate action.				[R]	(I)	(I)	(I)	(I)			(I)	(I)	Inform PHC-S of any adverse trends, as appropriate.
15. Perform periodic effectiveness reviews of the failure cause analysis and the adequacy of the corrective actions.				(S)		(R)	(I)				(I)	(I)	Inform PHC-S of the results of the effectiveness review. Initiate improvement via the Corrective Action Process (KAA-688), as required.

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ACTIVITIES	1	2	3	4	5 SYSTEM ENGINEERING MANAGERS	6 COMPONENT ENGINEERING MANAGER	7 RELIABILITY ENGINEERING MANAGER	8 PLANT HEALTH COMMITTEE-OPERATIONAL (PHO)	9 TECHNICAL REVIEW MEETING (TRM)	10 MAINTENANCE EXECUTION / RESPONSIBLE EXECUTION GROUP	11 SYSTEMS ENGINEERING MANAGER	12 PLANT HEALTH COMMITTEE – STRATEGIC (PHC-S)	NOTES & REFERENCES
E2. TOP EQUIPMENT RELIABILITY (ER) ISSUE PRIORITISATION													
1. Develop the Top ER Issues listing					[S]	[S]	[R]	[S]	[S]	[S]	[S]		Input from Engineering Group Heads is controlled at the Technical Review Meeting (TRM) and the Line groups provide input at the Plant Health Committee – Operational (PHO) meeting Top ER Issue Selection Guidelines are in KAA-826.
2. Multi-disciplinary review of Top ER Issues to ensure adequate support and timely resolution of actions.					(C)	(C)		[R]		(C)		(I)	Periodically inform PHC-S of the progress in addressing the Top ER Issues.
3. SAP notifications required for resolution to top ER issue?								Y/N					
4. Code SAP notifications/orders 'Do Not Reschedule' (DNR)								[R]					
5. Oversight of Top ER Issues to ensure adequate support and timely resolution of actions.												[R]	
6. Keep a record of resolved Top ER Issues in order to establish effectiveness of the process.							[R]						

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INTEGRATED EQUIPMENT RELIABILITY PROCESS

ACTIVITIES	1 OPERATING	2 ERI PROGRAMME OWNER	3 COMPONENT ENGINEER	4 SYSTEM ENGINEER	5 BACK-UP SYSTEM ENGINEER	6 RELIABILITY ENGINEERING MANAGER	7 SYSTEM ENGINEERING MANAGER	8 COMPONENT ENGINEERING MANAGER	9 SYSTEM / COMPONENT HEALTH REPORT ADMINISTRATOR	10 MAINTENANCE EXECUTION	11 SYSTEMS ENGINEERING MANAGER	12 PLANT HEALTH COMMITTEE-STRATEGIC (PHC-S)	NOTES & REFERENCES
F. PERFORMANCE MONITORING													See KGU-029, "Monitoring and Trending in Plant Engineering".
1. Start Performance Monitoring.											[R]		From C1, step 33 (PM Implementation) Also input from Operator Rounds, Maintenance Results, Plant OE, etc.
2. Establish or adjust Performance Criteria and Monitoring Parameters.			[S]	[S]		[S]					[R]	(C)	From A, step 5 (Scoping and Classification of Components). Go to F1, step 1 (System Health Reporting). Go to F2, step 1 (Component Health Reporting). Go to F3, step 1 (Equipment Reliability Index).
3. Compile a Performance Monitoring Plan (PMP).			(S)	[R]									See KGU-029 for guidance. Include the PMP into the relevant LOPP. Go to D2, step 5, (Life of Plant Plan Development). PMPs are reviewed at least annually, with the LOPP.
4. Measure and evaluate the performance of each system on a continuous basis.	(S)		(S)	[R]						(S)			From D2, step 21 (LOPP development). Monitoring the system performance enables the engineer to identify any problems before they adversely affect the functionality of the system. See KGU-029 for guidance.
5. Establish System Walkdown schedule.				[R]									Performed on the System IQ module of the ER Software. See KGU-031, "System Health Reporting Guide".

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6. Perform System Walkdown.				[R]									See KGU-002, "Guide for System Engineers", Guideline 6 – "System Walkdowns". Record the findings in the System IQ module of the ER Software. Raise Notifications or CRs to track the resolution of any significant issues identified.
7. Review and approve System Walkdown.							[R]						Performed on the System IQ module of the ER Software. See KGU-031, "System Health Reporting Guide".
F1. SYSTEM HEALTH REPORTING													See KGU-031, "System Health Reporting Guide".
1. Identify Systems requiring System Health Reporting.											(R)	(C)	From F, step 2 (Performance Monitoring). See KGU-031 for guidance.
2. Monitor and trend System Performance.	(S)		(S)	[R]						(S)			From step 10 below. See KGU-031 for guidance.
3. Compile System Health Report.				[R]	(S)								Performed on the System IQ module of the ER Software. System Health Reports are compiled according to a graded approach. System Health Reports are compiled within 1 month of the end of the assessment period. The Back-up System Engineer compiles the Health Report, if the System Engineer is not available. See KGU-031 for guidance.
4. Is System Health rating 'White', 'Yellow' or 'Red' status?				Y/N									White - Monitor Yellow – Degraded Red – Unacceptable

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5. Develop System Health Action Plan.				[R]									Action Plans are developed to improve the system health.
6. Review and approve System Health Report.							[A]				[I]		Performed on the System IQ module of the ER Software.
7. Present System Health Report at PHC-S challenge review session.							[S]		[S]		[R]	[C]	The System Health report Administrator to arrange and facilitate a challenge session.
8. Present System Health Action Plan to PHC-S, as required.				(R)								(C)	See KAA-826, "Plant Health Committee Constitution".
9. Update the System Health Report with comments and actions from the challenge session, as required.				(R)					[S]				
10. Proactively monitor system health between reporting periods and maintain SHR Action Plan.				[R]									Maintain SHR Action Plan to track progress on actions and update if system health indicates degrading performance. Return to step 2 above.
F2. COMPONENT HEALTH REPORTING													See KGU-023, "Guide for Component Engineers", Guideline 23 – "Component Monitoring and Component Health Reporting".
1. Identify groups of Components requiring Component Health Reporting.											(R)	(C)	From F, step 2 (Performance Monitoring). See KGU-023 for guidance.
2. Monitor and trend Component Performance.	(S)		[R]	(S)						(S)			From step 12 below. See KGU-023 for guidance.
3. Compile Component Health Report.			[R]										Component Health Reports are compiled on a bi-annual basis. See KGU-023 for guidance.
4. Has the Component Health rating degraded to a "Yellow" or "Red" status?			Y/N										Yellow – Needs Improvement Red – Not Acceptable
5. Develop Component Health Action Plan.			[R]										Initiate investigation to determine cause and identify appropriate corrective action. Additional monitoring may be required until health returns to an acceptable status.

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6. Review the Component Health Report.							[C]	[R]					Consolidated report to be reviewed by CE, NSE, CSE and ESE managers.
7. Authorise the Component Health Report.											[A]		All review comments to be resolved prior to authorisation.
8. Present Component Health Report to TRM.			[R]				[C]		[S]		[C]		The Component Health Report Administrator to arrange and facilitate a challenge session.
9. Update the Component Health Report with any comments and actions from the TRM, as required.			(R)										
10. Present Component Health Report at PHC-S challenge review session.			[S]					[R]	[S]			[C]	The Component Health Report Administrator to arrange a challenge session.
11. Present Component Health Action Plan to PHC-S as required.			(R)									[C]	See KAA-826, 'Plant Health Committee Constitution'.
12. Proactively monitor component health between reporting periods and maintain Component Health Action Plan.			[R]										Maintain the Component Health Action Plan to track progress on actions and update as required. Return to step 2 above.
F3. EQUIPMENT RELIABILITY INDEX (ERI)													See KAA-852, "Equipment Reliability Index".
1. Establish / revise and manage set of ERI Sub-Indicators for KOU.		[R]										[C]	From F, step 2 (Performance Monitoring). Consider the INPO EQP indicators. In accordance with KAA-852.
2. Document any deviations from the industry standard.		[R]										[C]	In accordance with KAA-852.
3. Compile the ERI sub-indicators, produce the overall ERI for KOU and report at PHC.		[R]										[I]	ERI reports produced monthly and reviewed at PHC. In accordance with KAA-852.

APPENDIX 3

TABLE OF GENERIC ATTRIBUTES OF AN EFFECTIVE AGEING MANAGEMENT PROGRAMME

Attribute	Description
1. Programme Scope	Structures, systems and components (SCCs), including structural elements, that are: • Subject to ageing management • Specified by the licence or regulatory requirements • From the industry Codes, Standard and best practices. • Required for safety improvement, plant integrity and plant efficiency. Understanding of ageing phenomena (significant degradation mechanisms, susceptible sites), safety improvement, plant integrity and plant efficiency: • Structure or component materials, service conditions, stressors, degradation sites, degradation mechanisms and ageing effects • Structure or component condition indicators and acceptance criteria • Quantitative or qualitative predictive models of relevant ageing phenomena
2. Preventive actions to minimise and control ageing or other effects	Identification of preventive actions. Determination of service conditions (i.e. environmental conditions and operating conditions) to be maintained and operating practices aimed at precluding potential degradation of the structure or component.
3. Detection of ageing or other effects	Identification of parameters to be monitored or inspected. Effective technology (inspection, testing and monitoring methods) for detecting ageing effects before failure of the structure or component.
4. Monitoring and trending of ageing or other effects	Condition indicators and parameters monitored. Data collected to facilitate assessment of structure or component ageing. Assessment methods (including data analysis and trending).
5. Mitigating ageing or other effects	Operations, maintenance, repair and replacement actions to mitigate detected ageing effects and/or degradation of the structure or component.
6. Acceptance Criteria	Acceptance criteria against which the need for corrective actions is evaluated.
7. Corrective Actions	Corrective actions if a structure or component fails to meet the acceptance criteria.
8. Operating Experience and feedback of research and development results	Mechanism that ensures timely feedback of operating experience and research and development results (if applicable), and provides objective evidence that they are taken into account in the ageing management programme.
9. Quality Management	Administrative controls that document the implementation of the ageing management programme and actions taken. Indicators to facilitate evaluation and improvement of the ageing management programme. Confirmation (verification) process for ensuring that preventive actions are adequate and appropriate and that all corrective actions have been completed and are effective. Record keeping practices to be followed.

APPENDIX 4

LIST OF ER TREND CODES

	Description	Trend Code
000	**Unknown**	
001	ER process cause was not determined (e.g. external event, investigation cost not justified, historical, unknown)	Unknown - 001
100	**Component Classification**	
101	Incorrect classification	ER.2-1 101
102	Not Classified	ER.2-1 102
200	**Performance Monitoring (System and Component)**	
201	Monitored scope inadequate (e.g. levels, temp, pressures, Vibration)	ER.2-8 201
202	Monitoring frequency not appropriate	ER.2-7 202
203	Monitoring execution less than adequate	ER.2-17 203
300	**Preventive Maintenance**	
301	PM did not exist	ER.2-3 301
302	PM frequency not appropriate	ER.2-3 302
303	PM task content not appropriate (or less than adequate)	ER.2-3 303
304	PM template/basis less than adequate	ER.2-3 304
305	PM execution less than adequate	ER.2-2 305
306	PM feedback not implemented	ER.2-5 306
400	**Work Practices**	
401	Work planning, instruction, or preparation less than adequate	MA.2-13 401
402	PMT not performed or less Than adequate	MA.2-4 402
403	Work activities incorrectly performed	MA.2-11 403
500	**Design**	
501	Original design less than adequate - Component not appropriate for its configuration/application	ER.2-14 501
502	Design change less than adequate - Component not appropriate for its configuration/application	CM.3 502
503	Design change implementation less than adequate	CM.3 503
600	**Manufacturer/Vendor quality, Procurement, Shipping, or Storage**	
601	Vendor quality or workmanship issues (manufacturing defects) from an Authorized Equipment Manufacturer or Authorized Distributor	ER.3-14 601
602	Procurement less than adequate (e.g. Specification, Equivalence)	ER.3-13 602
603	Storage, shipping, receipt inspection, or handling less than adequate (e.g. environment, shelf life, control of scavenged parts, storage PMs)	ER.3-11 603
604	Vendor quality or workmanship issues (manufacturing defects) in part procured from alternate source (e.g. third party or commodities dealer)	ER.3-14 604
605	Supplier services incorrectly performed offsite (e.g. equipment refurbishment)	ER.3-14 605

APPENDIX 4 (continued)

LIST OF ER TREND CODES

	Description	Trend Code
700	**Previous Corrective Action Implementation**	
701	Previous corrective actions less than adequate or untimely	ER.1-8 701
702	OE use less than adequate	ER.3-7 702
800	**Operational Performance**	
801	Equipment was not operated within design	OF.1-3 801
900	**Long Term Planning and LCM**	
901	Aging / obsolescence concern, Asset Management/LCM Plans less than adequate	ER.3-3 901
902	Previous Business Plan related items not implemented, untimely, or deferred	ER.3-1 902

APPENDIX 5

ER CLOCK PROCESS

- ER Clock resets allow for the sharing and trending of operational risk and component failure information. ER Clock resets highlight the learnings and risks related to consequential equipment issues.
- An ER Clock Reset is defined as an event that meets the “Consequential Equipment Failure Criteria” as described below:
  - **Unplanned Power Reduction**
    - Equipment failures that result in power reductions include the following:
      - Reactor or Turbine Trip
      - Unplanned Manual Shutdown
      - Unplanned Power Reduction > 5%
      - Significant power transient > 10%
  - **Unplanned shutdown Limiting Condition for Operation (LCO) ≤ 72 hours**
    - Equipment failure that results in Unplanned Entry into Technical Specification Shutdown LCO ≤ 72 hours
  - **Failure to Meet or Loss of a Critical Safety Function**
    - Equipment failure that results in a failure to meet or control a critical safety function, includes the following:
      - Core, Reactor Coolant System (RCP), or Spent Fuel Pool (SFP) Heat Removal,
      - RCP Inventory Control,
      - RCP Pressure Control,
      - Containment Isolation, Temperature or Pressure,
      - Reactivity Control
      - Vital Electrical Power Availability
  - **Unplanned Engineered Safeguards Features Actuation Systems (ESFAS) Actuation**
    - Equipment failure that directly results in an unplanned actuation of engineered safety features actuation system (that results in or should have resulted in flow into RCP or a containment isolation signal).
- Results of investigations into events that reset the ER Clock will be communicated to all site personnel through established media (departmental briefings, Station newspaper or newsletter, formal training, etc.)
- Plant events directly caused by human performance will be addressed under the Station Event-Free Clock Program (KGA-097).

APPENDIX 6

JUSTIFICATION

Revision 2

1. Remove reference to Plant Focus Meeting (PFM) as this meeting does not exist anymore and add reference to Plant Health Committee - Operational (PHO), which replaces the previous PFM.

2. Add reference to Programme Oversight Committee (POC), which replaced the previous PMOC meeting.

3. Changes to ERCR Process regarding ERCR form usage by Domain Owners

4. Changes to the PM Deferral Process, due to development of KGU-041 (New Guide)

5. Changes to the SHR Process (as required) following streamlined approach.

6. Changes to the ERI Process (as required) following Industry and INPO EQP (Equipment Performance) changes.

7. Remove the Appendix 5, Top ER Issues listing criteria from this procedure, as it is now captured in KAA-826 (Plant Health Committee Constitution)

8. Remove reference to 239-QWR-013 procedure, which has been withdrawn, include relevant elements from “PM Strategy Input Sheet” in ERCR form (KFU-038).

9. Responsibility changes and group name changes following 2018 Nuclear Engineering restructuring. E.g. Plant Engineering became Systems Engineering.

10. Remove reference to training of station personnel. Used the term guidance and instruction instead since Training has very specific processes. See AU 35830-005 QA.

11. Change abbreviation of EQP to EQ (Environmental Qualification Programme), to avoid confusion with the new INPO performance measure, EQP (Equipment Performance).

12. Update reference to KGU-021 to refer to KGA-124, ‘Guide for Troubleshooting’.

13. Remove reference to KSM-016 ‘Equipment Failure Investigation and Evaluation of Experience’, standard withdrawn.

14. Includes links to ageing management to address SE 38545-012 CA.

15. Remove references to tracking SAP implementation status on KLM-005.

16. Update workflow for scoping & classification of components to improve links to SPV evaluation.

APPENDIX 6 (continued)

JUSTIFICATION

17. Update workflow for PM Strategy development – remove instructions for flagging of tasks (not currently utilised).

18. Update workflow for PM Strategy review & approval to include graded approach to reviews.

19. Update workflow for PM Template tasks – remove steps for flagging of tasks (not currently utilised).

20. Update workflow for PM Strategy Implementation, to include changes due to PM Implementation engineer role and POC.

21. Update workflow for Proactive PM Review Process – split ERCRs and implementation actions.

22. Update workflow for SPV Evaluation process for better integration into ER process.

23. Update workflow for Top ER Issue Prioritization to include “DNR” coding.

24. Remove KFU-038 ‘ER Change Request’ form from appendices, form to stand-alone.

25. Remove KFU-039 ‘PM Deferral Request’ form from appendices, form to stand-alone.

26. Update KFU-039 ‘ER Change Request’ form to include elements from QFR-026 ‘PM Strategy Input Sheet’ and to streamline form.

27. Update procedure to reference to the ER Clock process (links to SE 38123-036 GA) as per GA 38167.

28. Removed the System Health Reporting frequency of “quarterly” because the frequency of reporting will be determined in a graded approach by the System Tier and system health colour (KGU-031).

29. Full Review.