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Content

1. Introduction

Ageing management for nuclear power plants is implemented to ensure that the effects of ageing will not prevent structures, systems, and components (SSCs) from being able to accomplish their required safety functions throughout the lifetime of the nuclear power plant. It covers all activities that aim to prevent or control ageing effects, within acceptable limits, throughout the entire lifetime of the nuclear power plant (i.e., design; fabrication or construction; commissioning; operation, including long term operation; and decommissioning, including long term shutdown).

As part of the management system of the utility, ageing management ensures that all equipment that is deemed important to nuclear safety and radiological release mitigation is considered in a specific graded approach and all potential degradation which could affect the function of the equipment is treated or managed. Various overlapping processes support the management of ageing and provide reassurance of functional capability and defense in depth. The required processes and procedures to achieve good ageing management forms one of the cornerstones of asset management and is expected to be developed and implemented as part of the plant management functions.

2. Supporting Clauses

2.1 Scope

This document provides the list of all Ageing Management Programmes (AMPs) as well and other processes used for ageing management of important to safety SSC's at Koeberg Nuclear Power Station (KNPS).

2.1.1 Purpose

The purpose of this list is to document all the AMPs and processes utilised for ageing management at Koeberg Nuclear Power Station.

2.1.2 Applicability

This document shall apply throughout the Nuclear Operating Unit.

2.1.3 Effective date

This list shall be effective from authorisation date.

2.2 Normative/Informative References

2.2.1 Normative

[1] ISO 9001 Quality Management Systems

[2] 240-149139512: Ageing Management Requirements for Koeberg Nuclear Power Station

[3] RG-0027: Interim Regulatory Guide Ageing Management and Long-Term Operations of Nuclear Power Plants

[4] 238-8: Nuclear Safety and Quality Manual

[5] 331-148: Programme Engineer's Guide

[6] 331-275: Process for the Development and Implementation of Ageing Management at Koeberg Nuclear Power Station

2.2.2 Informative

[7] SSG-48: IAEA Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants

[8] SRS-82: IAEA Ageing management for Nuclear Power Plants: International Generic Ageing Lessons Learnt (IGALL)

[9] 238-1: Integrated Management System Description

[10] 240-139089079: Programme Oversight Committee (POC)

2.3 Definitions

2.3.1 Ageing: Ageing is the process by which the physical characteristics of SSCs change with time when subjected to a specific ambient environment and operating regime.

2.3.2 Ageing Management: These are engineering, operations and maintenance actions performed to control ageing degradation of SSCs to within acceptable limits.

2.3.3 Ageing Management Programme (AMP): A programme that manages the effects of ageing on SSCs so that the intended functions will be maintained in accordance with the current licensing basis for the period of planned operation.

2.3.4 Engineering Programme: (Terminology used in [5]) An administratively controlled and on-going set of engineering activities that implement regulatory requirements, Institute of Nuclear Power Operations (INPO) and World Association of Nuclear Operators (WANO) recommendations, industry wide and plant specific OE and best practices, as well as management requirements, in order to improve plant reliability, efficiency and safety**.**

2.4 Abbreviations

Abbreviation	Explanation
AMP	Ageing Management Programmes
ASCC	Atmospheric Stress Corrosion Cracking
BAC	Boric Acid Corrosion
CASS	Cast Austenitic Stainless Steel
CLRTPRM	Containment Leak Rate Testing Programme Requirements Manual
ECMP	Environmental Condition Monitoring Programme
EDF	Électricité de France
EQ	Equipment Qualification
ISI	In-service Inspection
ISI	In-service Inspection
IST	In-service Testing
KNPS	Koeberg Nuclear Power Station
MIC	Microbiological Induced Corrosion
NEPP	Nuclear Engineering Position Paper
NOU	Nuclear Operating Unit
OHSA	Occupational Health and Safety Act
OTS	Operating Technical Specifications
PER	Pressure Equipment Regulations
RBI	Risk Based Inspections
SAR	Safety Analysis Report
SFP	Spent Fuel Pool
SRSM	Safety Related Surveillance Manual
SSC	Structure, System or Component

2.5 Roles and Responsibilities

Responsibilities for the development of ageing management programmes (AMPs) and maintaining this list of AMPs reside with the Programmes Engineering Department.

2.6 Process for Monitoring

AMPs are managed in accordance with the requirements provided in the AM standard 240-149139512 (Ageing Management Requirements for Koeberg Nuclear Power Station) and document 331-148 (Programme Engineer's Guide).

2.7 Related/Supporting Documents

Not applicable

3. Ageing Management Programmes and Processes

Ageing Management Programmes (AMPs) at nuclear power facilities are established to implement regulatory requirements or are based on industry operating experience, where similar equipment issues were identified that affected or could affect plant safety or operation.

This section provides a list and a brief description of AMPs and processes that are credited for ageing management and evaluations for long term operation at Koeberg Nuclear Power Station (KNPS). Details in terms of the scope and associated management requirements for each AMP or process listed herein can be found in the respective referenced programme documents.

3.1 Anchor Bolting Programme

The programme caters for the degradation of all Safety Class 1, 2 and 3 tie-rods anchored to concrete structures with pre-stressing, or/and installed through concrete walls and floors which are tightened by means of hydraulic tensioning equipment. The programme requirements are contained in document 240-138623765 (Anchor Bolting Programme Requirements Manual).

3.2 Atmospheric Stress Corrosion Cracking

The scope of examinations is an augmentation to the ASME required inspections contained in the ISIPRM AUG-14 (240-119362012 AUG-14 ISIPRM). This module provides the augmented in-service inspection (ISI) monitoring and inspection requirements for Eskom to employ in the management of atmospheric stress corrosion cracking (ASCC) on nuclear safety related components, as a permanent degradation mechanism at Koeberg. The initial inspection scope included the safety injection (RIS) and containment spray (EAS) systems' piping in the reactor spent fuel pool (PTR) tank rooms and the fuel buildings of both units. These systems are required for mitigation of ANSI N18.2-1973 Condition III and IV occurrences, classified as infrequent incidents and limiting faults respectively.

The programme manual 240-147386602 (Atmospheric Stress Corrosion Cracking of Austenitic Stainless-Steel Components) provide the technical basis for the ASCC programme, stipulate the specific requirements for the programme, and set the acceptance criteria for inspections/programme elements.

3.3 Ageing Management Programme for Electronic equipment, Whiskers, and Capacitors

The purpose of this ageing management programme (AMP) is to provide requirements for the ageing management of the electronic equipment installed in instrumentation and control (I&C) systems installed at Koeberg Nuclear Power Station (KNPS). The AMP further describes periodic inspection of whiskers and capacitors with liquid electrolyte to identify age-related degradation of the electronic and electrical equipment. The requirements for this AMP are documented in 240-165424554 (Ageing Management Programme for the Electronic Equipment Whiskers and Capacitors).

3.4 Ageing Management Programme for Lightning Protection and Grounding Grid

The purpose of this Ageing Management Programme (AMP) is to provide guidance for the effective management of the ageing lightning protection system and the station main earthing grids, as they are used in safety-related and non-safety related functions at Koeberg Nuclear Power Station (KNPS). An effective ageing management programme will ensure that the lightning protection components and main earthing grid will continue to perform their functions during extended plant operation, i.e., beyond the initial licencing period. Document 240-166957253 (Ageing Management Programme for Lightning Protection and Grounding Grid at KNPS) provides requirements to manage ageing of strike receptors, lightning arrestors, down conductors, connections to the earthing system and the main earthing system at Koeberg Nuclear Power Station.

3.5 Ageing Management Programme for Switchboards, Associated Switchgear Components and Metal Enclosures

The purpose of this Ageing Management Programme (AMP) is to provide guidance for the effective management of ageing switchboards, switchgear, and their subcomponents, as they are used in safety-related and non-safety related functions at Koeberg Nuclear Power Station (KNPS). An effective ageing management programme will ensure that the switchgear and associated metal enclosures will continue to perform their functions during extended plant operation. The programme document 240-164966115 (Ageing Management of Switchboards Associated Switchgear Components and their Metal Enclosures) provide an analysis of the potential age-related degradation mechanisms for the electrical switchgear (circuit breakers and contactors), metal enclosures, switchboard components such control cabling, relays, insulators, and protection relays installed at the Koeberg Nuclear Power Station. The manual contains requirements to be implemented to manage the ageing of equipment important to safety to ensure reliability and nuclear safety for the long-term operation of KNPS.

3.6 Ageing Management Programme Manual for Stainless Steel-lined Compartments and Epoxy Coated Sumps

The scope of this AMP covers the metallic and non-metallic liners found in compartments and sumps of plant buildings and structures that have been identified to be important to safety. The AMP manual 240-166959159 (Ageing Management Programme Manual for Stainless Steel-lined Compartments and Epoxy Coated Sumps) covers the programme requirements of the ageing management of metallic and non-metallic liners that are found in specific buildings and structures at the Koeberg Nuclear Power Plant.

3.7 Boric Acid Corrosion Control Programme

The programme is to manage the risk associated with boric acid leaks and corrosion. Document 331-511 (Engineering Guide for Boric Acid Corrosion Control (BACC) Programme Management) describes the scope for the Koeberg BACC Programme. This document also describes the relationship between the BACCP and the overall Koeberg Leak Management Process (KAA 802). The objective of the leak management programme is to ensure, through inspection, early identification and mitigation of plant leaks such as boric acid, water, oil, air, and gas leaks. (Boric acid affecting bolting is dealt with under ISIPRM)

3.8 Cable Ageing Management Programme

Cables are one of the major components of nuclear power plants (NPPs) and provide multiple functions including transmission of instrumentation and control signals and supply of electrical power to electric components of NPPs.

The cable ageing management programme (CAMP) has been developed to prescribe ongoing condition monitoring requirements for electrical cables and is meant to provide reasonable assurance that the intended functions of all electrical cables connected to important to safety components are fulfilled. It is also intended to manage significant ageing effects to preclude in-service failures as defined in procedure 331-127 (Standard for Cable Ageing Management Programme at Koeberg Operating Unit). The condition monitoring tasks required to be performed are documented in three separate CAMP manuals, 331-311 – “Cable Ageing Management Manual for Medium Voltage Power Cables and Cable Systems; 240-98789276 – “Cable Ageing Management Manual for Low Voltage Cables and Cable Systems” and 240-98789629 – “Cable Ageing Management Manual for Instrumentation and Control Cables and Cable Systems.”

3.9 Environmental Condition Monitoring Programme

The Environmental Condition Monitoring Programme (ECMP) manual, 240-165386950, “Environmental Condition Monitoring Programme” provides the requirements for the monitoring, recording, and trending of environmental data, during normal operation, to support ageing management. The ECMP aims to identify localised adverse environments and adverse service conditions that could lead to the accelerated degradation of important to safety SSC’s. This will ensure that environmental conditions that could adversely impact the environmental qualification of the equipment, re-assessment of qualified life and accelerate ageing of electrical cables and other SSCs are identified, monitored, and trended. Other related programmes may utilise the data from the ECMP to refine environmental zone assumptions and programme tasks.

3.10 Equipment Qualification Programme

The Equipment Qualification (EQ) programme as described in 331-186 (Environmental Qualification at Koeberg Operating Unit) is established to demonstrate that certain electrical and C&I qualified equipment and components located in harsh and mild environments are qualified to perform their safety function after the effects of in-service ageing and to preserve their qualification.

The EQ document 331-219 (Equipment Qualification Maintenance Manual for Qualified Equipment Located in Harsh Environments) prescribes the minimum preventive maintenance requirements in order to ensure that the qualification of equipment located in harsh environment is maintained.

The scope and the requirements of certain safety-related electrical and I&C equipment located in mild plant environments are documented in document 240-130611911 (Equipment Qualification Requirements for Safety Related Equipment Located in Mild Environments).

3.11 Civil Structures Monitoring Programme

The programme document KSA-128 (Civil Preventative Maintenance Strategy) defines the activities to ensure compliance with or to fulfil obligations of the nuclear license, to comply with the requirements of the OHSA as an employer, to align the civil maintenance and monitoring with EdF and other best practices and ensure that the functional and structural requirements of the KNPS civil structures are guaranteed throughout the life of the plant.

3.12 Civil Ageing Management Programme Manual (AMP 306)

Structures generally have substantial safety margins when properly designed and constructed. However, the available margins for degraded structures are not well known. In addition, age-related degradation may affect the dynamic properties, structural response, structural resistance/capacity, failure mode, and location of failure initiation. A better understanding of the effect of ageing degradation on structures and passive components is needed to ensure that the current licensing basis (CLB) is maintained under all loading conditions. The Civil Ageing Management Programme (Civil AMP) provides the means to identify adverse environmental and service conditions, and the management of significant ageing effects to prevent the premature loss of safety function and in-service failure of Civil SSC. The requirements of this AMP are set out in document 240-165425812 (Civil Ageing Management Programme Manual).

3.13 Containment Leak Rate Testing Programme

The intent of the programme is to provide containment integrity assurance by leak rate testing the containment isolations (which are the third fission product barrier) and correcting inadequate leak rate performance. The programme is based on U.S. NRC 10CFR50 Appendix J. The tests include LLRTs (Local Leak Rate Tests) which are performed on the containment penetrations and ILRTs (Integrated Leak Rate Tests) which are performed on the entire containment and its penetrations. The requirements are contained in the CLRTPRM (Containment Leak Rate Testing Programme Requirements Manual) KBA0028NESMACLR003.

3.14 Corrosion Management Programme

The Corrosion Management Programme (CMP) is developed to manage the long-term effects of atmospheric and process-related corrosion on the reliability and overall availability of the plant. The programme is currently fully developed as documented in 331-238 Koeberg Nuclear Power Station Corrosion Management Programme and 331-175 (Inspection Guide for the Koeberg Nuclear Power Station Corrosion Management Programme). It also encompasses the scope of AMP-134 “External surfaces monitoring of mechanical components”.

The programme provides for regular and systematic inspection and maintenance activities that will ensure the corrosion protection of plant, structures, and equipment, in a manner that will facilitate proper planning of resources, effective budgeting, and will provide the opportunity of identifying specific areas of concern with the need for upgrading of existing corrosion protection specifications. This programme is applicable to all structures, systems, equipment, and items of plant which are subject to environmental corrosion. The scope of this programme encompasses all buildings, structures, plant, and equipment within and including the Koeberg boundary/game fence.

3.15 Chemistry Programme

The programme as described in KSC-003 (The Chemistry Programme) provides for all of primary and secondary water chemistry controls in accordance with approved and authorized procedures and Chemistry Technical Specifications.

3.16 Thermal Fatigue Monitoring Programme

The Thermal Fatigue Management Programme describes the in-service operationally determined thermal fatigue issues that have arisen during the plant lifetime (including feedback from the EDF 900 MWe fleet) and the actions taken (including those in progress) to address and manage the issues identified which potentially affect the design base integrity of the impacted plant components. Refer to document 240-141494955 (Thermal Fatigue Management Programme)

The scope of the programme covers three main thermal fatigue issues: the thermal embrittlement of CASS components installed in the RCP when subjected to operating temperature of the system; the occurrence of thermal stratification in specific NSSS and BNI piping systems; and the occurrence of thermal fatigue due to temperature fluctuations in specific NSSS and BNI piping systems.

3.17 Flow Accelerated Corrosion Programme

The programme sets the requirements for all applicable components potentially affected by Flow Accelerated Corrosion (FAC) to manage the potential effects of the degradation, prevent equipment failures and its consequences, and maintain equipment under pressure within their minimum design wall thickness requirements. The FAC programme standard 331-173 provide requirements for developing and management of the FAC Programme.

3.18 Fire Protection

Life of plant plan (LOPP) document KBA0022NNEPOLOPP023 (Fire Detection and Suppression Systems) summarises the proposed maintenance and testing regimes and life cycle plan for the Koeberg fire detection and protection systems.

3.19 Heat Exchanger Programme

Heat exchangers are used extensively in the nuclear power generation industry. Their efficient and reliable operation is essential for safe and reliable nuclear plant operation. Increased emphasis on heat exchanger reliability at nuclear power plants has resulted in the development of engineering programmes or equivalent actions to maintain the required thermal performance and structural integrity. The programme document 240-154215724 (Heat Exchanger Management Programme) documents the requirements for monitoring of heat exchangers at Koeberg Nuclear Power Station. The programme shall identify all the degradation mechanisms that affect heat exchangers. Monitoring regimes for these degradation mechanisms will be addressed.

3.20 In-service Inspection (ISI) Programme

The in-service inspection (ISI) Programme at Koeberg is governed by ASME Section XI requirements for the examination and testing of ASME Class 1, 2, 3, MC, and CC components and component supports. The requirements for the ISI programme are contained in the ISI standard 240-110745414 (KSA-021) - Standard for In-service Inspection Programme at Koeberg Nuclear Power Station) and programme manual 240-119362012 Fourth Interval In-Service Inspection Programme Requirements Manual (ISIPRM) for Koeberg Nuclear Power Station. This ISIPRM summarises the in-service inspection programme (ISIP) requirements for the examination and testing of ASME Class 1, 2, 3, MC, and CC components and component supports during the fourth inspection interval.

ISIPRM also provide requirements for the following ISI Augmented Scope.

- AUG-01 Pressuriser Surge and Spray Lines (Thermal Stratification and Fatigue)
- AUG-02 Thermal Stresses in Piping Connected to Reactor Coolant System
- AUG-03 RCP Valve and RCP Valve Interspace Examinations
- AUG-04 Not included. Withdrawn. The number was retained to align the remaining modules with the implementer's sequence of AUG modules
- AUG-05 In-Service Inspection of Reactor Pressure Vessel Heads
- AUG-06 Reactor Pressure Vessel Nozzle Bores and Underclad Regions in the Core Beltline
- AUG-07 Pressuriser Nozzle-to-Safe End Welds Examinations
- AUG-08 Reactor Coolant Pump Flywheel Examinations
- AUG-09 Steam Generator Tubing
- AUG-10 Safety Class 1, 2, and 3 Bolting Examinations
- AUG-11 RRA Valves and Pipework affected by Erosion Cavitation
- AUG-12 ARE and ASG Systems associated with Thermal Stratification and Thermal Shock
- AUG-13 Manufacturing Flaws in 32"/20" and 20"/8" Branch Welds in Main Steam System Piping
- AUG-14 Atmospheric Stress Corrosion Cracking of Austenitic Stainless Steel in the RIS, EAS, and PTR Systems
- AUG-15 Microbiologically Influenced Corrosion (MIC)
- AUG-16 Not included (covered under separate FAC programme)

3.21 In-service Testing (ISI) Programme

The intent of the ISTP is to establish assurance on the operability readiness of safety related active components under all design basis conditions. This assurance is established by means of a variety of periodic surveillances. The operability readiness statement confirms that the design basis safety functions of IST components remain within acceptable limits throughout their lifetime.

Document 240-97087308 (In-Service Testing Programme Requirements Manual - ISTPRM) establishes testing and examination requirements to assess the operational readiness of certain components important to nuclear safety.

3.22 Internal Surfaces, Coatings and Linings Ageing Management Programme

The scope of this AMP document 32-T-PE-010 (Internal Surfaces, Coatings and Linings Ageing Management Programme Manual) is to provide the requirements for the management of the ageing mechanisms which potentially affect the integrity of internal surfaces of piping, piping components and ducting in the scope of IGALL AMP 135 and all internal coatings and linings installed on in-scope piping, piping components, heat exchangers and tanks of IGALL AMP 157.

3.23 Microbiology Induced Corrosion

The module (240-119362012 AUG-15 ISIPRM) specifies the inspections and monitoring activities to be conducted on all applicable systems at Koeberg to address potential Microbiological Induced Corrosion (MIC) concerns in fluid-retaining safety-related systems. In general, the MIC programme inspections serve to assess and maintain paint coatings as corrosion protection barriers. In the case of uncoated fire protection water pipes, the integrity of the fire system involves replacement of pipe sections when through-wall pipe leaks are detected. This process is managed by the Fire Engineer (Conventional Systems Engineering) via the scope of feasibility study no. 09024.

3.24 Motor Operated Valves Programme (MOV-P)

The intent of the programme is to establish the periodic testing requirements in order to confirm that MOVs will continue to fulfil their intended design function following the close out of GL 89-10 (at Koeberg the completion of mod 99087). Motor Operated Valve Programme Requirements Manual (MOVPRM), 240-149053169, represents the Motor Operated Valves Programme Manual (MOVPRM) at Koeberg Nuclear Power Station (KNPS) in accordance with the guidelines and intent of the NRC Generic Letter (GL) GL 96-05.

3.25 Nuclear Steam Supply System Design Transient Monitoring Programme

The Nuclear Steam Supply System (NSSS) Transient Monitoring Programme is a result of a National Nuclear Regulatory (NNR) requirement as documented in 36-197 (Koeberg Licensing Basis Manual). The purpose of tracking the transients is to ensure compliance with the Koeberg design basis for all Safety Class 1 piping and pressure vessel components. The design base transients for Koeberg are defined and described in document KBA0022E00006 (Nuclear Steam Supply Design Transients).

The document 240-149867926 (Nuclear Steam Supply System Design Transient Monitoring Programme) provides requirements for a Transient Accounting programme and describes the process of recording and documenting design transients relevant to Koeberg Nuclear Power Station. The administrative procedure KAA-652 allocates responsibilities and actions to be carried out to ensure that all fatigue related transients are identified and accounted for and confirmed to be within design analysis criteria for the life cycle of the NSSS and auxiliary systems.

3.26 One-time Inspections Ageing Management Programme

The One-Time Inspection (OTI) Programme documented in 32-T-PE-006 (One-Time Inspection Ageing Management Programme Manual) is different from most other AMPs in that it does not focus on a specific component or degradation-type. It serves to verify the system-wide effectiveness of other ‘indirect-influencing’ AMPs, such as the Water Chemistry, Fuel Oil Chemistry and Lubricating Oil Analysis Programmes, or to validate the assumptions from other AMPs regarding the rate of development of degradation related to fluid chemistry.

3.27 One-time inspections of Class1 Small Bore Piping Ageing Management Programme

The One-Time Inspection of Class 1 Small Bore Piping Programme is specific to piping components in a defined safety class and size range. As the name suggests it is not intended to be a repetitive or periodic inspection, but to confirm the absence of the cracks. It thereby acts as a filter to exclude the need for further monitoring for components that do not suffer from cracking

defects. If the inspection finds cracks the further management of the ageing will be assigned to one of the monitoring AMPs. The programme's assigned population is primary circuit piping components and socket weld-inserts in the nominal bore range of 25mm to 100mm whose rupture would result in a leakage of a magnitude that could not be easily compensated for by the make-up water systems. The AMP requirements are provided in document 32-T-PE-007 (One-Time Inspection of Class 1 Small Bore Piping Ageing Management Programme Manual).

3.28 Preventive Maintenance (PM) Programme

The plant process for determining the maintenance programme requirements forms part of the Koeberg integrated equipment reliability process. This process has been based on the recommendations contained in INPO AP-913 (Equipment Reliability Process Description). The requirements for the preventive maintenance basis are expanded on in KSA-913 (Integrated Equipment Reliability Standard: Preventive Maintenance Basis). This standard establishes the approach to preventive maintenance (PM) and defines the requirements and controls for managing the PM basis. The Equipment Reliability Process provides for the maintenance of equipment to high levels of safe and reliable plant operation and is applicable to all elements and activities that comprise (and which includes): Scoping and Classification of Components, Continuing Equipment Reliability Improvement, PM Implementation, Long-Term Planning and Life-Cycle Management, Corrective Action, and Performance Monitoring.

The top tier document governing the maintenance process is KSM-LIC-001 (Requirements for the Control of Maintenance). The purpose of this document is to define the requirements for the maintenance process and the controls to be in existence to comply with the requirements of the nuclear licence.

3.29 Pressure Equipment Regulations Programme

This programme satisfies the in-service inspection and testing requirements documented in the Pressure Equipment Regulations (PER) of the Occupational Health and Safety Act (OHSA) 85 of 1993. The PER allows users of pressure equipment, as an alternative to the prescriptive requirements to implement a certified risk based inspection management system. The scope of the programme and the requirements are documented in the Inspection, Maintenance & Testing Plans 240-115852755.

3.30 Pressuriser Programme

This AMP is component specific for the Koeberg Units 1 and 2 Pressurisers which covers the plausible and active degradation mechanisms. As such, this AMP will refer to other degradation-specific and/or monitoring type of AMPs that deal with particular degradation mechanisms and ageing effects. The draft programme document 240-165295505 (The Pressuriser Programme Manual).

3.31 Reactor Integrity and Internals

The scope of this manual is to provide the requirements for the management of the integrity of the reactor pressure vessel and its subcomponents (including the internals), as part of a holistic management method. The scope of the components, their associated ageing and degradation mechanisms and management requirements are provided.

3.32 Reactor Vessel Surveillance Programme

The programme manages the reactor pressure vessel material embrittlement as a result of neutron irradiation. The surveillance program is required to ensure that the resultant mechanical properties of the vessel are adequate for all operating conditions during the vessel design life.

The scope of this position paper is the irradiation embrittlement monitoring and end of life embrittlement predictions of the belt line of the reactor pressure vessels of Unit 1 and 2.

3.33 Seismic bearings

The programme documented in KBA09A2D/5378/3 and J43/87-002 (Aseismic Bearings Monitoring Programme) provides the specifications for the testing of the aseismic sample bearings, namely the friction couple tests, neoprene pad shear modulus tests and the corrosion couple test.

3.34 Soil cement foundations

The document KWU-DE-016 (Long Term Monitoring of Soil Cement) caters for the long term monitoring and testing of the soil cement sub-foundation at Koeberg Nuclear Power Station. The objective is to provide early warning of degradation of the soil cement. It includes Cross hole seismic tests (in situ), Ground water sampling and analysis, Control sample storage water sampling and analysis, Handling and storage of core samples, Visual inspection of core samples, Volumetric measurement of core samples and Density tests of core samples.

3.35 Steam Generator Management Programme

The steam generator management programme (SGMP) manual 240-118809269 (Steam Generator Management Programme describes the Koeberg Steam Generator Management Programme for the inspection, repair, and online monitoring of the original steam generators. 331-613 is the programme manual for the replacement Steam Generators. The steam generator programme establishes a framework and structure to existing steam generator efforts. Provided in these documents are the fundamental regulatory and quality elements that form the basis for prevention, inspection, assessment, repair, and leakage monitoring measures.

3.36 Selective Leaching Ageing Management Programme

Selective leaching is the preferential removal of one element from an alloy by corrosion processes. Some alloy metallurgical phase-composition create the potential for differential rates of degradation of its grain-level structures. This allows the corrosion to extend beyond being a surface effect to develop sub-surface porosity. The degradation mechanism is assigned its own programme because its attack can be associated with specific alloys and metallurgical compositions making a focussed programme viable, and its corrosion product structure has the potential to hide the significance of the degradation from an examination that is designed to assess general corrosion. The AMP document 240-166959251 (Selective Leaching Ageing Management Programme) defines the requirements for the sample selection, examination, and testing of components important to safety made by using materials and forming processes that introduce a known susceptibility to Selective Leaching if in contact with water or moisture. The purpose is to manage the integrity of components manufactured from alloys potentially susceptible to selective leaching.

3.37 Thermal performance Programme

The Thermal Performance Programme (TPP) aims to maximise unit generator output and optimise plant steam cycle thermal performance under full power, steady-state operation. The programme focuses on turbine performance, efficient operation of the main steam, extraction steam, condensate, heater drains, feedwater and condenser cooling water systems, feedwater performance, condenser performance, and main generator power metering. While this programme directly interfaces with the core thermal power calculation (SHB / PHB), station service loads and equipment reliability, the administration and control of these technical areas are outside the scope of the thermal performance programme. Document 331-272 (Thermal Performance Programme) defines the key attributes/elements, responsibilities, and performance criteria recognised by the nuclear power industry for an effective thermal performance programme.

3.38 Technological Obsolescence Programme

The process for the development and implementation of a proactive Technological Obsolescence Programme (TOP) is described in 331-146 (Technological Obsolescence Programme). This proactive process is to deal with technological obsolescence at Koeberg Nuclear Power Station and to prepare for its incorporation into regular business. This procedure is applicable to systems, structures, and components (SSCs) important to safety that are deemed obsolete (or are in the process of becoming) technologically obsolete.

3.39 Welding Programme

The generic requirements for welding activities performed at Koeberg Nuclear Power Station are provided in document KNM-001 (Maintenance Welding Programme). This programme defines the generic requirements for welding activities performed at Koeberg Nuclear Power Station and applies to manufacture, repair and replacement welding activities performed by Koeberg or Contractor personnel on all components, systems, and structures.

3.40 Processes used for Ageing Management at KNPS

3.40.1 Cast Austenitic Stainless Steel Thermal Ageing Safety Case

The safety case demonstrates that the structural integrity of the cast elbows can be guaranteed for unconditional use as-is (only limited by not exceeding the 40-year NSSS design transients) for 50 years of operation for the cold leg elbows and 45 years (2025) for the hot leg elbows. (This safety case is included in the ageing management programme and process list as it is expected by international guidance, although not specifically a programme or process. Refer to the Safety Case SC2004/0022 Revision 1 Validation of the Structural Integrity of the Primary Circuit Cast Elbows until the end of Plant Operating Life).

3.40.2 Corrective Action Process

The corrective action process for Koeberg Nuclear Power Plant is captured in document KAA-688 (The Corrective Action Process). The identification and reporting of occurrences, problems, incidences, conditions, events, or near misses, including ageing-related degradations, is the responsibility of each person working at KNPS.

3.40.3 Leak management Process

This process KAA-802 (Leak Management Process) provides a proactive approach for preventing leaks and ensures aggressive and timely identification, investigation, and repair of leaks found on plant SSCs. The scope is intended to address Power Block Equipment leaks on the conventional island and nuclear island. The leakage from plant SSCs which may include High-energy process fluids (steam), non-borated water, Borated water, Chemicals, Gases (air, hydrogen, nitrogen, etc.) and Oil.

3.41 Safety-related surveillance Manual

The safety-related surveillance manual (SRSM), KBA-0022-SRSM-000-00, defines the objective of the surveillance programme and specifies the scope and validity of the periodic test requirements. It further describes the principles for periodic testing and defines the form and manner in which periodic testing is performed. SSCs that perform safety functions (as credited in accident and safety studies) are subject to the SRSM periodic test programme.

4. Acceptance

This document has been seen and accepted by:

Name	Designation
R Cassim	Manager - Material Engineering Group
R Menacere	Senior Engineer – Materials Reliability Group
G Mdluli	Senior Technologist – Materials Reliability Group
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5. Revisions

Date	Rev.	Compiler	Remarks
October 2022	2	K Moroka	Document the AMP List with the new AMPs.
May 2020	1	A Kotze	Initial issue.

6. Development Team

- A Kotze
- K Moroka

7. Acknowledgements

Not applicable