	Procedure	Nuclear Engineering
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Title: **Equivalency Study Process to Change the Plant**

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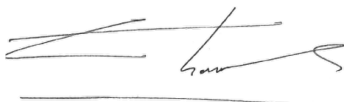
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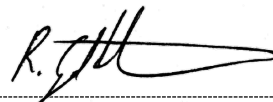
Functional Responsibility



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Nuclear Additional Classification Information

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1. Introduction

This document demonstrates the process to be followed to change the plant by means of an Equivalency Study, and how to determine when an equivalency request should be resolved using a different process.

2. Supporting Clauses

2.1 Scope

Applicable to all plant equipment of Units 1, 2, 9, 0, and 6

2.1.1 Purpose

- To describe the process and responsibilities to ensure that equivalent and alternative plant equipment is assessed, approved and implemented in a systematic and controlled manner.
- To control the interfaces relating to investigation, evaluation, documentation, testing, qualification, and procurement.
- To ensure that all activities where indicated are documented.

2.1.2 Applicability

This document shall apply throughout Nuclear Engineering.

2.1.3 Effective date

The document shall be effective from the date authorization.

2.2 Normative/Informative References

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

2.2.1 Normative

- [1] ISO 9001 Quality Management Systems
- [2] 331-2: Nuclear Engineering Management Manual
- [3] 331-3: Nuclear Engineering Document and Records Management Work Instruction
- [4] 331-144: Standard for the preparation of an Equivalency Study
- [5] 331-155: Guide for the preparation of an Equivalency Study
- [6] 331-94: Importance Category Classification Listing

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2.2.2 Informative

- [7] Plant Support Engineering: Guidelines for the Technical Evaluation of Replacement Items in Nuclear Power Plants—Revision 1. EPRI, Palo Alto, CA: 2006. 1008256
- [8] MIL-STD-973: Military Standard Configuration Management
- [9] GGG-1299: Guide for Technical Writing
- [10] 240-149139512: Ageing Management Standard
- [11] 240-101650256: Ageing Management Matrix
- [12] 331-93: Guide for Classification of Plant Components, Structures and Parts
- [13] 331-135: Process for Performing Safety Evaluations, Screenings, and Safety Justifications
- [14] 331-275: Process for the Development and Control of Ageing Management at Koeberg Operating Unit Rev 2
- [15] RD-0034: National Nuclear Regulator Quality and Safety Management Requirements for Nuclear Installations
- [16] RG-0027: National Nuclear Regulator Ageing Management and Long Term Operations of Nuclear Power Plants Regulatory Guide
- [17] KAA-913: Integrated Equipment Reliability Process

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2.3 Definitions

- 2.3.1 Ageing Management:** Engineering, operations and maintenance actions to control within acceptable limits the ageing degradation of structures, systems and components.
- 2.3.2 Certificate of Interchangeability:** A certificate supplied by the OEM and signed by the OEM QA manager, stating that the proposed item is equivalent to the obsolete item. If a C.O.I. is supplied by the OES, a documented technical evaluation proving that the proposed item is equivalent to the obsolete item is required.
- 2.3.3 Common Cause Failure:** When a single fault results in the corresponding failure of multiple components.
- 2.3.4 Common Mode Failure:** Multiple failures attributed to a common cause.
- 2.3.5 Compiler:** An authorised person who is competent and takes responsibility for compiling documents.
- 2.3.6 Controlled Disclosure:** Controlled disclosure to external parties (either enforced by law, or discretionary)
- 2.3.7 Design Bases:** The fundamental requirements for a system or structure that define the bounding parameters that ensure that the licensing basis' requirements are met.
- 2.3.8 Design Function:** The operation that an item is required to perform to meet the component or system design basis.
- 2.3.9 Equipment:** Any plant component or part.
- 2.3.10 Equivalency Study:** The study comparing the proposed replacement equipment against plant design requirements and the original item.
- 2.3.11 Equivalent Item:** A replacement item whose introduction to the facility does not alter the design functions of the SSCs.
- 2.3.12 Failure Mode:** The effects or conditions that result from an item's credible failure mechanism.
- 2.3.13 Failure Mode and Effects Analysis:** An evaluation of an item's credible failure mechanisms and their effects on system or component functions.
- 2.3.14 Fit:** The ability of an item to physically interface or interconnect with or become an integral part of another item.

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2.3.15 Form: The shape, size, dimensions, mass, weight, and other visual parameters which uniquely characterise an item. For software, form denotes the language and media.

2.3.16 Function: The action or actions which an item is designed to perform.

2.3.17 Identical item: An item that exhibits the same technical and physical characteristics (physically identical fit, form and function).

2.3.18 Item: Any level of unit assembly, including structures, systems, subsystems, subassembly, component, part, or material.

2.3.19 Obsolete Item: Items in plant service that are no longer manufactured, or are otherwise difficult to procure and qualify.

2.3.20 Original Item: The item installed during construction, or as a result of a design change.

2.3.21 Originator: An individual who identifies a need for an equivalency study.

2.3.22 Replacement item: An item that replaces an original or installed item that can be either identical to the original or an alternate.

2.3.23 Reviewer: An authorised person from Specifications Engineering who is technically competent and takes responsibility for reviewing the technical content of documents.

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2.4 Abbreviations

Abbreviation	Explanation
AMM	Ageing Management Matrix
CCF	Common Cause Failure
CE	Component Engineering
CMF	Common Mode Failure
C.O.I	Certificate of Interchangeability
DCC	Document Control Centre
DDR	Document and Drawing Revision
DEVONWAY	Corrective Action and Observation Programmes
DSE	System Description Manual
E-BOM	Engineering Bill of Materials
EPRI	Electrical Power Research Institute
EC	Engineering Change
EQ	Equipment Qualification
EQML	Equipment Qualification Master List
FMEA	Failure Modes and Effects Analysis
GA	General Action
M-BOM	Maintenance Bill of Materials
MM	Maintenance Manual
MRG	Materials Reliability Group
NE-CMG	Nuclear Engineering Configuration Management Group
OE	Operating Experience
OEM	Original Equipment Manufacturer
OES	Original Equipment Supplier
OTG	Operations Training Group
RE	Reliability Engineering
SAP	Systems, Applications and Products
S-BOM	Super Bill of Materials
SPE	Specification & Procurement Engineering
SME	Subject Matter Expert
SSC	Structures, Systems and Components
TCR	Training Change Request

2.5 Roles and Responsibilities

Refer to the Work Flow Responsibility Matrix (Appendix A) for responsibilities.

2.6 Process for Monitoring

The Specification & Procurement Engineering (SPE) Manager is functionally responsible for making sure that the process in this procedure is correctly implemented and maintained.

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2.7 Related/Supporting Documents

Not Applicable

3. The Equivalency Study Process

3.1 Process Flow

The equivalency study process encompasses the following phases as indicated in the work flow responsibility matrix in Appendix A:

- i. Initiation;
- ii. Registration;
- iii. Initial Evaluation & Impact Assessment;
- iv. Equivalency study compilation;
- v. Equivalency study review;
- vi. Equivalency study authorization;
- vii. Configuration management and
- viii. Implementation.

4. Acceptance

This document has been seen and accepted by:

Name	Designation
S Ebrahim	Senior Advisor – SPE
B Ogle	Senior Advisor – SPE
Bradley Paulse	Senior Advisor – Materials Management
Disebo Sangweni	Manager – Maintenance
Sydney Cyster	Acting Manager – NE-Configuration Management Group
Rida Cassim	Manager – Materials Reliability Group
Susan van Wyk	Manager – Reliability Engineering
Nizaam Ryland	Manager – Systems Engineering

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5. Revisions

Date	Rev.	Compiler	Remarks
September 2021	3	MV Phalane	Updated Section E(1.3) of Appendix A to specify correct EQ reference documents
November 2020	2	MV Phalane	Full revision to include Ageing Management requirements, to address SE 38545-016 CA under section E (1.4)
March 2016	1	PN Clark	Complete revision to address the QA audit findings detailed in CR 90904 and CR 90907

6. Development Team

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

- N/A

7. Acknowledgements

N/A

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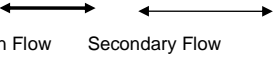
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8. Appendix A: Work Flow Responsibility Matrix

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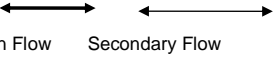
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WORK FLOW RESPONSIBILITY MATRIX						APPENDIX A							
R – Responsible A – Approve F – File • – Outside Matrix Scope Y/N or N/Y – Decision C – Concur I – Informed S – Service [] – Mandatory Requirement () – As Appropriate/Required Flow Path:  Main Flow Secondary Flow	ORGANISATION / FUNCTION												• NOTES & REFERENCES
	TRAINING	ORIGINATOR	SPECIFICATION ENGINEERING GROUP	SYSTEM ENGINEERING	RELEVANT MAINTENANCE GROUP	PROCUREMENT QUALITY ENGINEERING	MATERIALS	NE CONFIGURATION MANAGEMENT GROUP	SYSTEMS ENGINEERING	PROCUREMENT	SUPPLIER	MATERIALS RELIABILITY GROUP	
ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11	12	
[A] INVESTIGATION AND EVALUATION													
1. Initiation													
1.1 Originator to discuss equivalency request with SPE prior to raising a type EC notification.		[R]	[C] — [I]										NOTE: When concurrence has been obtained, originator to request equivalency via relevant groups single point contact, if one exists
1.2 Complete a SAP type EC notification and forward the notification number to the SPE Planner.		[R]	[I]										NOTE: Applies to alternative items, equivalent items and items processed with a COI supplied by the OEM – KAA-641 and KAA-733
1.3 Is an equivalent or alternative item available?			N/Y										
1.4 If the item has been defined as obsolete follow 331-146		[R]											Raise a CR in accordance with the Obsolescence Programme 331-146
1.5 Is the replacement item equivalent to the original/current item? (A modification is NOT required for its installation.)			N/Y										
1.6 Inform System Eng. to raise a modification.		[I]	[R] — [S]										NOTE: Modification to be raised by System Engineering. KAA-501, 331-83, 331-86 and 331-88
2. Registration													
2.1 Assign the next sequential number to the request.			[R]										331-144
2.2 Inform the originator of the negotiated completion date.		[C]	[R]										NOTE: Inform the SPE Planner to update the SAP notification with the negotiated completion date

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ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11	12	
3. Initial Evaluation & Impact Assessment													
3.1 Determine the classification of the item and verify the validity of the classification.			[R]										Classification hard-copies, 331-93, 331-94 and 331-91
3.2 Identify the minimum design characteristics and the technical specifications of the item under evaluation.			[R]										Equipment Data sheets, Maintenance Manual, DSE and plant walkdowns
3.3 Identify the operating parameters of the installation.			[R]										NOTE: Alternate upgraded items are to be evaluated for any impact on the SAR and EQ document
3.4 Is this a standard production item?			N/Y										Go to Section [E]
[B] PREPARATION OF SPECIFICATION AND ECONOMIC EVALUATION FOR REVERSE ENGINEERING.													
1. Preparation of Technical Specification													
1.1 Material Identification Determine the technical and material requirements.			[R]						(S)			(S)	DSE, MRG and Original equipment specification
1.2 Specify a manufacturing document or prepare a specification to enable manufacture. Identify any testing and qualification requirements.			[R]		(S)				(S)		(S)		331-165 – where applicable
1.3 Determine quality assurance requirements.			[R]			(S)							SSC Classification

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	1	2	3	4	5	6	7	8	9	10	11	12		
	2. Economic Evaluation													
	2.1 Determine viability by evaluating all the costs incurred to perform the equivalency.			[R]										NOTE: 36-222 for Reverse Engineering
	2.2 Is it a viable option to perform an equivalency.			Y/N	(I)									If NO, inform System Engineers
	[C] IDENTIFICATION OF MANUFACTURER													
	1. Can the item be manufactured on-site?			N/Y										
	2. Raise the Purchase Request for the required material.			[S]		[R]		(S)		(S)				240-95405347 KAA-693 Go to Section D
	3. Forward the technical specification/ drawings for the equivalent item to suppliers to determine if they can comply and authorise if compliance is met.			[R]		(S)	(S)			(•)				240-95405347
4. When required request PQE to assess the supplier of the proposed replacement item to verify compliance to the required Quality Level.			[R]		[S]							238-124		

WORK FLOW RESPONSIBILITY MATRIX						APPENDIX A							
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ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11	12	
(D) TESTING AND QUALIFICATION													
<div>1. Qualification Tests</div> <div>Perform all the necessary qualification tests identified in the technical specification to verify that the replacement item meets the required criteria.</div>			(R) ↓	— (S) —	(S)	— (S) —					(S)		331-97
<div>2. Reliability Tests</div> <div>2.1 Ensure that the item is installed on the plant for a trial period to prove its reliability, under a Test Application.</div>			(R) ↓	— (I) —	(S)	— (C) —							KAA-647
<div>2.2 Independent Review</div> <div>Review the test results for technical acceptance.</div>			(R) ↓	— (I) —					(S)				331-144
[E] EQUIVALENCY PACKAGE COMPILATION/CONTROL													
<div>1. Equivalency Type</div>													
<div>1.1 Determine type of equivalency using graded approach and complete the equivalency package.</div>			[R] ↓										331-144 331-155

WORK FLOW RESPONSIBILITY MATRIX						APPENDIX A							
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ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11	12	
1.2 Request a SAP number for equivalent items, for inclusions in document updates.			[R]				[S]						<p>NOTE: In accordance with KAA-614</p>
1.3 Check if the item is in the scope of the plant EQ as per 331-219			[R]										<p>Refer to EQML and 331-219</p> <p>NOTE: 331-187. Should the item be new to the EQ list, a EQ specification needs to be compiled and existing EQ item changes are to be updated using 331-496 template. When required MRG to be informed in step F7 that the EQ document is to be updated.</p>
1.4 Where applicable,			[R]										
<ul style="list-style-type: none"> Identify known/potential ageing degradation/effets related to the equivalent item. Check if the identified ageing degradation and ageing effects are already covered in the existing Ageing Management Matrix 			[R]										Ageing Management Matrix
1.5 Raise a DeWonWay action to MRG for the review of impact of the equivalency studies on applicable Programmes and the AMM			[R]										Ageing Management Standard, MRG list of Programmes
1.6 Raise a TCR for TMG to ascertain the effect of the equivalency on training.	(S)		[R]		(S)								

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ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11	12	
1.7 Raise a DDR to update the relevant attachments in the Maintenance Manual.			[R]										NOTE: Attachments as in 331-155
1.8 Raise a DDR for the update of appropriate component specific documentation where applicable.			↓ (R)		(S)								Drawings, Equipment List, DSE
1.9 Perform Safety Screening			↓ [R]										331-135
2. Review													
2.1 Review of the equivalency study.			↓ [R]										331-144
2.2 Authorise the equivalency study.			↓ [A]										331-144
2.3 Transmit equivalence package to TD & RM for distribution.			↓ [R]										<p>Copies to:</p> <ol style="list-style-type: none"> NE CMG Relevant Maintenance Group Manager Materials Management Manager Reliability Eng Manager SE Manager TD & RM (Records) Training

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	OPS TRAINING	ORIGINATOR	SPECIFICATION ENGINEERING GROUP	SYSTEM ENGINEERING	RELEVANT MAINTENANCE GROUP	PROCUREMENT QUALITY ENGINEERING	MATERIALS MANAGEMENT	NE CONFIGURATION MANAGEMENT GROUP	RELIABILITY ENGINEERING	PROCUREMENT	SUPPLIER	ENGINEERING PROGRAMMES GROUP	
ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11	12	
[F] Configuration													
1. Log the equivalency on DevonWay as a type GA			[R]										331-155
2. On the authorisation of the equivalency, the following is to be created in Devonway, using the parent GA number that was raised for the equivalency, by adding a new action General; Equivalencies to have a S-BOM created, to have the relevant Maintenance Manual, Drawings and Material Lists updated by NE CMG.			↓ [R]					[S]					NOTE: If the GA action of a previous equivalency revision has not been completed, it should be closed with reference being made to the new GA raised in the latest equivalency revision.
3. On the authorisation of the equivalency, the following is to be created in Devonway, using the parent GA number that was raised for the equivalency, by adding a GA; Equivalencies to update the M-BOM, to complete a SAP Change Control Form and to update any listed procedures.			↓ [R]		[S]								NOTE: If the GA of a previous equivalency revision has not been completed, it should be closed with reference being made to the new GA raised in the latest equivalency revision.
4. On the authorisation of the equivalency, the following is to be created in Devonway, using the parent GA number that was raised for the equivalency, by adding a new action General; Equivalencies to capture the Equivalency in SAP by Materials Planning.			↓ [R]				[S]						NOTE: If the GA action of a previous equivalency revision has not been completed, it should be closed with reference being made to the new GA raised in the latest equivalency revision.

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WORK FLOW RESPONSIBILITY MATRIX						APPENDIX A							
<div>R – Responsible</div> <div>A – Approve</div> <div>F – File</div> <div>• – Outside Matrix Scope</div> <div>Y/N or N/Y – Decision</div> <div>C – Concur</div> <div>I – Informed</div> <div>S – Service</div> <div>[] – Mandatory Requirement</div> <div>() – As Appropriate/Required</div> <div>Flow Path:</div> <div>Main Flow</div> <div>Secondary Flow</div>	ORGANISATION / FUNCTION												NOTES & REFERENCES
	OPS TRAINING	ORIGINATOR	SPECIFICATION ENGINEERING GROUP	SYSTEM ENGINEERING	RELEVANT MAINTENANCE GROUP	PROCUREMENT QUALITY ENGINEERING	MATERIALS MANAGEMENT	NE CONFIGURATION MANAGEMENT GROUP	RELIABILITY ENGINEERING	PROCUREMENT	SUPPLIER	ENGINEERING PROGRAMMES GROUP	
	1	2	3	4	5	6	7	8	9	10	11	12	
	ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11	
5. On the authorisation of the equivalency, the following is to be created in Devonway, using the parent GA number that was raised for the equivalency, by adding a new action General; Equivalences to the MRG to review the Ageing Management Matrix			[R]									[S]	NOTE: If the GA action of a previous equivalency revision has not been completed, it should be closed with reference being made to the new GA raised in the latest equivalency revision.
6. <i>This is only required if a FMEA has been done and there are changes required .</i> On the authorisation of the equivalency, the following is to be created in Devonway, using the parent GA number that was raised for the equivalency, by adding a new General action (Type Equipment Reliability Change Request) General;; Equivalences to have the preventive maintenance basis reviewed by Reliability Engineering.			[R]						[S]				KAA-913 NOTE: If the GA action of a previous equivalency revision has not been completed, it should be closed with reference being made to the new GA raised in the latest equivalency revision..
7. When applicable, on the authorisation of the equivalency, the following is to be created in Devonway, using the parent GA number that was raised for the equivalency, by adding a new action General; Equivalences to the EP Group to revise the EQ document.			[R]									[S]	NOTE: If the GA of a previous equivalency revision has not been completed, it should be closed with reference being made to the new GA raised in the latest equivalency revision.

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	OPS TRAINING	ORIGINATOR	SPECIFICATION ENGINEERING GROUP	SYSTEM ENGINEERING	RELEVANT MAINTENANCE GROUP	PROCUREMENT QUALITY ENGINEERING	MATERIALS MANAGEMENT	NE CONFIGURATION MANAGEMENT GROUP	RELIABILITY ENGINEERING	PROCUREMENT	SUPPLIER	MATERIAL RELIABILITY GROUP	
[G] Implementation													
1. Capture Equivalency in SAP.			[I]					[R]					Close GA on DevonWay
2. Create a S-BOM.			[I]					[R]					331-85
3. Update the Maintenance Manual, relevant Drawings and Material Lists and Engineering Programmes .			[S]					[R]					NOTE: In accordance with 331-85 Close GA on DevonWay
4. Update the M-BOM and complete a SAP Change Control form.													KAA-820 Close GA on DevonWay
5. Review the Service Notifications.													KAA-820
6. Review the Working Procedures.													KAA-500
7. Evaluate Common Mode Failure.													KSM-006
8. Update the SAP M-BOM.													
9. Perform 12 monthly check of equivalent items installed onto plant and document updates			[S]										Perform 12 monthly inspection on SAP Plant Maintenance History

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