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1. INTRODUCTION

Due to the unprecedented depletion rate of the generating reserve margin, the effect of unplanned generating plant outages has become more pronounced. Furthermore, generating units are required to operate at high load factors, leading to adverse component degradation and unpredictable failure rates. The fact that a majority of the generating units have either passed or reached the mid-lives of the original design lives has compounded this problem.

These unpredictable failures result in capacity constraints and hence challenge the reliability of supply. Depending on the severity of the event, turnaround times can be excessive, resulting in:

- Loss of production revenue.
- High spare parts cost to expedite lead times.
- Elevated labour costs due to pressure for short turnaround times.
- Increased production costs due to the prolonged use of gas turbines.
- Poor workmanship due to production pressure, leading to a further rise in failure rates.

However, if a replacement spare is available these effects are reduced considerably and in some cases eliminated.

The Generation Strategic Spares Health Programme Standard (GGS 1495) was first developed in 2005 to ensure the availability and serviceability of the identified strategic spares. The Management and Reporting of Strategic spares (36-972) sought to develop criteria and a methodology to identify strategic spares, leading to an update of the listing from 19 items to 27 items for fossil plant. Nuclear, Gas turbine and hydro plant remained the same.

2. SUPPORTING CLAUSES

2.1 SCOPE

This manual provides a list of strategic spares to be kept by each power station and stipulates the strategic spares health program for managing availability and serviceability of these spares in Generation.

2.1.1 Purpose

The proper application of the requirements contained in this document will:

- Instil a common understanding of the intent of the strategic spares.
- Ensure that the correct spares are identified through a systematic and transparent methodology.
- Provide a management framework that ensures that the identified spares are procured and maintained in a condition fit for service.
- Support Generation’s strategic objectives to maximise plant availability.

2.1.2 Applicability

This document shall apply throughout Eskom Generation Division.

2.2 NORMATIVE/INFORMATIVE REFERENCES

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

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2.2.1 Normative

[1] BS4999-144 Stator Bar Testing.

[2] 32-1034 Eskom's Procurement and Supply Chain Management Procedure

[3] 32-204 Accounting for Strategic Spares

[4] ESKASAAF1 Oil Dielectric Strength Confirmation.

[5] GGD 1155 Shared Strategic Spares.

[6] 240-56356675 Partial Discharge Testing Guideline

[7] 240-56358344 Refurbishment of Generator Rotor.

[8] 240-56358788 Refurbishment of Generator Stators for Steam or Gas Turbines Standard

[9] GGS 0580 Maintenance and Repair of High Temperature and High Pressure Valves and Fittings.

[10] 240-56361259 The Testing of Large Generator Rotors Standard

[10] 240-56357338 Life Management of Coil Retaining Rings in Turbo Generators and Major Motors Standard

[11] 36-972 Management and Reporting of Strategic Spares

[12] 36-1042 Material Control, Preservation & Storage Handling.

[13] 240-56360387 Storage of Power Station Electric Motors Standards

[14] ESKASAAI3 Prolonged Storage of Key Stock Transformers.

2.2.2 Informative

[15] GGS 1181 Avoid Contact with Harmful Products.

[16] GGP 0322 NDT Examination.

[17] GGD 1447 Plant Asset Management Directive.

2.3 DEFINITIONS

Definition	Description
Availability	Refers to whether a replacement spare exists in Generation but does not refer to whether the spare is in a good working condition (i.e fully serviceable)
Conditional Release	Refers to the status of a spare which is not able to deliver against the full functional design.
In-storage Maintenance	Activities associated with periodic maintenance, adjustment, monitoring, or items to prevent or detect deterioration while in-storage.
Redundancy	Refers to the design of a system in which a component is duplicated so if it fails there will be a backup to provide the equivalent function.
Rotable Spare	A component or item of plant that upon removal may be repeatedly or economically restored for return to inventory to be applied as a spare in the future.
Serviceability	An indication of the condition of spare in storage and fitness for service when required for deployment.
Storage Requirements	Measures taken to mitigate various environmental factors to prevent

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Definition	Description
	deterioration, damage, or contamination of item while in storage. These measures include climate control, packaging, inspections and in-storage maintenance
Strategic Spares	Items of plant, which if not readily available in inventory or from suppliers would directly cause the loss of generating, transmission or distribution capability (i.e. items without which continuity of supply will not be possible).

2.3.1 Disclosure Classification

Public domain: published in any public forum without constraints (either enforced by law, or discretionary).

2.4 ABBREVIATIONS

Abbreviation	Description
BU	Business Unit
CR	Conditional Release
CRR	Coil Retaining Rings
CV	Control Valve
FD	Forced Draft
GE	Group Executive
GENOPS	Generation Operations Meeting
GSSHP	Generation Strategic Spares Health Programme
HP	High Pressure
HV	High Voltage
ID	Induced Draft
IM	Information Management
IP	Intermediate Pressure
LOPP	Life of Plant Plan
LP	Low Pressure
NCR	Non Conformance Report
NDT	Non Destructive Testing
OEM	Original Equipment Manufacturer
PA	Primary Air
RS	Rotable Spare
SAP	System Application Products
TLC	Traffic Light Chart
UCLF	Unplanned Capability Loss Factor

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2.5 ROLES AND RESPONSIBILITIES

2.5.1 Technology Engineering

In executing their responsibilities towards the GSSHP, the Discipline Specialist/Consultants shall:

- Ensure that they remain abreast with the status of the GSSHP robot.
- Identify shortcomings (alerts) in their respective areas of responsibility and ensure that the responsible power station has compiled an action plan for such items.
- Provide specialist advice on strategic spares.
- Scrutinise the Generation Technical Plan and Life of Plant Plans to ensure that these are aligned with station GSSHP action plans.

2.5.2 Power Station Engineering Managers

In executing their responsibilities towards the GSSHP, the Power Station Engineering Managers shall:

- Ensure that gaps in the GSSHP are identified, actions plans compiled for the station and that spares to be purchased are included in the Generation Technical Plan and Life of Plant Plans.
- Ensure that site specific storage and quality control criteria exist and are documented.
- Write and implement specific procedures as required per site.
- Confirm the power station specific strategic spares requirements in reference to this document and spares holding stock level to ensure high availability of strategic spares
- Provide technical specifications for the procurement, storage and deployment of station specific strategic spares

2.5.3 Maintenance Centre of Excellence

In executing their responsibilities to the GSSHP, Maintenance Centre of Excellence shall:

- On a regular basis, ensure that a sample of the stations is reviewed and audited against the criteria established to ensure compliance.
- Ensure that the audit programme is included in the yearly Generation audit programme.
- Maintain and update of the GSSHP model and “Robot” indicator.
- Ensure that a regular strategic spares (weekly/monthly) status report is available for review.

2.5.4 Power Station Maintenance Managers

In executing their responsibilities to the GSSHP, the Power Station Maintenance Managers shall:

- Drive and keep focus on the GSSHP.
- Provide the required inputs for the monthly and weekly update of their stations’ Strategic Spares Health Programme data.
- Ensure that the Generation Strategic Spares Health Programme is implemented and executed against the established criteria.
- Ensure compliance with the minimum storage and quality control inspection criteria as per Annex “B” and site specific procedures.

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- Ensure that review of the GSSHP “TLC” indicator is a standard agenda item at the Maintenance Managers Forum and that status and trends are reviewed.

2.6 PROCESS FOR MONITORING

The basic tenet behind the development of the strategic spares list is based on the need to ensure that plant equipment can be quickly returned to service to minimise impact on production, in the event of a **major plant failure.** Therefore, a strategic spare is not meant to prevent failure, only to minimise the impact once **major plant failure** has occurred.

Items are classified as strategic spares based on considerations such as the **effect on operations if the item is not available, probability of need, source and lead-time**. Strategic spares include both capital spares and non-capital spares (hereafter referred to as strategic inventory). They are held in inventory for deployment in the event of a **major plant failure**.

2.6.1 Assumptions

In order to develop the criteria and the process for identifying the strategic spares, the following assumptions were made;

- The precursors for all the major plant failure incidents are all internal to boundaries of the production unit. Strategic spares are not meant to mitigate the consequent effects of catastrophic events.
- Adequate maintenance programme exists for all plant equipment. The implication is that strategic spares are not necessitated by normal maintenance.
- Process for ensuring functional integrity for both standby equipment and redundant equipment is in place.

2.6.2 Strategic Spares Qualification Criteria

For a plant component to qualify for a strategic spare it must satisfy the following criteria.

- It must have no redundancy. If there is a redundancy in the plant function, or if the full production capability can continue then a direct loss of production does not result from the failure of the plant component (a redundant plant component must be in good working condition).
- Time-to-failure cannot be reliably predicted. If one can monitor the condition or performance of the plant to better predict an impending failure then the time-to-failure can be predicted with a high degree of confidence therefore a replacement spare can be acquired when the need arises.
- In case of a refurbishable plant component, a replacement spare should be able to restore the loss of production capability in a time considerably shorter than it would take to refurbish the failed component.
- The normal lead-time of a replacement spare for the failed plant component must be in excess of a period equivalent to 1% of the BU's UCLF. The implication is that if a replacement spare can be readily sourced and deployed in time for the unit to be returned to service without a significant delay to the repair programme then the spare is considered readily available.
- There is a high level of confidence that a spare can be maintained in a fully serviceable condition for the life of the plant component that it is intended to replace. If the functional condition of a replacement spare can be maintained over the life of the plant component then the intended benefit of the spare is ensured.

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2.6.3 Strategic Spare Qualification Process

The process flow chart for the identification of strategic spares is attached in **Annex A.** This process employs the five (**5**) qualification criteria mentioned in subsections **2.6.2,** at various stages, to identify plant components that qualify for strategic spares.

2.6.4 Strategic Spares List

Through the application of Strategic Spares Qualification process depicted in **Annex A,** the following lists of Strategic Spares were developed. These lists are mandatory for coal fired, Koeberg, OCGTs and Hydro/Pump Storage power stations where the spare is applicable. The minimum spares-holding has been stated with consideration to stock levels and cost to retain this inventory

Table 1: Coal Fired Power Station Strategic Spares List

Item No.	Spare Component	Remarks
1	Unit Transformer	Minimum of one per station for each type.
2	Generator Transformer	Minimum of one per station for each type.
3	LP Turbine Diaphragms	Minimum of 50 % per blade row for removable blades or minimum of one diaphragm per stage for non-removable blades
4	Exciter	Minimum of one Stator, rotor and CRR's for rotating type, Bridge & transformer for static type per station for each type.
5	HP Turbine Governor Valve Cartridge & Actuator	Minimum of one assembled cartridge per station (assumes that the valve cartridges are interchangeable).
6	IP Turbine Governor Valve Cartridge & Actuator	Minimum of one assembled cartridge per station (assumes that the valve cartridges are interchangeable).
7	Boiler Water Circulation Pump	Minimum of one complete assembly per station (assumes that the pumps are interchangeable), two per station is desired.
8	LP Turbine Rotating Blade Set	100 % of the last 3 stages and a minimum of 50 % per blade row for the rest if a fully bladed rotor is available, else carry the full set.
9	HP Turbine Diaphragms	Minimum of 50 % per blade row for removable blades or minimum of one diaphragm per stage for non-removable blades
10	IP Turbine Diaphragms	Minimum of 50 % per blade row for removable blades or minimum of one diaphragm per stage for non-removable blades
11	HP Turbine Stop Valve Cartridge & Actuator	Minimum of one assembled cartridge per station (assumes that the valve cartridges are interchangeable).
12	IP Turbine Stop Valve Cartridge & Actuator	Minimum of one assembled cartridge per station (assumes that the valve cartridges are interchangeable).
13	HP Turbine Rotating blade set	100% of the front rows and a minimum of 50 % per blade row for the rest if a fully bladed rotor is available, else carry the full set.
14	IP Turbine Rotating blade set	100% of the front rows and a minimum of 50 % per blade row for the rest if a fully bladed rotor is available, else carry the full set.
15	Secondary Air heater Packs	Complete set for one pass as a minimum.

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16	LP Turbine rotor	Bladed (Minimum of one per station) for each type.
17	HP Turbine rotor	Bladed (Minimum of one per station) for each type
18	IP Turbine rotor	Bladed (Minimum of one per station) for each type.
19	Generator Rotor	Minimum of one per station for each type.
20	PA Fan Motor	Minimum of one per station for each type (assuming that they are uni-directional, else keep one for each direction)
21	FD Fan Motor	Minimum of one per station for each type (assuming that they are uni-directional, else keep one for each direction)
22	ID Fan Motor	Minimum of one per station for each type (assuming that they are uni-directional, else keep one for each direction).
23	PA Fan Impeller	Minimum of one per station for each type.
24	FD Fan Impeller	Minimum of one per station for each type.
25	ID Fan Impeller	Minimum of one per station for each type.
26	Generator Stator Bars	Full top bars set and **30 %** bottom bars set.
27	Generator Breaker Poles	Minimum of one per station if universal, else keep one for each type.

Table 2: Koeberg Power Station Strategic Spares List

Item No.	Spare Component	Remarks
1	Generator Transformer	Minimum of one for each type.
2	Unit Transformer	Minimum of one for each type.
3	Generator Rotor	Minimum of one for each type.
4	Generator Stator Bars	Full top bars set and **30 %** bottom bars set.
5	Exciter (incl. rotor)	Minimum of one Stator, rotor and CRR's for rotating type, Bridge & transformer for static type.
6	Generator Breaker Poles	Minimum of one if universal, else keep one for each type.
7	LP Turbine Rotor	Minimum of one for each type (Bladed).
8	RCV Charging Pump	Minimum of one for each type.
9	RRA Heat Exchanger	Minimum of one for each type.
10	HP Turbine Governor Valve & Actuator	Minimum of one cartridge & actuator for each type.
11	HP Turbine Stop Valve & Actuator	Minimum of one cartridge & actuator for each type.
12	Intercept/Reheat Governor Valve Cartridge & Actuator	Minimum of one cartridge & actuator for each type.
13	Intercept/Reheat Stop Valve Cartridge & Actuator	Minimum of one cartridge & actuator for each type.
14	Rod, Control Full Length	Minimum of one assembly for each type.

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	Assembly	
15	RPN, Detector Chamber Assembly	Minimum of one assembly for each type.
16	RCP Motor	Minimum of one for each type.
17	HP Turbine Diaphragms (or stationary blades)	Minimum of 50 % per blade row for removable blades or minimum of one diaphragm per stage for non-removable blades
18	LP Turbine Rotating Blade Set	Minimum of 50 % per blade row if a fully bladed rotor is available, else carry the full set.
19	LP Turbine Diaphragms (or stationary blades)	Minimum of 50 % per blade row for removable blades or minimum of one diaphragm per stage for non-removable blades
20	RPN Ionisation Chamber	Minimum of one for each type.

Table 3: Peaking Power Station Strategic Spares List (excl. Ankerlig & Gourikwa)

Hydro/Pump Storage (Drakensberg, Palmiet, Vanderkloof & Gariep)		
Item No.	**Spare Component**	**Remarks**
1	Generator Transformer	Minimum of one for each type.
2	Generator Rotor or Rotor Pole	Minimum of one for each type.
3	Generator Stator Bars	Minimum of one for each type.
Gas Turbines (Acacia & Port Rex)		
1	Generator Transformer	Minimum of one for each type.
2	Generator Rotor or Rotor Pole	Minimum of one for each type.
3	Generator Stator Bars	Minimum of one for each type.
4	Pump Liquid Fuel System	Minimum of one for each type.
5	Exciter Rotor	Minimum of one Stator, rotor and CRR's for rotating type, Bridge & transformer for static type.

2.7 RELATED/SUPPORTING DOCUMENTS

This document supersedes 36-972 (Management and Reporting of Strategic Spares) and GGS 1495 (Generation Strategic Spares Health Programme).

3. STRATEGIC SPARES HEALTH PROGRAMME REQUIREMENTS

All strategic spares applicable to each station must be made stock items and stock numbers must be updated on SAP. Each spare must have technical specification also captured on SAP.

3.1 STRATEGIC SPARES HEALTH ASSURANCE

In order to satisfy the intent of the strategic spare, the spare identified for this purpose must satisfy two key criteria, namely;

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- Availability, and
- Serviceability

3.1.1 Availability

The intent of this health status index is to ensure that the spares are available in storage and that they can be readily deployed, in the event of a major plant failure condition.

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Table 4: Availability Health Status Index Criteria

Availability Status	Criteria	Remarks
GREEN	1. Available 2. Spare stored on site 3. In a good working condition	All three criteria must be satisfied
YELLOW	1. Available **2. Spare not on site** 3. In a good working condition	The only criterion that qualifies it as YELLOW **is** that that spare is offsite.
YELLOW (CR)	1. Available 2. Spare on site **3. Reduced performance capability**	Reduced performance is the criterion that qualifies it as YELLOW (CR).
YELLOW (RS)	1. Available 2. Spare not on site 3. Spare is rotable in nature and will be serviceable within one month of being removed from site.	A rotable spare must be treated on a case-by-case item and have a confirmed return date to site within a period of one month
RED	1. **NOT** available 2. Available but **NOT** in a working condition 3. Spare offsite for refurbishment 4. No feedback from the BU 5. Modification outstanding that would make the spare unusable	Anyone of these criteria qualifies the component as RED.
WHITE	**Not applicable to the specific BU**	

The desirable state is for the strategic spare to be available, on site and in a good working condition. Hence the **GREEN** status.

3.1.2 Serviceability

The intent of this health index is to ensure that processes are in place to provide a high degree of confidence that available spares will continue to be in a condition fit for service when they are required for deployment.

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3.1.2.1 Sub-criteria for serviceability

Table 5: Serviceability Sub Criteria

In-Storage Activity	*Sub-criteria*
Storage Requirements	
1. Storage Procedure	*A suitable procedure must be developed in consultation with the OEM or at least the Generation Technical Specialist*
2. Storage Execution	*Spares must be stored in accordance with the developed procedure.*
In-Storage Maintenance Requirements	
3.Maintenance Programme	*A suitable maintenance programme must be developed. It must provide a detail of maintenance activities to be performed, their frequencies, etc. The maintenance programme must include condition monitoring and testing activities.*
4. Maintenance Execution	*In order to demonstrate compliance, the service notes or PM's must be loaded on the SAP maintenance module and the records of performed maintenance activities must be kept.*
Protection Systems Requirements	
5. Protection Systems	*Protection should be provided against fire, environmental stressors, etc. Periodic testing schedules of protection systems must be maintained and testing procedures developed. Records of the status of protection systems must be kept.*

3.1.2.2 Serviceability Health Status Index

The serviceability health status index measures the extent to which the requirements have been met in ensuring that an available spare will be in a condition fit for service when it is required.

Table 6: Serviceability Health Status Index Criteria

Status	*Criteria*
GREEN	*If all sub-criteria are met*
YELLOW	*If 2 or less criteria are not met*
RED	*1. If availability is red or* *2. If more than 2 criteria are not met*
WHITE	*Spare is not applicable to a specific BU*

3.1.3 Strategic Spare Compliance

- The requirements set in this document shall be audited against the set criteria (Annex B) on a regular basis
- The audits shall be built-in into the CTAD Data Integrity schedule.
- The audit programme shall be included in the yearly Generation audit plan.

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3.1.4 Strategic Spares Status Reporting

- Status report on strategic spares shall be submitted and reviewed on a monthly basis or as and when required by management.
- The report shall reflect the health status of spare against the Strategic Spare Health Criteria. An example is reflected in ANNEXURE C.
- The feedback from the BU shall be consolidated in to Generation Strategic Spare Health Programme TLC (example in ANNEXURE D)
- The Generation Strategic Spares Health Programme TLC to be a visual representation of the status of the specific spare with respect to availability and serviceability, and shall provide an indicator in “Robot” format.
- The Generation Strategic Spares Health Programme TLC shall be used as an Executive overview and review tool
- The Generation Strategic Spares Health Programme TLC shall measure the health of the strategic spares using availability (see 3.1.1) and serviceability (see 3.1.2).
- The “Robot” indicator shall be reviewed on a monthly basis at the BU’s management team meeting. The relevant managers should provide the Power Station Manager with the detailed action plan on how to correct the deviation.
- The management and minimisation of “RED” areas i.e. strategic spares that do not conform to the required minimum requirements for availability and serviceability will be managed by means of the Non Conformance Report process.

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5. REVISIONS

Date	Rev.	Compiler	Remarks
August 2009	0	L Reddy	Replaced GGS1495
March 2013	0.1	PR Ngoetjana	Replaces 36-972 and scheduled review. Update on strategic spares health status report template. Update on GSSHP “TLC” template. Update on stock item, stock number and technical specifications as requirements. Update on roles and responsibilities. Update on spares qualification criteria wording. Update on spares component remarks. Final document prepared by F Bosch for Review
May 2013	0.2	PR Ngoetjana	Update feedback from reviewer for final approval
May 2013	1	PR Ngoetjana	Final document for Authorisation and Publication
June 2016	2	PR Ngoetjana	Document Rev 2 for Authorisation and Publication. Extension of Next Review Date with no material change to document content. Definitions and abbreviations updated

6. DEVELOPMENT TEAM

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

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7. ACKNOWLEDGEMENTS

- Logan Reddy.

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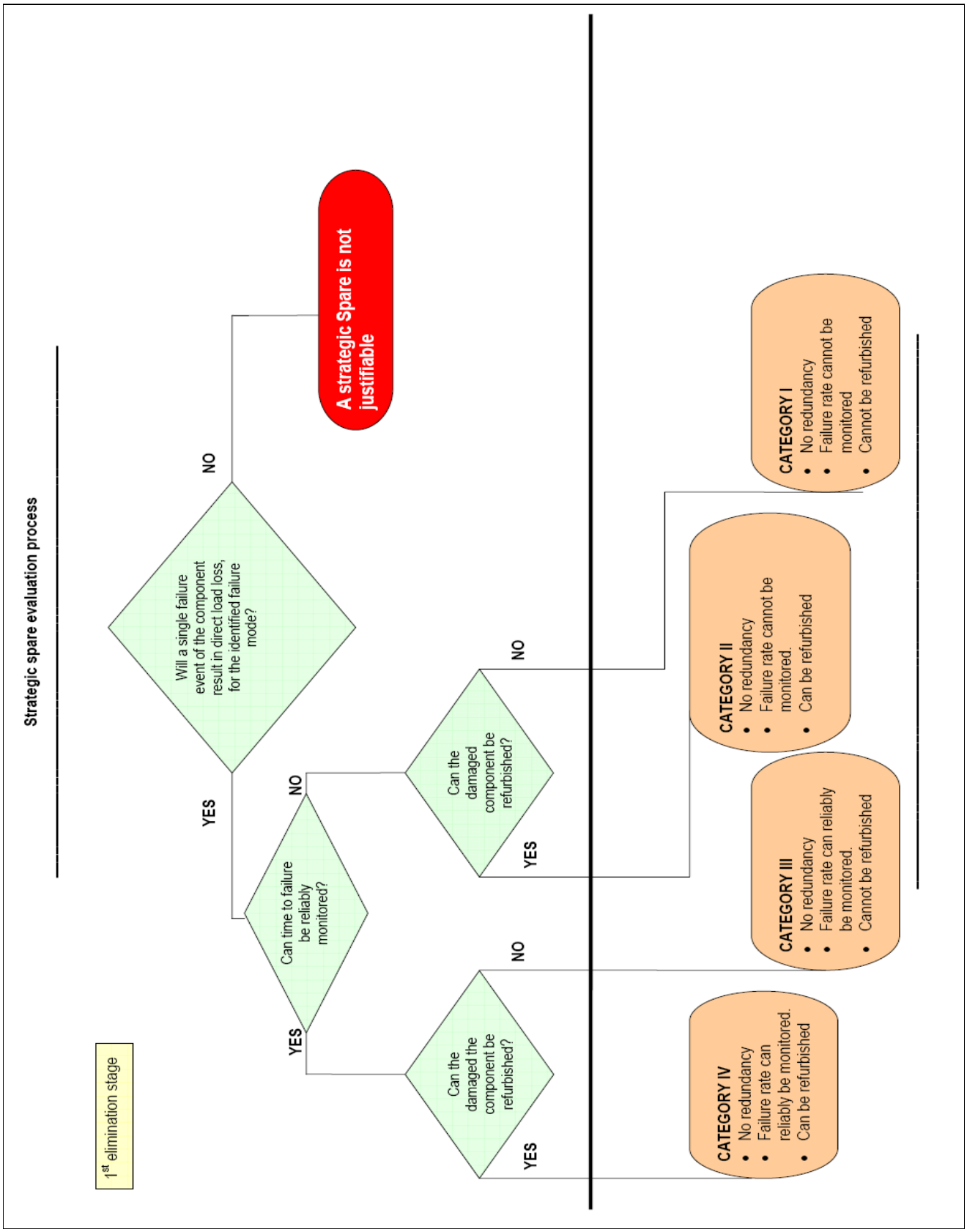
APPENDIX A: STRATEGIC SPARES QUALIFICATION PROCESS



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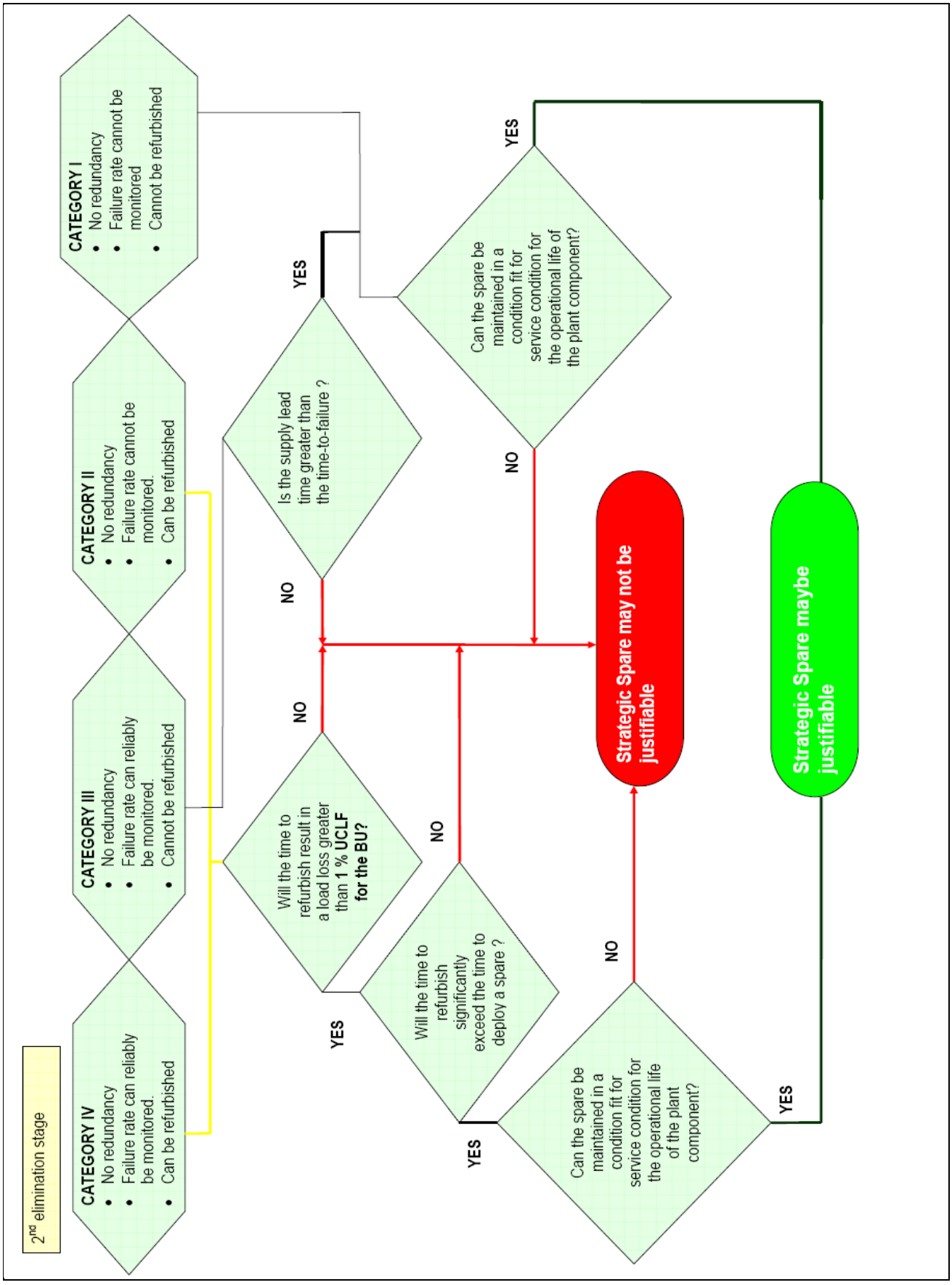

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APPENDIX B: GSSHP AUDIT CRITERIA

For

Performing Internal Audit and Peer Reviews

A) Scope:

The scope of the audit and peer reviews will include all the strategic spares identified for Generation as listed in sub-Section **4.4** of this document.

B) Verification for Compliance:

1. Spare x

(Material nr)

Availability

- Confirm: that status is consistent with reported
- Consistent with on SAP (or equivalent)
  - In stores?
  - Location (on site or not)?
  - Status of risk/CR is documented?
  - Is it in working condition and is this documented?
  - Are there any outstanding modifications?

Serviceability

- Storage Procedure - (Does a suitable storage procedure exist?)
- Storage Execution - (Is the storage procedure being executed?)
- Maintenance Programme - (Does a suitable maintenance programme exist? Does it include condition monitoring and testing requirements?)
- Maintenance Execution - (Is the maintenance program being executed? Are suitable records being kept for maintenance activities, condition monitoring and testing activities?)
- Protection Systems - (Status of fire protection, environmental control etc. in storage area)

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APPENDIX C: STRATEGIC SPARES HEALTH STATUS REPORT

Please do not edit format. Input your station name and update Columns E to S!

	Generation Strategic Spares Health Program	Status		Site Name:	Your Power Station			Date: DD/MM/	2012/01/01				Purchase Requisition	Purchase Order		Supplier	Material/ Stock Number	Driver / Leading Person	Comments
	SPARE	Avail.	Serv.	Reason for Status (If not green or white)	Action Plan to Rectify Status	Initial Date Spare Used	Action Status	Action Completion Date	Delivery Date	Qty Req.	TechPlan Code	ERA Status	PR No.	PO No.	QTY				
1	Unit Transformer																		
2	Generator Transformer																		
3	LP Turbine Diaphragms (or stationary blades)																		
4	Exciter																		
5	HP Turbine Governor Valve Cartridge & Actuator																		
6	IP Turbine Governor Valve Cartridge & Actuator																		
7	Boiler Water Circulation Pump																		
8	LP Turbine Rotating Blade Set																		
9	HP Turbine Diaphragms (or stationary blades)																		
10	IP Turbine Diaphragms (or stationary blades)																		
11	HP Turbine Stop Valve Cartridge & Actuator																		
12	IP Turbine Stop Valve Cartridge & Actuator																		
13	HP Turbine Rotating blade set																		
14	IP Turbine Rotating blade set																		
15	(Secondary) Air heater Packs																		
16	LP Turbine rotor																		
17	HP Turbine rotor																		
18	IP Turbine rotor Bladed																		
19	Generator Rotor																		
20	PA Fan Motor																		
21	FD Fan Motor																		
22	ID Fan Motor																		
23	PA Fan Impeller																		
24	FD Fan Impeller																		
25	ID Fan Impeller	CR																	
26	Generator Stator Bars																		
27	Generator Breaker Poles																		

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	M_11 F2013/February 2013	Coal 1						Coal 2										Coal 3									
		Ken		Maj		Mat		Duv		Kr		Mtl		Let		Tut		Ar		Cam		Gtv		Hen		Kom	
	SPARE	Av.	Srv.	Av.	Srv.	Av.	Srv.	Av.	Srv.	Av.	Srv.	Av.	Srv.	Av.	Srv.	Av.	Srv.	Av.	Srv.	Av.	Srv.	Av.	Srv.	Av.	Srv.	Av.	Srv.
1	Unit Transformer																										
2	Generator Transformer																										
3	LP Turbine Diaphragms (or stationary blades)																										
4	Exciter																										
5	HP Turbine Governor Valve Cartridge & Actuator																										
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21	FD Fan Motor																										
22	ID Fan Motor																										
23	PA Fan Impeller																										
24	FD Fan Impeller																										
25	ID Fan Impeller																										
26	Generator Stator Bars																										
27	Generator Breaker Poles																										
	No. R	5	5	8	8	8	8	10	10	8	8	7	7	2	1	14	14	15	15	6	6	10	11	6	6	7	7
	No. G	16	21	14	19	15	17	17	17	18	19	19	19	1	1	11	13	10	8	13	14	9	11	14	14	12	20
	No. CR	0		3		0		0		0		0		2	1	0		0		0		1		0		0	
	No. RS	0		0		0		0		0		0		0		0		0		0		0		0		0	
	No. Spares not applicable to site	0		0		0		0		0		1		0		0		1		7		0		7		7	

Serviceability

- All 8 sub-criteria OK.
- 6 or 7 sub-criteria OK (Including no outstanding mods.)
- 5 or fewer sub-criteria OK

Note: If Availability = RED, then Serviceability = RED

- Permanently not applicable at this station

Availability

- Available, on site and in working condition.
- CR — Available but with risk or restrictions.
- Available and in working condition, not on site.
- Not available or not in working condition.
- Permanently not applicable at this station.

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APPENDIX D: RECOMMENDED STORAGE

Recommended Storage And Qc Inspection Criteria For Selected Strategic Spares (As Per 36-1042, Material Control, Preservation & Storage Handling)

Table 1: Minimum storage and QC inspection requirements

Component	Minimum storage and QC inspection requirements
Generator and exciter rotor (with CRR's)	**Minimum storage requirement** • CRR storage as per GGS 0700. • Store in clean, dry, vibration free environment away from direct sunlight above dew point temperature recommended by the OEM. • Avoid contact with harmful products as per GGSS 1181 Specification • Seal in suitable plastic which will limit halogens and chlorides in contact with rotor to < 200 ppm with inert gas and silica gel or apply heating elements to mitigate corrosion or stress corrosion cracking risk using dust cover. • Store in crate or use suitable barrier to minimise inadvertent damage or uncontrolled access. Alternatively, store in "bullet" and pressurise to seal from atmosphere with suitable pressure gauge to detect air ingress. • Use support arrangement designed to counter risk of bowing. • Inspect twice a year?
	Minimum technical refurbishment scope before storage • Refurbishment of generator rotor as per GGS 0391/2/3. • Testing of generator rotor as per GGS 0684. • Partial discharge testing as per GGM 0826. • CRR inspection and refurbishment as per GGS 0700. • Refurbishment history updated.

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Component	Minimum storage and QC inspection requirements
Draught group motors	**Minimum storage requirement** • Store in clean dry, vibration free environment. • Protect shaft couplings, shaft extensions, exposed keyways and other unpainted areas with anti-rust preparation. • Clean externally. • Ensure adequate oil or excess grease in bearings. • Monthly turn shaft through 90 degrees (only if there are rolling element bearings fitted). • Conduct visual inspection quarterly. • Megger test HV motors quarterly.
	Minimum technical refurbishment scope before storage • Refurbishment as per GGS 0389. • Refurbishment history updated.
Draught group fan impellers	**Minimum storage requirement** • Coat bearing surface with anti-rust preparation. • Store in clean, dry environment • Conduct quarterly visual inspection. • Rotate the impeller and shaft through 180 degrees every 6 months. Applicable where the impeller and shaft are stored as an assembly, supported by trestles under the shaft
	Minimum QC technical inspection scope before storage • Full NDT examination as per GGP 0322. • Dimensional measurement using check sheet. • Refurbishment history updated.
Generator and unit transformer (with HV & LV bushings)	**Minimum storage requirement** • Prolonged storage of key stock Transformers as per ESKASAAI3 – Storage method 3 • Ensure oil dielectric strength conforms to ESKASAAF1. • Inspect quarterly.
	Minimum QC technical inspection scope before storage • Refurbishment as per GGG 1055. • Quarterly inspection according to GGS 0178 Standard. • Refurbishment history updated.

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Component	Minimum storage and QC inspection requirements
Main turbine Control Valves	**Minimum storage requirement** • Store in clean, dry environment on pallets, shelving or racks on concrete floor. • Protect shaft, valve head, exposed keyways and other unpainted areas with anti-rust preparation.
	Minimum QC technical inspection scope before storage • Refurbishment as per GGS 0580. Standard. • Refurbishment history updated.
Bladed or unbladed main turbine rotor and / or main turbine blades	**Minimum storage requirement** • Protect turbine shaft, journals, exposed keyways, blades and other unpainted areas with anti-rust preparation. • Turbine blades are also wrapped / covered in wax paper. • Store in metallic cradle with non-metallic dummy bearings within wooden crate, sealed in sheet plastic to avoid moisture ingress. • Store components in clean, dry, vibration free environment on concrete floor.
	Minimum QC technical inspection scope before storage • Rotor: Protect shaft, exposed keyways and other areas with anti-rust preparation. • Individual blades: Protect blade root and blade surface with anti-rust preparation. • Full NDT and visual examination as per OEM recommendations. • Rotor dimensional recording using check sheet. • High speed balancing based on refurbishment scope and risk assessment. • All turbovisory tracks to be covered with suitably designed protective covers. • Refurbishment history record updated.
Generator breaker (including poles)	**Minimum storage requirement** • Store in clean, dry environment on pallets, shelving or racks on concrete floor.

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Component	Minimum storage and QC inspection requirements
	Minimum QC technical inspection scope before storage • All spare poles must be complete and stored fully assembled, with top and side covers fitted. It is not required to store the spare poles in a fully serviceable state. All components required to ensure availability of the power generating unit must be serviced before utilisation. • Refurbishment as per GGPP 0965. • When items are scavenged from any of the spare poles to ensure the availability of a power generating unit, these items must be replaced within six months of removal. • Business unit responsible for spare pole to conduct inspection as per check sheet to verify pole completeness. • Refurbishment history record updated. • Annual audits to be conducted.
Stator bars	**Minimum storage requirement** • Store bars in crate in clean, dry environment on flat surface. • Bars to be sealed in plastic with inert gas to avoid moisture ingress. • Bars to remain in wooden crate with packaging until required in plant. • Buffer elements to separate bars from each other.
	Minimum QC technical inspection scope before storage • Dimensional and material checks to be performed to ensure that the winding copper meets the necessary electrical and mechanical requirements. • Stator bars are tested in accordance with BS4999-144.

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