Eskom	SPECIFICATION	Medupi Power Station

Title: **Medupi Power Station LV Variable Frequency Drives, Soft Starters and Thyristor Bank Controller Refurbishment Contract User Requirement Specification**

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1. Introduction

Medupi Power Station intends contracting out refurbishment of LV VFD, Soft Starters and Thyristor Bank Controller to suitable suppliers. This specification provides the requirements for the refurbishment of LV VFD's, Soft Starters and Thyristor Bank Controller for Medupi Power Station.

2. Supporting Clauses

2.1 Scope

2.1.1 Purpose

The purpose of this document is to define the LV VFD's, Soft Starters and Thyristor bank Controller refurbishment requirements for Medupi Power Station. It is therefore imperative that each Supplier aligns its organisation fully to the systems laid down in this document. Once this document has been approved at all relevant levels, it will form a baseline for the refurbishment specifications for LV VFD's, Soft Starters and Thyristor bank Controller in Medupi Power Station.

2.1.2 Applicability

This document is applicable to all LV VFD's, Soft Starters and Thyristor bank Controller associated with Medupi Power Station.

2.1.3 Effective date

This document shall be effective from the date of the last signature.

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] 200-1689 Specification Quality Management

[3] Occupational Health and Safety Act, 85 of 1993.

[4] 240-50237146 Medium Voltage AC Variable Frequency Drives Standard rev 1.

[5] 240-54819241 Identify Items for Repair Work Instruction

[6] SANS 61800-2 General requirements – Rating specifications for low voltage adjustable frequency AC power drive system

[7] 240-155767143 Medupi Power Station Refurbishment of Low Voltage Variable Frequency Drives and Soft Starters Works information

[8] 240-54819241 Identify items for Repair Work Instruction.

2.2.2 Informative

[9] Sinamics G120 &G120P Low voltage converters built-in and wall mounting units with CU230P-2 control units

[10] Sinamics G130 converters built-in units 75kW – 800kW. Edition 12/2018.

[11] Sinamics G150 converters cabinet units 75kW – 800kW. Edition 12/2018.

[12] Siemens Sirius Soft started 3RW44 manual, Issue 10/2010

[13] Siemens soft starters and solid state switching devices 3RW44 soft starters, issue 02/2020

[14] Vacon NXS/P ac (DPD00910) drives user manual wall-mounted drives standalone drives.

[15] Vacon NXS/P ac drives enclosures IP21 and IP54 user's manual

[16] Weg CFW-09 frequency inverter manual, 0899.5306 / 12.

[17] Weg CFW-11 frequency inverter manual, 10000063093 / 06.

[16] Variable speed drives Altivar 71 and Altivar 71 Plus, Catalogue April 2014

[17] Operating instruction VLT soft starter –MCD 500, Rev.2012-03-05,17R0549/MG17K802

2.3 Definitions

Definition	Description
Power Drive System	A system consisting of power equipment (converter, transformer and filters), control, protection, auxiliaries, interconnecting cable and motor.
Variable Frequency Drive	A device consisting of power equipment (converter, transformer and filters), control, protection and auxiliaries to vary the speed of the motor
Soft starter	Is a device used with AC electrical motors to temporarily reduce the load and torque in the powertrain and electric current surge of the motor during start-up.
Employer	Company that is a recipient of a good or service provided by a Supplier under a purchase order or contract of sale. For the purpose of this Works Information, the Employer is Eskom Holdings SOC Medupi Power Station or representative thereof.
Supplier	An enterprise that provides goods or services. For the purpose of this Works Information, the Supplier may refer to the OEM, OEM approved distributor or Supplier appointed to implement the works herein.
Refurbishment	It is a total process of restoring the machine or component that has become inadequate (or has failed) for continued for normal maintenance, thereby making it suitable for an extended period of service.
Repairable Materials	Plant items that can be repaired cheaper than purchasing a new item should be changed to RF-Items and managed accordingly through the Rotable Process. The item must be repairable at least 3-times.The cost of repair of the material must be equal to or less than 70% of the cost of a new item. The condition of the material after repair must be "as good as

	New", e.g. must be back to its original specification and capable of the same performance as a new item. Lead-time is a factor that needs to be considered, if the repair lead-time is considerable.
Repair	Steps required to rework or replace components to restore the LV VFD's, Soft Starters and Thyristor bank Controller to original design specifications
Overhaul	A basic refurbishment or refurbishment with limited replacement of components(e.g. Fan capacitor or card replacement)

2.4

1. Abbreviations	**2. Explanation**
FAT	Factory Acceptance Test
IP	Ingress Protection
ISO	International Organization for Standardization
ITP	Inspection Test Plan
LV	Low Voltage
PS	Power Station
QCP	Quality Control Plan
SANS	South African National Standards
SoW	Scope of Work
SS	Soft Starter
VFD	Variable Frequency Drive
WI	Work Instruction

2.1 Roles and Responsibilities

2.5 Roles and Responsibilities

Contract Management must ensure the following:

Manage the contract as per the contract management processes. e.g.

Create task orders, assessments and service entries.

Electrical and PTM must ensure the following:

Test the failed or damaged LV VFD's, Soft Starters and Thyristor bank Controller.

Compile internal failure or breakdown report and submit to the System Engineer.

Load notification on SAP for Mechanical maintenance rigging to load, transport and offload LV VFD's, Soft Starters, and Thyristor bank at the stores.

Book back the damaged LV VFD's, Soft Starters and Thyristor bank Controller to stores

Perform QC on refurbished LV VFD's, Soft Starters and Thyristor bank Controller.

Book back the repaired or refurbished LV VFD's, Soft Starters and Thyristor bank Controller to stores.

Mechanical Maintenance rigging must ensure the following:

Load, transport and offload the damaged LV VFD's, Soft Starters and Thyristor bank at the stores.

Engineering must ensure the following:

Approve upgrades

Sign repair scope of work

Witness testing

Competent service provider responsibility:

Collect LV VFD's, Soft Starters and Thyristor bank Controller from Medupi Power Station.

Strip and Assess LV VFD's, Soft Starters and Thyristor bank Controller and develop repair SOW.

Submit assessment report, recommended repair SOW and quote to the Employer.

Execute repairs, QC requirements and testing of the LV VFD's, Soft Starters and Thyristor bank Controller.

Deliver refurbished LV VFD's, Soft Starters, Thyristor bank Controller and data pack back to Medupi power Station.

2.6 Process for monitoring

This document will be monitored through internal peer checks.

2.7 Related/Supporting Documents

Related documents are listed under normative and informative documents

3. Requirements

3.1 scope requirements

3.1.1 Adherence to Eskom generic policies

The Service provider shall ensure that they comply with Eskom's policies and site regulations, including but not limited to, non-use of cell phones in restricted areas, adherence to Eskom's lifesaving rules, no smoking policy and zero tolerance on alcohol usage.

3.1.2 On-site Support Services

The service provider shall be required to assist the client onsite or telephonically in resolving any faults or issues encountered after the installation of refurbished or repaired LV VFD's, Soft Starters and Thyristor bank Controller.

3.1.4 Details of Scope of work

The following scope is only a baseline and does not reflect the actual refurbishment scope for any LV VFD, Soft Starters and Thyristor bank Controller sent for refurbishment. The Supplier will furnish the Employer, in writing, with the preliminary SOW after assessing the LV VFD, Soft Starters and Thyristor bank Controller.

Once the scope of work has been approved and a task order issued, refurbishment may proceed as per agreed SOW.

Annexure A is a flowchart to simplify the process to be followed.

ITEM NO	TASK DESCRIPTION
General Requirements	
1	Collect LV VFD, Soft Starters and Thyristor bank Controller from Medupi Power Station and perform incoming inspection as per Eskom document 240-155767143 section 3.2.1.3.1
2	Dismantle/strip the LV VFD, Soft Starters and Thyristor bank Controller as per Eskom document 240-155767143 section 3.2 B.1
3	Pre-cleaning assessment as per Eskom document 240-155767143 section 3.2 B.1
4	Cleaning of the LV VFD, Soft Starters and Thyristor bank Controller as per Eskom document 240-155767143 section 3.2.1.3.1 H
5	Post-cleaning Assessment as per Eskom document 240-155767143 section 3.2 B.1
6	Provide an Employer with a detailed Failure Report as per Eskom document 240-155767143 section 3.2.1.1.1
7	Refurbish/Repair the LV VFD's, Soft Starters and Thyristor bank Controller after agreement with the Employer as per Eskom document 240-155767143 section 3.2.1.4 F
LV VFD's, Soft Starters and Thyristor bank Controller Repairs	
8	Replacement of components as per Eskom document as per Eskom document 240-155767143 section 3.2.2.2.1
9	Conduct functionality tests and checks on all power components as per Eskom document 240-155767143 section 3.2.1.3.1 F
10	Checks for cracks, broken and missing parts before Assembly as per Eskom document 240-155767143 section 3.2.2.2.3
11	Records as per Eskom document 240-155767143 section 3.2.2.2.3.1
12	Repaired LV VFD's, Soft Starters and Thyristor bank Controller Delivery as per Eskom document 240-155767143 section 3.2.2.3.2
13	Inspection & Testing as per Eskom document 240-155767143 section 3.2.1.3.1
14	Standard Routine Tests as per Eskom document 240-155767143 section 3.2.2.2.3
15	Performance Tests and checks as per Eskom document 240-155767143 section 3.2.2.2.3

Table 1: List of LV VFD's and Soft Starters in Medupi Power Station:

Type (LV)	OEM	KW
Sinamics G120	Siemens	15-132
Sinamics G130	Siemens	132-400
Sinamics G150	Siemens	132-315
Micro master 430	Siemens	75
3RW44/30	Siemens	1-250
CFW-11	Zest Weg	55-160
CFW-09	Zest Weg	160
ATV71	Schneider Electric	15-110
Vacon NXP/NXS	Vacon/Danfoss	7.5-250
MCD 500	Danfoss	1-2500
Thyristor power controller	Part number:2P 690-1400 HF-2000000343	690Vac-1400A

3.1.5 Deficiencies and modifications

No modification or upgrade shall be done on the LV VFD's, Soft Starters and Thyristor bank Controller without the approval of the employer's Engineer.

3.1.6 Turnaround time

The contractor shall have a maximum of 2 working days to submit a strip and asses report.

The contractor shall have a maximum of 07 days from the date of the order to refurbish the LV VFD's, Soft Starters and Thyristor bank Controller and deliver to site. Depending on the failure on LV VFD's, Soft Starters and Thyristor bank Controller, or notify the employer of any issues that may delay the return of the item.

3.1.7 Record keeping

The supplier will keep originals of the test results, quality records and any other documents used on the VSD for the period of the contract plus two (2) years.

The employer shall be given the copy of the tests results.

3.1.8 Data Pack

The LV VFD's, Soft Starters and Thyristor bank Controller shall be returned to site only if it's accompanied with a data pack comprising as a minimum of the following:

Failure analysis report

Test results specified on the scope of work

Copies of quality records

Repair scope of work,

All tests and check reports

Certificates

Drawings

3.1.9 Warranty

Any refurbished LV VFD's, Soft Starters and Thyristor bank Controller shall have 12 months warranty granted by the supplier to the Employer. The period shall commence on the day the LV VFD's, Soft Starters and Thyristor bank Controller is accepted back on the Employer's site.

3.1.10 Transportation, delivery and storage

The Service provider is responsible and accountable for transporting the LV VFD's, Soft Starters and Thyristor bank Controller from Medupi Power Station to their sites and from their sites to Medupi Power Station.

The Employer shall inform the Service provider of specific Medupi PS requirements such as security requirements, collection times and details of the LV VFD's, Soft Starters and Thyristor bank Controller.

The LV VFD's, Soft Starters and Thyristor bank Controller collection point and lifting requirements shall be managed by the Employer.

The Service provider shall supply standard packaging and tools necessary to clamp the LV VFD's, Soft Starters and Thyristor bank Controller before transport leaves the collection point.

The LV VFD's, Soft Starters and Thyristor bank Controller shall be transported by the service provider with the necessary care to prevent further damage as a result of transportation.

The Service provider's transportation and storage requirements shall comply with SANS 61800-2,

Section 4.

3.1.11 Quality and Documentation control

Quality Control Plans (QCP's) approved by the employer shall be produced, maintained and implemented per tasks (as agreed by the Employer).

These QCP's shall comply with ISO 9001: 2008 standards. Any new or amended QCP's shall be discussed with the employer.

The Service provider shall ensure that any witness, hold and inspection points are strictly adhered to.

The Employer representative is required to perform quality check for repaired items before they could be delivered on site.

All Quality References and Standards as stipulated in this document shall be adhered to.

The Service provider has to ensure that all measuring and testing equipment are calibrated in accordance with Medupi Power Station Test Equipment Calibration User Scope of Work Specification (240-94144946) at all times and proof thereof must be readily available.

Unless otherwise specified or approved by the Employe*r*, all materials, parts, and processes shall comply with the most recent the Employer, SANS and/or IEC standards and certification applicable.

Test certificates must be submitted indicating the testing authority, method of testing and the test results.

Only OEM certified components (e.g. fans and cooling tunnel) must be used unless otherwise specified by the Employer.

New components are to be tested before installing on the LV VFD's, Soft Starters and Thyristor bank Controller.

The tests results are to be included on the final repair report.

During LV VFD's, Soft Starters and Thyristor bank Controller repairs and assembly, component protection and clean conditions shall be practiced to ensure no foreign materials are left inside the LV VFD's, Soft Starters and Thyristor bank Controller.

The original LV VFD's, Soft Starters and Thyristor bank Controller nameplate or other nameplate shall not be removed or damaged.

The refurbishment work shall not reduce the IP rating of the LV VFD's, Soft Starters and Thyristor bank Controller.

3.1.12 Special tests and investigations

The Supplier will perform special tests, investigations and record all findings.

The Contractor shall perform functionality tests and checks on all power components, control, monitoring and protection circuits, auxiliary inputs and outputs and accessories. The tests are to determine the probable cause of the failure if any, record the findings, and to determine additional work which may be required.

The findings shall be shared with the employer.

3.1.13 Insurance

All LV VFD's, Soft Starters and Thyristor bank Controller insurance shall be covered by the supplier as from the time they leave Employers' site until delivery back on the Employers' site.

LV VFD's, Soft Starters and Thyristor bank Controller that involve either warranty or insurance claims shall not be disassembled without the Employers' written approval for the contractor to commence with the work.

Arrangements shall be made with the employer's representative to witness the disassembling.

3.1.14 Industrial Relation

Any industrial relation issues from the supplier should be discussed with the Employer's contract manager.

3.1.15 Quarterly Technical Meetings

Employer will schedule quarterly meetings to discuss technical issues relating to the contract. Therefore the contractor should avail themselves for the scheduled meeting.

4. Acceptance

This document has been seen and accepted by:

Name	Designation
Moses Nonyane	Snr Advisor Technical Support
Ntando Mbatha	Electrical System Engineer
Pontsho Letsholonyane	Manager Contracts Management
Kevin Rabbolini	Manager Maintenance

5. Revisions

Date	Rev.	Compiler	Remarks
April 2021	1	S.C Mathiyana	Original document

6. Development Team

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

Frans Mokobodi

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7. Acknowledgements

Thanks to the EMD team for all the contributions made towards this document.

Annexure A Process flow chart