Eskom	Scope of Work	Engineering

Title:	**The provision of maintenance service and refurbishment during outages on the Sulphur Trioxide (SO3) plant units 4, 5, 6 and Outside plant at Duvha Power Station for a period of 5 years.**	Unique Identifier:	**559-1356448008**
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1. INTRODUCTION

This document contains a detailed scope of work for the provision of a full mechanical maintenance service on the SO3 plant at units 4 to 6 as well as the outside/common plant. This scope covers the the day to day maintenance as well as refurbishment during outages. Duvha Power Station utilises SO3 injection to improve the efficiency of the electrostatic precipitators to contribute significantly to cleaner air, efficient power generation, and environmental sustainability at Duvha Power Station. Their proper implementation ensures a healthier environment and optimal plant performance.

The above-mentioned plants require internal and external maintenance to ensure compliance with emission standards, health risk is reduced for workers and nearby communities, prevent equipment fouling and maintains system efficiency all the time.

It is for the above-mentioned reason that a contract to conduct maintenance on those plants must be initiated.

2. SUPPORTING CLAUSES

2.1 SCOPE

The provision of maintenance service and refurbishment during outages on the SO3 plant unit 4, 5, 6 and outside plant.

2.1.1 Purpose

- The purpose of this contract is to ensure availability of the SO3 plant to ensure low stack emissions throughout the station.
- To establish an effective and efficient maintenance and repair process for the SO3 plant.

The parties are committed to the following:

- Continuous improvement of Plant performance
- Retention of critical skills.
- Cost Efficiency
- Safety (Zero harm policy)

2.1.2 Applicability

This document shall apply to Duvha Power Station.

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] 240-53113965: Fabric Filter Plant Bag Standard.

[3] HBI1213 FABRIC FILTER PLANT ON-LOAD REBAG

[4] Occupational Health and Safety Act No. 85 of 1993,

[5] QM58 - Suppliers contract quality requirements specification

[6] SANS 1200 - Standardized specification for civil engineering construction

[7] 240-106628253 - Standard for Welding Requirements on Eskom Plant

[7] SANS 9096-1:1994: Testing of welders, where applicable to the type of welding required

[8] SANS 1044-3: Welding Part 3: The fusion of steel (including stainless steel): Tests for the approval of welding procedures

[9] SANS 10044-4: Welding Part 4: The fusion welding of steel (including austenitic stainless steel): Tests for the approval of welders working where weld procedure approval is not required.

[10] SANS 10064: The preparation of steel surfaces for coating

[11] SANS 10341: Installation and maintenance of bearings – General guidelines

[12] SANS 1700-5-9: Fasteners Part 5: General requirements & material properties

[13] Section 8: Corrosion resistant stainless steel fasteners-Bolts, Screws & Studs

[14] SANS 1700-5-10: Fasteners Part 5: General requirements & material properties Section 8: Corrosion resistant stainless steel fasteners-Nuts

[15] SANS 1123: Pipe Flanges

2.2.2 Informative

[1] 474-58 (Rev1): Document and Records Management

2.3 DEFINITIONS

2.3.1 Disclosure Classification

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.4 ABBREVIATIONS

Abbreviation	Description
FFP	Fabric Filter Plant
PPS/PI	Polyphenylene Sulfide Polyimide 84
SANS	South African National Standards
SE	System Engineer
SHEQ	Eskom Safety, Health, Environment and Quality
QA	Quality Assurance
QM	Quality Manual
QCP	Quality Control Plan
NDT	Non Destructive Testing
WPS	Welding Procedure Specification
WPQR	Welding Procedure Qualification Record
WQR	Welder qualification record

Abbreviation	Description
WRT	Weir Reduction Technology

2.5 ROLES AND RESPONSIBILITIES

Appointed Contractor – Execute the scope of work as per the employer's specification, with adherence to all standards prescribed in this document.

Project manager – To ensure that the supplier execute all the work specified in the scope of work on the set timelines.

System Engineer – The SE will review all works which is being executed and ensure that quality assurance and compliance.

Eskom QC- Eskom QC will quality approve all activities executed in the plant and sign off the *contractors* QCP document.

2.6 PROCESS FOR MONITORING

n/a

2.7 RELATED/SUPPORTING DOCUMENTS

None

3. SCOPE OF WORK

3.1 DESCRIPTION OF THE SERVICE

The service is the maintenance of the Sulphur trioxide (SO3) plant on units 4, 5, 6 and the Common/Outside plant at Duvha Power Station during normal maintenance and planned outages for a period of 5 years.

Maintenance includes monitoring, testing, inspecting, overhaul and repairs of equipment. The maintenance services is equipment overhauls, repairs, planned maintenance, routine maintenance, monitoring, testing, lubricating or greasing of plant, cleaning to access the component/equipment for maintenance, recommissioning of plant and other actions necessary for restoring the equipment to its optimum operating condition. The service is the supply of skilled labour, equipment and tools to carry out maintenance.

3.2 EMPLOYER'S REQUIREMENTS FOR THE SERVICE

- The *Contractor* provides qualified labour to carry out corrective and preventive maintenance activities.
- The *Contractor* provides tools, gear, equipment and consumables to carry out the work.
- The *Contractor* ensures the safety of own personnel, other contractors and Eskom employees in the vicinity of the works by complying with the OHS Act No.85 of 1993 and its Regulations.

- The *Contractor* plans and executes the work and provides a detailed plan for each unit outage and weekend maintenance opportunities.
- The *Contractor* performs quality control on own work as per pre-approved control plans.
- The *Contractor* performs work within the specified period and to the acceptable quality standard.
- The Contractor is required to have a minimum of 2 RP's (Responsible Person) as per the Eskom's Plant Safety Regulations within four months from the contract start date. The course will be provided free of charge by Duvha Power Station. It remains the Contractor's responsibility to book his personnel for the training.
- The works also includes the decommissioning and re-commissioning, removal, dismantling as well as making good of areas affected by the removal thereof. All redundant equipment to be removed by the Contractor.
- The Contractor is required to take permit to work for other contractors for short term projects.

3.2.1 MAINTENANCE SITE CORE CREW

The service provider provides a site crew comprising of a:

1x Site Supervisor

2x Mechanical Fitters

2x Trade Assistants

- This crew will be required to perform maintenance work on a day-to-day basis and on call-out for failures after normal working hours. Maintenance includes monitoring, testing, inspecting, overhaul and repairs.

3.2.2 Standby and callouts

The service provider shall ensure availability of personnel to attend to breakdowns outside of normal hours. The standby person attends to call-outs outside of normal working hours:

Supervisor

or

Fitter

The call-out hours will be based on the entering the gate and on completion of the work. Call-outs traveling is limited to 30 min in each direction (1 hr in total) per call-out.

3.2.3 Short UCLF/PCLF maintenance opportunities

The station is granted short maintenance opportunities to attend to repairs that cannot be attended to on load. During these opportunities the supplier will be required to provide additional resources for the duration of the opportunity, these resources will be required to carry out repairs on a 24-hour basis.

3.2.4 Day to day activities performed by the Service Provider

a) The contractor will be required to work the same Eskom hours which are 07:00 to 16:15 on Mondays to Thursdays and 07:00 to 12:00 on Fridays.

b) The contractor to attend morning meetings with Eskom Service/Contract manager whatever the case maybe,

c) The contractor performs daily inspections/checks on the SO3 skids (inclusive of all its components and equipment) on unit 4 to 6 installed on 16ml, 57ml and outside plant.

d) The contractor performs daily inspections on the molten sulphur common plant at the outside plant 0ml,

e) The contractor records and submit all notable findings from inspections to the service/contract manager,

f) The contractor repairs/ fixes all the defects on the plant within allowable duration (repairs program will be requested or required for all critical work),

g) The contractor collects weekly scheduled work orders from Eskom Service/ Contract manager and execute work as per work order and submit back,

h) The contractor report back all the weekly work orders to Eskom Service/Contractor upon completion,

i) The contractor ensures that weekly schedules and planned maintenance (PM) compliance targets are met,

j) The contractor ensures that all the priority 1 (P1) and priority (P2) work orders are closed out within a day or 2 of defect notification,

k) The contractor performs standby duties as per Eskom Service/ Contract manager's requirements,

l) The contractor performs housekeeping on all the plants associated with the SO3 gas generating plants.

m) The contractor performs monthly inspections and maintenance on the following equipment: process air blowers, process air filters, SO3 lances, SO2 cooler fans, sulphur supply and offloading pumps.

n) The contractor will be required to submit weekly plant inspection check sheets

3.2.5 The Contractor shall carry out the following activities as and when requested by Eskom Service/ Contract manager:

a) The contractor may be requested to be present during the weekdays or weekends for the offloading of molten sulphur into the sulphur bulk storage tank,

b) The contractor may be requested to issue a scope of work showing duration for any breakdown that will emerge in the plant,

c) The contractor may be requested to assist operating in the swapping of sulphur supply pumps,

d) The contractor may be requested to overhaul/ repair valves, sulphur supply and the offloading pumps on site,

e) The contractor will from time-to-time grease and rotate sulphur offloading pumps in the Eskom stores as specified by the relevant work instruction,

f) The contractor will be responsible for painting of the plant/components in-situ and after overhauling

3.2.6 The Scope of work consists of the following:

The activities are categorized according to the subsystems as detailed below.

Sulphur Trioxide (SO3) gas generating plants on Unit 4, 5 and 6 located on 16ml.

3.2.6.1 Molten Sulphur Supply and Burner system:

i) Molten Sulphur Hand Isolating Valve

- Repair any sulphur leaks on the valve housing,
- Repair and stop any steam leaks on the steam jackets and jumpers,
- Replace or fix the isolating valve if it is passing – Eskom to supply replacement valve,
- Replace the valve handle if broken or missing.

ii) Molten Sulphur Auto Block Valve

- Remove the valve actuator,
- Refurbish the valve,
- Repair/ replace the leaking steam jacket and jumpers,
- Replacement of the faulty valve,
- Overhaul the auto-block valve,
- Remove the valve positioner.

iii) Molten Sulphur supply Control Valve

- Remove the valve positioner,
- Remove the valve position feedback loop,
- Remove the valve actuator,
- Refurbish the valve.

iv) Sulphur Burner vessel

- Remove burner outlet flange bolts,
- Separate burner outlet flanges to inspect the gaskets,
- Remove burner inlet flange lid for inspections,
- Perform thicknesses test on burner vessel shell. Note – Written report to be submitted with findings. (Contractor to supply steel for patch work if required)
- Perform thicknesses test on burner outlet pipe. Note – Written report to be submitted with findings. (Contractor to supply steel for patch work if required)
- Perform inspection on vessels, internal inspection and brick matrix. Note – Written report to be submitted with findings.
- Remove and replace brick matrix if damaged.

- Repair refractory lining on the inside of the burner vessel,
- Effect any necessary repairs on the sulphur burner vessel if required,
- Remove burner outlet pocket thermocouple for inspection,
- Clean all the flanged areas when the vessel is opened,
- Renew gasket and replace burner inlet and outlet flange using stainless steel (S/S) bolts,
- Use approved gasket material for the gaskets on the inlet and outlet flanges of the burner vessel.

3.2.6.2 SO2 Gas Cooling system:

i) SO2 Cooler fan

- Uncouple the motor – Permit must be in force.
- Remove fan housing inlet plate assembly.
- Undo and remove taper-lock that secures impeller to motor shaft.
- Remove the impeller.
- Clean fan impeller and fan casing.
- Perform visual crack inspection test on impeller - Report findings and repair any defects.
- Check for free fan movement – no interference and correct clearances (Engineering to give clearance specifications)
- Replace fan housing inlet plate assembly – install sealing material between housing and plate.
- Align fan motor assembly and tighten hold-down bolts.
- Test run fan – Check that fan rotation and vibrations are correct – Balance, if necessary. (Eskom to supply specifications).

ii) SO2 Cooler Valve

- Remove and inspect the valve.
- Clean flanges and replace gasket.
- Renew all gaskets and replace valve.
- Process air block valve.
- Remove the actuator.
- Support pipe work.
- Overhaul valve and actuator. Note – if valve body is damaged or spares not available replace valve with new type.
- Clean all flanges.
- Check that the valve operates freely (does not interfere with pipe work) by moving through 900 by hand.

- Inspect all the wiring and connection lugs and repair, if necessary.
- Test valve operation to ensure correct stroke and indications.

iii) SO2 Cooler line.

- Remove the SO2 cooler airflow control valve positioner and instrument air pipes.
- Remove SO2 cooler valve actuator.
- Support cooler inlet pipe and remove flow control valve.
- Overhaul flow control valve.
- Clean flanges and install new gaskets - Replace flow control valve if necessary. Note – Ensure the valve is correctly orientated.
- Remove, inspect and replace, if necessary, the rubber connector - Contractor to supply the rubber.
- Inspect all the wiring and connection lugs and repair, if necessary.
- Grind open the SO¬2 cooler pipe housing.
- Inspect and replace SO2 cooler internal stainless-steel piping if necessary- Contractor to supply stainless steel pipe insert/spool piece.
- Replace the piping. Refer to 3.2.6.7 below

3.2.6.3 Process Air System:

i) Process air blower

- Change oil and re-grease the blower on a 3-monthly basis.
- Uncouple motor from the blower.
- Remove coupling guard.
- Split and overhaul coupling.
- Check for oil leaks on blower.
- Drain oil from blower Non-Drive End (NDE) side.
- Renew oil in blower – (fill up to the middle of the oil level indicator).
- Grease the Drive End (DE) bearing through grease nipple. Note – when re-greasing, the old grease will be forced out of the vents which must always be open.
- Replace the blower and re-align motor. (Alignment certificate and vibration report required)
- Box-up coupling & replace guard.
- Inspect and report on condition of process air pressure relief valve.
- Remove process air blower pressure relief valve.
- Send relief valve away for re-calibration (55kPa - 8PSIG)-Safety certificate required.
- Clean relief valve and pipe flanges.
- Renew gaskets between valve and process air pipe work and replace valve

• Check condition of rubber connection piece and clamps – replace if necessary (Contractor to supply).

ii) Process Air Filters.

• Change the auxiliary and cylindrical filters when blocked or defected.
• Open and clean filters monthly and report any findings.
• Check that all the solenoids are pulsing.
• Repair any air leaks on the pulsing system.

3.2.6.4 SO2 to SO3 Gas Converter vessel.

i) SO3 Convertor vessel.

• Perform externally inspections on the convertor vessel- Do thickness test on shell on grit of 200mm around the vessel. Note - Written report to be submitted with findings. Contractor to supply steel for patch repairs,
• Remove dilution air piping on converter vessel and inspect stub for corrosion,
• Remove stub, - (Contractor to supply new stub and backing plate)
• Replace stub, Note – Dye-pen to be done on welding (Follow M&M procedure)
• Open convertor vessel top lid,
• Remove quartz filter if required,
• Asses the condition of the catalyst inside the convertor vessel and report on condition of catalyst,
• Remove and replace catalyst- (Sift size of +6mm grit to be used)- Replacement to be done in consultation with System Engineer,
• Clean all flanges and clean inside stainless grating,
• Replace the flanged opening lid and fit the new gaskets with stainless steel bolts.

ii) SO3 Gas injecting Lances.

• Unblock and clean all gas injector lances,
• Remove and replace damaged injector lances,
• Repair or assist in replacing the thermocouples,
• Replace the injector lance protection plate.

3.2.6.5 Auxiliary Steam supply Valves and steam Lines AT 57ml:

• Verify that the steam pressure is always set at 800kPa.
• Repair any steam leaks on the steam lines.
• Check that the steam pressure gauge is functional.
• Perform inspections and report defects.

- Remove and replace steam valves if defective.

3.2.6.6 Sulphur Common / Outside plant located outside unit 6 on 0ml:

- Perform inspections on all equipment and report defects
- Ensure daily that the steam supply to the steam rack is open and supplying required pressure (+-450kPa),
- Ensure sulphur offloading jacketed piping steam line supplying steam in the offloading piping is open all the time and in a functional condition,
- Remove and install sulphur offloading pump and sulphur supplying pumps,
- Inspect and repair all the steam leaks on the steam rack and report ant defects,
- Inspect and maintain all the sulphur jacketed piping system and report any defects,
- Grease and adjust the gland follower on the sulphur supply pumps monthly and report any defects,
- Inspect the molten sulphur storage tank and report any defects,
- Ensure that all the temperature and pressure gauges are installed and functional on the steam rack and the bulk storage tank,
- Clean any and remove all sulphur solidified spillages and dispose-off into designated skips,
- Inspect and maintain molten sulphur discharge valves on the supply pump,
- Inspect, unblock and clean both the long and short vent pipes on the sulphur bulk storage tank,
- Ensure the plant is clean and the handrails are painted with correct colour coding,
- Inspect the tank bund wall and report any defects,
- Ensure that the bund wall drain valves are installed and functional,
- Ensure that all the required warning signs and boards are always installed and visible,
- Ensure that the emergency water fountain at the sulphur common plant is functional and not leaking water.
- Report all lagging and cladding issue to service/contract manager.
- Report any defect on the plant, that is control and instrumentation, electrical, civil and mechanical,
- Report any lighting issue around the plant to the service / contract manager.

3.2.6.7 Process Air dilution Valve

- Remove the valve actuator, and positioner
- Refurbish the valve,
- Replacement of the faulty valve.

3.2.6.8 Welding Requirements

The SO2 cooling pipe is made of 316L stainless steel and from time to time it requires to be welded. The following requirements will apply on all welding work:

1. A Level 1 welding inspector to oversee the repair

2. Adherence to the Eskom Standard for Welding Requirements (Attached)
3. NDT Requirements: Dye Pen through Eskom approved NDT providers.

4. AUTHORISATION

This document has been seen and accepted by:

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5. REVISIONS

Date	Rev.	Compiler	Remarks
June 2025	0	N Tootla	New document

6. DEVELOPMENT TEAM

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

- Naeem Tootla
- Victor Thubakgale

7. ACKNOWLEDGEMENTS

- None