	Scope of Work	Medupi Power Station
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Title: **Medupi Power Station Scope of work for Online Gas Analysers Services** Document Identifier: **241-2022922**

Alternative Reference Number:

Area of Applicability: **Medupi Power Station**

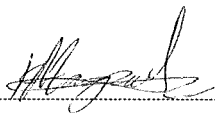


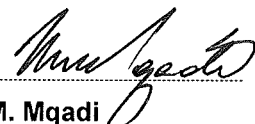
Functional Area: **Electrical Maintenance**

Revision: **1**

Total Pages: **12**

Next Review Date: **January 2028**

Disclosure Classification: **Controlled Disclosure**

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Date: <u>19/09/2024</u>	Date: <u>2024/09/19</u>	Date: <u>2024/09/20</u>	Date: <u>2024/09/25</u>

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1. Introduction

Transformers are major equipment within Eskom Generation and they play a major role in ensuring reliability of supply to Eskom consumers nationwide. It is therefore of high importance to ensuring that proper maintenance is carried out timeously as per Eskom Standards and OEM recommendations in order for the transformers to serve their expected operating design life before replacement.

Oil filled Transformers use oil for insulation and as cooling medium. Oil sampling from Oil Transformers and full analysis will ensure that the equipment health is adequately assessed to ensure that developing faults are detected well in advance.

Online Gas Analysers were installed for online condition monitoring analysis on each of Medupi Power Station big three transformers (i.e. Generator Transformer and two Unit Transformers). It is therefore expected that these Online Gas Analysers be maintained to ensure accurate and reliable analysis of the transformer oil.

Medupi has installed 18 Siemens/Serveron Dissolved Gas Analysers / Gas Guards that samples the transformer oil every four hours to detect any gassing of the transformer oil and send an alarm of any specific gas that has ppm greater than the setpoint and Eskom standards.

2. Supporting Clauses

2.1 Scope

This document covers 3 years maintenance contract for the Online Gas Analysers installed on the Generator Transformers and Unit Transformers at Medupi Power Station for all six Units.

2.1.1 Purpose

The purpose of the document is to provide specifications and the scope of work for Online Gas Analysers periodic maintenance as will be specified in the Scope of Work.

2.1.2 Applicability

This document shall apply to Medupi Power Station

2.1.3 Effective date

The document will be effective from the date of authorization.

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] ISO 9001 Quality Management Systems

[2] 240-56358993: Standard for the Maintenance of Power Transformers

[3] 240-56358900: Sampling and Testing of Mineral Insulating Oil for Power Transformers Within Generation Division Standard

[4] 240-84855628: Medupi Power Station Power Transformer Maintenance Strategy

2.2.2 Informative

[1] 240-56361382 Transformer Hand Condition Monitoring Guideline

[2] 240- 56356687 Transformer Long Term Plant Health Guideline

[3] 240-64917195 - Technical Standard for Online Dissolved Gas Analysers for Application in Power Transformers for all Eskom Divisions

[4] 240-56227443 - Requirements for Control and Power Cables for Power Stations Standard

[5] 240-75661431 - Eskom Standard for insulating oils

2.3 Definitions

Definition	Description
Authorised	A person who is trained & have been proved competent to carry out transformer maintenance in terms of this document
Power transformer	A power transformer for the purpose of this document, is a transformer which is at ground level, oil filled with a rating of 1MVA or higher
Contractor	Service provider contracted to provide a specific service to Eskom, Medupi Power Station. Also referred to herein as 'Partner'
Employer	Eskom, or Eskom Medupi Power Station or representative
Condition Based Maintenance	Predictive maintenance carried out because of findings from analysis of parameters measured under a condition-monitoring regime, or from recommendations from reliability analysis.
Corrective Maintenance	The process of restoring plant and equipment which have failed or deteriorated to a state which renders it unable to meet the acceptance criteria required for its particular application.
Condition Monitoring	Non-intrusive monitoring carried out to determine the physical condition of plant and equipment.
Maintenance Philosophy	The principle approach decided upon for performing maintenance, such as pro-active or reactive maintenance
Preventive Maintenance	Maintenance carried out at predetermined time intervals or according to prescribed criteria and intended to reduce the probability of failure or the degradation of the functioning of an item.

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2.4 Abbreviations

Abbreviation	Explanation
BOM	Bill of Materials
DCS	Distributed Control System
DGA	Dissolved Gas Analyzer
EMD	Electrical Maintenance Department
ITP	Inspection Test Plan
PO	Purchase Order
OHS Act	Occupational Health and Safety Act
OEM	Original Equipment Manufacturer
SOW	Scope of Work
MVA	Mega Volt-Ampere
QCP	Quality Control Plan

2.5 Roles and Responsibilities

2.5.1 EMD

- Manage this maintenance contract and ensure that the work is carried out as per the requirements covered in this document
- Create POs for the service and maintenance of the DGAs
- Develop, update and review of this document
- Provide gate access to the contractor and ensure all relevant technical, Safety and quality requirements are received.
- Plan and Inform the contractor and engineering of arising defects based on plant inspections and alarms.
- Download a failure / out of service data from the DGA and send it to engineering to analyse and to provide a repair scope of work for POs
- Sign off contractor QCPs/ITPs for repair and installation works.

2.5.2 System Engineer

- Support electrical maintenance in development and review of this document.
- Provide Technical drawings to the contractor for fault finding, maintenance and installations.
- Analyse DGA data and compile a SOW to maintenance for repairs.
- Analyse Data and provide technical support for optimisation of the plant performance.
- Accept and sign off QCPs/ITPs for repair and installation works.
- Implement engineering changes and present modifications to the SCCC.

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2.5.3 Operating

- Daily DGA status check-sheet inspections during shifts.
- Load defects for maintenance on SAP/FLIP system during abnormal DGA conditions (Power off, alarm ON and Service ON).
- Reporting DGA alarms from the DCS to maintenance and engineering.
- Authorize access to Transformer bay for maintenance services.

2.5.4 Contractor

- Adhere to this works information.
- All Contractor employees shall comply with Eskom's policies and site regulations, adherence to Eskom's Life Saving Rules, adherence to Generation Occurrence Management Procedure, Smoking Policy, zero tolerance on alcohol usage, etc. These requirements will be detailed during the induction training process.
- The number of staff required to execute the works is to be decided by the Contractor after his/her assessment of the scope of work and submitted to the Employer for approval.
- Provide QCPs/ITPs to the employer for approval before the works.
- Provide Quotation for parts and service for approval before the works.

2.6 Process for Monitoring

This document will be revised every 3 years or should the design base of the DGA change.

3. Scope of Work

3.1 Maintenance Requirements

3.1.1 Regular Maintenance

- Scheduled Inspections: Conduct a six monthly inspections of Medupi 18 DGAs. Submit a check sheet detailing of the status of the DGAs and its components.
- Preventive Maintenance: Perform tasks that prevent equipment failures, such as calibration, and parts replacement.
- Cleaning: Ensure the equipment is cleaned as necessary to maintain optimal operation.

3.1.2 Repairs and Troubleshooting

- Emergency Repairs: Provide timely repairs in the event of equipment breakdowns or malfunctions, with specified response times for emergency situations.
- Troubleshooting: Diagnose issues with the equipment and implement corrective actions to restore functionality.

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3.1.3 Parts and Labour

- **Supply of Spare Parts:** Ensure availability and supply of necessary spare parts for the equipment as per appendix B, bill of materials. Supplier shall submit the complete BOM with costs and lead times if each spare as per BOM as part of tenderer returnable.
- **Labour Costs:** Include labour costs for maintenance and repair activities, unless otherwise specified in the contract, 2X technicians for 6 monthly inspections and 2X technicians for emergency works and repair activities, depending on the scope of the works additional resources may be discussed and agreed upon.

3.1.4 Record Keeping and Reporting

- **Maintenance Logs:** Keep detailed records of all maintenance and repair activities, including dates, actions taken, and parts used.
- **Reporting:** Provide reports to the client on the status of the DGAs, maintenance performed, and any recommendations for future actions.

3.1.5 Compliance and Standards

- **Regulatory Compliance:** Ensure that all maintenance and repair activities comply with relevant Medupi regulations, standards, and safety guidelines.
- **Quality Assurance:** Adhere to Medupi quality standards for maintenance work to ensure that the equipment operates efficiently and safely.

3.1.6 Safety and Environment Considerations

- **Safety Compliance:** Ensure that all maintenance activities are conducted in a safe manner, following best practices and Medupi safety regulations.
- **Environmental Responsibility:** Dispose of any waste or hazardous materials in compliance with Medupi environmental regulations.

3.1.7 Training and Technical Support

- **User Training:** Provide training to the client's personnel on the proper use of the DGA software and system interface.
- **Technical Support:** Offer ongoing technical support to address any operational issues or questions from the client.

3.1.8 Warranty and Guarantees

- **Warranty on Services:** Guarantee the quality of maintenance and repair services, often including a warranty period of three months for the work performed.
- **Equipment/Parts Warranty:** The warranty of the replaced equipment itself or spare parts covering specific failures.

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3.1.9 Upgrades and Modifications

- System Upgrades: Implement upgrades or modifications to the equipment as required or requested by the client, which may involve software updates, hardware replacements, or improvements.
- Retrofits: Provide retrofit services to enhance the performance or capabilities of the equipment as technology evolves.

3.1.10 Monitoring Diagnostics

1. Monitoring: Contractor shall conduct six monthly inspections or as agreed outside the contract with the client and send a report on the status of the DGA and other key metrics such as:
 - Transformer number
 - DGA Serial number
 - Helium Pressure
 - Calibration Pressure
 - Hot zone unit status
 - Manifold Operation
 - Communications/ IP Address
 - Power Supply
 - Firmware Version
 - LEDs

3.2 Maintenance Works during unit shutdown / Outages

The Siemens/Serveron GAS-Guard is designed to keep maintenance to a minimum. The following service plan is recommended as per 810-1734-00 Rev A.

3.2.1 Helium and Verification Gas

3.2.1.1 Helium Gas

2. Check the gauge on the regulator and perform a gas leak-check to the fittings to ensure no leaks have developed.
3. Replace the Helium cylinder should the pressure gauge reads less than 150psi(10.34 bar) as per the 810-1734-00 Rev A instructions.

3.2.1.2 Helium Dryer

4. Perform a leak-check to the fittings to ensure no leaks have developed.
- Replace the Helium dryer when the cylinder is being replaced as per 810-1734-00 Rev A.

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3.2.1.3 Oil Filter Service

The GAS-Guard uses two inline screen type oil filters. Under normal operation, no filter maintenance is required. If service is required, the filter consist of three main parts: the filter housing, filter screen and the filter cap. For filter service proceed as follows:

- Turn off power to the GAS-Guard by opening the GAS-Guard door and toggling the power
- switch located in the upper right hand corner to the OFF position.
- Loosen the filter cap while supporting the filter housing with an adjustable end wrench. The
- exact filter location will vary by installation.
- After loosening the filter cap slowly back off the cap until transformer oil starts flowing out
- the purge hole located on the side of the filter cap.
- Let the oil continue to flow until a clear stream of oil void of any contaminates is visible.
- Tighten filter cap.
- Turn on power to GAS-Guard.

3.2.1.4 Wiring and Termination Box

- Clean and tighten the terminal box wiring
- Simulate alarms and ensure they are received at the DCS

3.2.1.5 DGA Condition Monitoring

- Download, compile and send the report as per **3.1.10** above.

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4. Acceptance

This document has been seen and accepted by:

Name	Designation
C Matthee	Electrical Senior Engineer
D Chauke	Electrical Engineering Line Manager
P Twala	Electrical Senior Supervisor Technician
C Hlanyane	Electrical Senior Technician
X Mcawe	Electrical Technician
V Mandavha	Electrical Senior Technician
T Shekwa	Senior Advisor commissioning
A Shirindzi	Senior Technician Operating
B Shongwe	Electrical Outage Coordinator Technician
P Letsholonyane	Contracts Management

5. Revisions

Date	Rev.	Compiler	Remarks
August 2024	1	K Magaela.	First Issue

6. Development Team

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

- Lenox Mokoka
- Khotso Magaela
- Prince Twala
- Cathrine Hlanyane

7. Acknowledgements

Not Applicable

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Appendix A: Drawings**A.1 List of Drawings**

DRAWING DESCRIPTION	DRAWING NUMBER
MEDUPI POWER STATION Generator Transformer DGA P & ID	0.84/49541
MEDUPI POWER STATION Generator Transformer DGA Mimic	0.84/56040
MEDUPI POWER STATION Unit Transformer 2 DGA P & ID	0.84/49546
MEDUPI POWER STATION Unit Transformer 2 DGA Mimic	0.84/56350

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Appendix B: Bill of Materials

1. Helium Dryer
2. Regulator CAL
3. Cylinder
4. Regulator Helium
5. Regulator Helium with Pressure Switch
6. Calibration bottle
7. Hot Zone Unit
8. System Board
9. Power Supply Assembly
10. Column Assembly, Gas Guard
11. Heater
12. LED Green
13. LED Red
14. LED Blue
15. Fuse, TD 4 amps
16. Oil Filter

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