

 Eskom	Scope of Work	Hendrina Power Station
---	---------------	------------------------

Title: **Scope of Work for The Provision of Hydrogen Plant Maintenance Services at Hendrina Power Station on an “As and When Required” Basis for a period of five years** Document Number: **380-137509**
Alternative Reference Number: **N/A**

Area of Applicability: **Hendrina Power Station**

Functional Area: **All**

Revision: **0**

Total Pages: **10**

Next Review Date: **As required**

Disclosure Classification: **Controlled Disclosure**

Content

	Page
1. Introduction	3
2. Supporting Clauses	3
2.1 Scope	3
2.1.1 Purpose	3
2.1.2 Integrated Business Improvement objectives	3
2.2 Normative/Informative References	3
2.2.1 Normative	3
2.2.2 Informative	3
2.3 Definitions	4
2.4 Abbreviations	4
2.5 Roles and Responsibilities	4
2.6 Process for Monitoring	4
2.7 Related/Supporting Documents	5
3. SCOPE OF WORK	5
3.1 Monthly Service	5
3.2 Three Monthly Service	5
3.3 Six Monthly Services	5
4. SHEQR requirements	7
5. Records to be kept	9
6. Notes / Forms / Appendices / Annexures	10
7. Acceptance	10
8. Revisions	10
9. Development Team	10
10. Acknowledgements	10

CONTROLLED DISCLOSURE

1. Introduction

Hydrogen is used for cooling at Hendrina Power Station, mainly in the generators. To ensure a continuous and reliable supply of hydrogen, a preventative maintenance strategy as prescribed by the Original Equipment Manufacturer (OEM), must be followed. This is a five-year Service Contract for maintaining the Hydrogen Production Plant.

This scope includes six monthly, yearly as well as a three-year services. The scope includes all consumables and spares required for the five years and will be closely monitored by the Employer during each intervention.

Only trained and qualified personnel with certification from the OEM will be allowed to perform maintenance on the Hydrogen Production Plant.

2. Supporting Clauses

2.1 Scope

The document covers the scope is limited to the hydrogen plant at Hendrina Power Station for the next five years.

2.1.1 Purpose

The purpose of this scope of works is to ensure timely maintenance and that activities are carried out as per the set intervals.

2.1.2 Integrated Business Improvement objectives

N/A

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] The HySTAT manual indoor revision 9
- [2] ISO 9001 Quality Management Systems
- [3] EST 32-124 Eskom Fire Risk Management

2.2.2 Informative

- [1] Occupational Health and Safety Act 85 of 1993

CONTROLLED DISCLOSURE

2.3 Definitions

Maintenance Plan: A structured set of tasks, which include the activities and time scales required to carry out maintenance on equipment. This could be a combination of corrective, preventive or predictive maintenance tasks and forms the basis of all Task Lists found in SAP for that particular plant system. SAP for that plant system.

Maintenance Strategy: Management method used to achieve the maintenance objectives. Furthermore, it is the choice of routine maintenance tasks and the timing of those tasks, designed to ensure that an item of equipment continues to fulfil its intended functions.

2.4 Abbreviations

Abbreviation	Explanation
HTA	Hydrogen Transmitter in Atmosphere
HTO	Hydrogen Transmitter in Oxygen
OEM	Original Equipment Manufacturer
OTA	Oxygen Transmitter in Atmosphere
OTH	Oxygen Transmitter in Hydrogen
PLC	Programable Logic Controller
UPS	Uninterruptable Power Supply

2.5 Roles and Responsibilities

Role	Responsibility
Auxiliary Engineering	Compilation of the maintenance scope of work required to ensure optimal performance and reliability of the system.
Auxiliary Maintenance	Managing and expediting the Hydrogen Plant maintenance contract. Ensuring that the scope of work is being executed by the Contractor. Ensuring that the works management process is followed during contract duration.
Maintenance Contractor	Executing the tasks as per the maintenance contract and scope of work.
Contract Manager	Ensure that the contractor executes the works as defined in the scope of work

2.6 Process for Monitoring

N/A

CONTROLLED DISCLOSURE

2.7 Related/Supporting Documents

N/A

3. SCOPE OF WORK

The objective of the works is to ensure timely maintenance and the activities with all intervals as part of the objectives are tabled below:

3.1 Monthly Service

Perform visual inspections on pressure gauges and transmitters with comparison to the HMI readings.

Perform visual inspections of the HTO with its pipework.

Visual inspection on pipework.

3.2 Three Monthly Service

Calibrate OTH Sensor

3.3 Six Monthly Services

6 MONTHLY SERVICE
INSPECT AND CLEAN POWER AND CONTROL CABINETS
RECHARGE CHILLER SYSTEM AND CLEAN CONDENSER FINS
CHECK THE TORQUE ON THE CELL STACK
CLEAN/REPLACE FILTERS IN POWER/CONTROL PANELS
CALIBRATE THE OTH ANALYZER
CALIBRATE THE HTA DETECTOR CELL
CALIBRATE H2 PURITY ANALYSER H2 PLANT
CALIBRATE H2 PURITY ANALYSER METERING PANEL
CALIBRATE THE HTO ANALYSER
DISASSEMBLE AND CLEAN THE HTO PANEL
DISASSEMBLE AND CLEAN THE OTH PANEL
SERVICE HTO PANEL REGULATOR
SERVICE OTH PNL H2 SUPPLY REGULATOR
SERVICE OTH PNL N2 SUPPLY REGULATOR
CHECK LEAK TIGHTNESS OF SYSTEM

CONTROLLED DISCLOSURE

CHECK ELECTROLYSER VALVES TO USER OPEN INSPECT AND TEST
CHECK ALL VENT AND REGEN VALVES OPEN INSPECT AND TEST
CHECK THE CONCENTRATION OF THE ELECTROLYTE
CHECK THE FIXINGS OF THE POWER RACK CABLES INCL TRANSFORMER TAPS
CHECK INSTRUMENT AIR SUPPLY
TEST AND CALIBRATE THE OTA ANALYSER

3.4 Yearly Services

YEARLY SERVICES
CHECK FUNCTIONALITY OF TEMPERATURE SWITCHES
CHECK FUNCTIONALITY OF TEMPERATUR SWITCHES
CHECK FUNCTIONALITY OF LEVEL SWITCHES
CHECK FUNCTIONALITY OF LEVEL TRANSMITTERS
CHECK FUNCTIONALITY OF FILL UP VOLUME AND DRYER DRAIN POT LEVEL SWITCHES
INSPECT AND CLEAN BREAK TANK
CHECK FUNCTIONALITY OF BREAK TANK LEVEL SWITCH
CALIBRATE PRESSURE SWITCHES H2 PROCESS
CALIBRATE PRESSURE TRANSMITTERS
CALIBRATE PRESSURE INDICATORS
REPLACE THE OTH ANALYSER CELL
REPLACE THYRISTOR COOLING FANS
REPLACE CHILLER AND CONDUCTIVITY PANEL FILTERS
REPLACE THE LEVEL TRANSMITTER FLOATS.
REPLACE THE LEVEL SWITCH FLOATS.
CALIBRATE DEW POINT TRANSMITTER.
REPLACE THE HTO DETECTOR SENSOR.
REPLACE THE OTA DETECTOR SENSOR.
CHECK THE 24VOLTS UPS BATTERIES.
REPLACE THE PLC BATTERIES.
COMPILE SERVICE DATA PACK AND SUBMIT

CONTROLLED DISCLOSURE

3.5 Three Yearly Services

3-YEARLY SERVICE
CALIBRATION OF PRESSURE RELIEF VALVES AND REPLACE IF FAULTY
PRESSURE TESTING OF H2 PLANT ONLY TO PER 2009 REGULATIONS
RE-GAS CHILLER UNIT INSPECT AND TEST CHILLER PUMP AND CONDENSER UNIT
EXCHANGE THE ELECTROLYTE
ELECTROLYTE 300 LITRES 30% COMPOSITION
HTA ANALYZER CELL (2) TTL OVER 5 YEARS
DEOXO CATALYST
MODIFICATION OF DEOXO DRIER VESSELS TO ENABLE CATALYST AND DESICCANT CHANGE INCLUDING DESIGN CALCULATIONS

3.6 Additional Scope

ADDITIONAL SCOPE
CALIBRATION EXCHANGE PROGRAM FOR 2 X MICHELL IS PROBES FOR 3 YEARS
SAFETY AND QUALITY DOCUMENTATION (SHEQ) (SAFETY FILE TO BE SUBMITTED)
PROVISION FOR 30 BREAKDOWN CALLOUTS.
DEW POINT CALIBRATIONS

3.7 Training

In depth training covering all aspects of the plant including but not limited to operation, maintenance and troubleshooting/fault finding techniques is to be offered to the station's personnel as part of skills transfer. A provision is made for ten (10) employees to be trained in a twelve-month window (one financial year) for the duration of the contract period. Competency certificates are to be issued at the end of the training.

4. SHEQR requirements

SHEQR requirements that cover the total holistic approach to all potential risks includes the following legal obligation:

- **S** = All possible **Safety** risks associated with the applicable activity is identified and captured in a risk assessment format which include compliance to the Occupational Health and Safety Act and regulations - 85 of 1993

CONTROLLED DISCLOSURE

- In terms of describing the actions required for the routine to be executed, the safety aspects below need to be reviewed in liaison with the Safety officer and addressed accordingly:
 - 1) *Does the System and/or Process introduce any Safety risks in terms of OHSA requirements?*
 - 2) *Does the System and/or Process minimise risk to personnel? - personal protective equipment requirements to be stipulated.*
 - 3) *Have all aspects of occupational hygiene / health been considered? - if there is uncertainty, it may be prudent to request assistance from the Medical station or the Safety Officer*
 - 4) *Security aspects must also be considered - this is to prevent unauthorised entry into limited access areas such as equipment rooms, etc. It is important that the requirements for access, as well as contact persons regarding such be stipulated clearly.*
 - 5) *Fire precautions to be detailed in terms of the type of fires that can occur as a result of the routine and the type of fire control that needs to be exercised.*
 - In respect of hazardous locations, certain tools, equipment and personal protective equipment needs to be specified. The following quick reference to be used to define the risk and establish the relevant safety measures, and control measures initiated in liaison with the Electrical system engineer responsible for hazardous locations:
 - 1) *Is it a storage area for chemicals (Lime, Ammonia, Caustic, Acids)?*
 - 2) *Is it a storage area for fuels (Diesel, Petroleum, Oil)?*
 - 3) *Is it a storage area for gases (Hydrogen, LPG)?*
 - 4) *Is there a risk of exposure to flammable or combustible gases as a result of the process in the area (Hydrogen generating plant, Generators, Battery rooms, Sewage plant, Paint spray booths)?*
 - 5) *Is there a risk of exposure to flammable combustible liquids or particles as a result of the process in the area (Oil burner workshop, Fuel off loading and filling stations, Coal plant, Carpenter workshop)?*
 - 6) *Is there a risk of exposure to flammable or combustible chemicals as a result of the process in the area (Chlorine dosing)*
 - 7) *Is any X-ray testing performed in the area?*
- **H** = All possible **Health** risk exposures to employees are to be identified in liaison with the Occupational Hygienist in respect of the following aspects when defining measures to ensure the health of personnel is not compromised in the execution of the activities described by the document:
- 1) *Is there any risk of exposure to hazardous substances, i.e. asbestos, silica, dust?*
 - 2) *Does the routine include working in a confined space?*
 - 3) *Does the routine include working in an area where the noise levels exceed 85dB?*
 - 4) *Does the routine include working at heights?*
 - 5) *Does the routine include working in an area where lighting may be compromised?*
- **E** = All **Environmental** aspects and impacts are identified to mitigate any potential environmental impact and ensure compliance with ISO 14001:2004. Use the questions below to guide you on what may lead to environmental impacts and liaise with the Environmental Management Department in order to capture these impacts on the EMS

CONTROLLED DISCLOSURE

database, reference to the legal register and include suitable processes to manage the aspects:

- 1) *Will any effluent, (solid, liquid or gas) be produced as a result of this activity?*
- 2) *Could any environmental emergency (i.e. ash or oil spillage) result from this activity being carried out?*
- 3) *Will this activity have an effect on any third party? I.e. the draining of units could lead to overflow of the Maturation Pond into the farmer's dam.*
- 4) *Will this activity impact on the physical environment? I.e. are you dumping ash, coal etc.*
- 5) *Is this activity governed by any permits or legislation that may be contravened? I.e. the changing of fabric filter bags.*
- 6) *Can any possible aspects be identified as a result of the input, process and output of the activity under normal as well as abnormal conditions?*

Note: An environmental aspect is the element of an organisation's activities or products or services that can interact with the environment, i.e. during the maintenance of a motor, the environmental aspect in this activity would be oil, degreasers, solids, rags, etc. These aspects create a negative impact through pollution when they interact with the environment.

- **Q** = All Contract **Quality** Plans, Quality Inspections plans, and compliance to ISO 9001:2015 to be included in the document and adhered to.
Quality requirements to be specified in the form of a Quality Inspection Plan (QIP):
 - *A QIP contains a list of all activities contained in the process, and refers back to the document for all detailed information, as would be contained in the document annexures. It is also attached to the document as an annexure.*
 - *Hold and/or witness points are indicated for each activity listed, in order to define the type of quality control activity required.*
 - *Master QIP's need to be approved per process but can be compiled for a group of components. However, before work on any component commences, a QIP must be approved for that component specifically.*
- **R** = All **Business risks** applicable to the specific activity are identified and captured to mitigate business risk impacts. This is done in accordance with the Risk assessment procedure (HSPPA/036) and is to include all other risk disciplines, i.e. Protective Services.
 - *The Integrated Risk Management philosophy is to be applied when compiling the risk assessment.*
 - *All aspects identified in respect of Safety, Health, Environmental, Quality, Finance, Commercial, Legal and Security requirements need to be listed and ranked, and mitigating strategies identified.*
 - *Responsible persons to be listed by designation, and time frames for mitigation to be included.*
 - *The risk assessment included in the document will basically serve the purpose of a baseline risk assessment, with a detailed risk assessment being compiled whenever there is a need, based on the system status at the time of the activity taking place.*

5. Records to be kept

All maintenance related documents.

CONTROLLED DISCLOSURE

6. Notes / Forms / Appendices / Annexures

N/A

CONTROLLED DISCLOSURE