	<p align="center"><b>Scope of Work</b></p>	<p align="center"><b>Camden Power Station</b></p>
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**Title: Scope of Work – Maintenance of the Hydrogen Production Plant**

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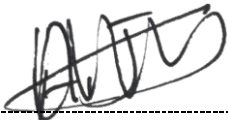



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## 1. Introduction

Hydrogen is used for cooling in Camden Power Station, mainly cooling on the generators. In order to ensure a continuous and reliable supply of hydrogen, a preventive maintenance scheme must be followed as prescribed by the OEM to ensure safety, reliability and availability of the plant. This scope also includes the supply of spares as on listed on table 6.

## 2. Supporting Clauses

### 2.1 Scope

The scope is limited to the Hydrogen Production Plant at Camden Power Station.

#### 2.1.1 Purpose

The purpose for this scope of work is to define all the activities which need to be carried out.

#### 2.1.2 Applicability

This document shall apply to Camden Power Station.

#### 2.1.3 Normative References

[1] HySTAT manual indoor revision 09

#### 2.1.4 Informative References

[2] Occupational Health and Safety Act 85 of 1993

[3] Doc No 004/4830 Camden Power Station Safety, Health and Environment Specification.

#### 2.1.5 Abbreviations

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	Programmable Logic Controller
UPS	Uninterruptible power supply

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**2.1.6 Definitions**

Not applicable

**2.2 Roles and Responsibilities**

The requirements of this document shall be carried out by the contractor.

**2.3 Process for Monitoring**

Not applicable

**2.4 Related/Supporting Documents**

Not applicable.

**3. Scope of Work**

The tables below show all the activities and the intervals that need to be performed as part of the service. This contract is for both planned (PM) and unplanned corrective maintenance (breakdowns) and stand-by personnel should be provided for such.

Response time for call-outs after hours (Monday until Friday), over weekends and all public holidays will be 24 hour from the time the call has been received by the Contractor.

**Table 1: General and outdoor housing service**

<b>HySTAT - General and outdoor housing</b>	
<b>Interval</b>	<b>Description</b>
6 monthly	Clean the container housing internally and externally
6 monthly	Check leak tightness
Yearly	Check the 24 volt UPS batteries
Yearly	Replace the PLC batteries
2 yearly	Replace the UPS batteries
2 yearly	Replace the thyristor cooling fans

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**Table 2: HySTAT process services**

<b>HySTAT - Process</b>	
<b>Interval</b>	<b>Description</b>
6 monthly	Check the electrolyser valves- Hydrogen to User, Hydrogen to Atmosphere, Oxygen To User and Oxygen to Atmosphere
6 monthly	Check the concentration of the electrolyte
6 monthly	Check the fixing of the power cables
6 monthly	Check the leak tightness
Yearly	Check the functionality of the temperature switches
Yearly	Check the functionality of the level switches
Yearly	Replace the level transmitter floats
Yearly	Replace the level switch floats
2 yearly	Inspect and clean break tank
3 yearly	Replace or calibrate the safety relief valves
Yearly	Replace/ service the solenoid and pneumatic valves

**Table 3: Dryer systems services**

<b>Dryer Systems</b>	
<b>Interval</b>	<b>Description</b>
6 monthly	Replace the coalescing filter after DEOXO
6 monthly	Check instrument air supply
6 monthly	Check leak tightness
Yearly	Replace the coarse particle filter element
Yearly	Check the functionality of the temperature switches
Yearly	Check the functionality of the level switches
3 yearly	Replace or calibrate the safety relief valves
3 yearly	Inspect the vessels
2-5 yearly	Replace the catalyst in the DEOXO dryer and two Drier vessels
7-10 yearly	Replace the molecular sieve in the dryer vessels

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**Table 4: Gas sensors services**

<b>Gas sensors</b>	
<b>Interval</b>	<b>Description</b>
6 monthly	Test and calibrate the HTA detector
6 monthly	Test and calibrate the OTA detector
6 monthly	Calibrate the HTO analyser
Yearly	Replace the sensor in OTA detector
Yearly	Replace the sensor in OTH detector
Yearly	Calibration of the dew point transmitter
18 monthly	Replace the sensor in HTA detector

**Table 5: Chiller services**

<b>Chiller</b>	
<b>Interval</b>	<b>Description</b>
6 Monthly	Check leak tightness
Yearly	Replace filters
Yearly	Flush circuits to remove sludge
Yearly	Refill the circuit with appropriate coolant

Table 6 below shows all the spare parts that will be required for the period of 3 year to ensure that the hydrogen plant is available and reliable.

**Table 6: Required spare parts.**

<b>DESCRIPTION</b>	<b>QUANTITY</b>
METER, FLOW: TYPE: VARIABLE AREA; CONNECTION: NPT 1/4 IN	1
ANALYZER, GAS: TYPE: O2X1; RANGE 0 TO 250000 PPMV	1
ANALYZER, GAS: TYPE: HYDROGEN IN NITROGEN XMTC	2
VALVE, SOLENOID: PIPE SIZE: 1/4 IN; STYLE: 1 WAY; POTENTIAL ORIFICE SIZE: 1.2	34
VALVE, SOLENOID: POTENTIAL: 24 VDC; DESIGN RATING: 3 MPA	1
SWITCH, LEVEL: MUST BE SUPPLIED WITH EX RATED CERTIFICATION	1
ANALYZER, GAS: TYPE: 3HYE HYDROGEN CITICE	1
VALVE, SOLENOID: PIPE SIZE: 1/4 IN; STYLE: 1 WAY; POTENTIAL ORIFICE SIZE 3.2mm	6
Flow Meter METER, FLOW: PURGEMETER;0.1-1 LPM; SS 316 Tokyo flow switch	1
VALVE, SOLENOID: PIPE SIZE: G3/4 IN; STYLE: 2; POTENTIAL Solenoid valves outside/black in colour	1
FILTER: COALESCING; WD 41 X LG 113 MM (Steel body)	1
REGULATOR, PRESS: HYDROGEN; IN 400 BAR (Back Pressure regulator- Blue )	1
CELL: STACK; DIA 680MM X LG 1.35M	2

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ANALYZER, GAS:1035324; H2; O2 (Yellow analyser F/R in plant)	1
FILTER:IN LINE; SQ 292 MM; CHEMICAL FIBRE (square white, door fan filters)	2
FILTER, ELEMENT:1014142; MICRA ON DRIER (Small O2 Coessor filter cartridge)	2
VALVE: METERING;6 MM;2000 PSIG; 137 BAR	1
Solenoid valve vessels - VALVE: SAFETY;3/4 IN;150-350 BAR; DN 6	1
REGEN FLOW SWITCH	1
H2 REGULATOR	6
N2 REGULATOR	5
Production & Metering panel pressure switch	1
3-way controller valve to chiller	1
Receiver safety valve	1
Bull nose & nut for H2 regulator	15
Bull nose & nut for N2 regulator	10

**Table 7: Receiver vessel maintenance.**

Receiver Vessel	
Interval	Description
As required	Maintenance of the receiver vessel and metering panel
As required	Purging of the receiver vessel

### 3.1 Limit of the scope

The scope only limited to the Hydrogen Plant in Camden Power Station.

## 4. Revisions

Date	Rev.	Compiler	Remarks
August 2018	01	A Khumalo	Original Issue
December 2022	02	A Khumalo	Spare parts added

## 5. Development Team

Giel Kruger

## 6. Acknowledgements

Not applicable.

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