Eskom	**SCOPE OF WORK**	**GROOTVLEI**

Title: **Supply of Spares, Modifications and Maintenance During Operation of the H_2 Dryer, H_2 Skid, CO_2 Evaporator and Gas Analysers Scope of Work**

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1. Introduction

Grootvlei Power Station Generators utilizes hydrogen to cool the rotor and core, which means that the hydrogen gas must be readily available in a clean dry state and at a temperature below that of the H_2 cooler outlet. The H_2 Dryers are utilized to keep the hydrogen dry and at temperature below that of the cold gas temperature. During extended shutdown periods of the Generator plant, the hydrogen gas must be safely removed from the generator without mixing with air, this is achieved by displacing the hydrogen gas with CO_2 supplied via the skid. The H_2 skid is a series of pipework and valves, that allows operating personnel to easily fill the generator with H_2 and purge the Generator. Both H_2 and CO_2 are supplied from the Bottle station located next to the H_2 skid plant, inside the Bottle Station are cylinders placed in series and parallel inside two different racks to form both the H_2 and CO_2 pellets. Depending on the purging stage, hydrogen or CO_2 is supplied through the pipework and by correct selection of valves firstly to the skid, and from the skid into the Generator manifolds for gassing up of the machine. The H_2 dryer, skid and CO_2 evaporator are essential auxiliary systems that ensure continued operation of the Generators. Hydrogen gas at the correct pressure, temperature and purity ensures that the Generator is cooled efficiently and partial discharge activities on the winding insulation are suppressed thus prolonging the life span of the machine.

This document will outline the scope of work for the procurement of spares, required modifications and maintenance during operation /on opportunity shutdown for Grootvlei Power Station H_2 dryer, H_2 skid, CO_2 evaporator, and Gas Analyzers for a period of about 5 years. This will include, but not limited to, the scope for supplying spares technical information and supply of spares. Following the explosion incident on the Unit 3 Generator, the Technical Investigation Team from Eskom A & F together with Gx Central Engineering Specialists concluded that modifications are required on the H_2 skid to ensure that correct sampling points are utilized during purging activities on the Generator. Hence, the SOW will also cover all the required modifications required to optimized purging activities on the Generator but more importantly to prevent the formation of an Explosive Gas Atmosphere inside the machine. Another modification is required which include the installations of Liquid Level Detectors with auto-shut off magnetic valves to shut-off gas supplies to the analysers should seal oil ingress be detected on the H_2 skid system.

2. Supporting Clauses

2.1 Scope

This document specifies the required spares, quantities of spares to be supplied by the Supplier/OEM, required plant modifications and maintenance of the Unit 1, 2 and 3 H_2 skids, H_2 dryers and CO_2 evaporators for 5 years. The scope included here does not substitute procurement procedures that will be followed during the procurement process.

2.1.1 Purpose

The purpose of this document is to formally request the *Supplier* to supply spares, perform the required modifications and maintain the H_2 dryer, H_2 skid, CO_2 evaporator, and Gas Analyzers during operation and also during opportunity shutdown.

2.1.2 Applicability

This scope is only applicable to Generator Power Station Generator H_2 skid, H_2 dryer and CO_2 evaporator components or sub-components.

NOTE: Mark appropriate block/s with a "X" (Select at least one)	**ALL**	**HEAD OF DEPARTMENT**	**HEAD OF FUNCTION**	**SYSTEM ENGINEERS**	**SUPERVISORS**	**ADMINISTRATION**	**AUXILIARY**	**CIVIL**	**CONTROL & INSTRUMENTATION**	**ELECTRICAL**	**MECHANICAL**	**PROJECTS**	**SUPPORT**	**TRAINING**	**SHIFTS**	**OTHER (SPECIFY):** .....
Grootvlei Staff																
Operating					X					X	X				X	
Maintenance										X	X					
Engineering									X	X						
Risk Management																
Human Resources																
Finance																
Production																
Contractors																

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] 240-76960420 Guideline for Spares Procurement Technical Evaluation and Quality Inspection.

[3] 32-1033 Eskom Procurement and Supply Chain Management Policy.

[4] 32-1034 Eskom Procurement and Supply Chain Management Procedure.

2.2.2 Informative

[5] 240-56227413 Eskom Hydrogen Standard

[5] GVLEG 0285: Hydrogen Regulating Plant Maintenance Strategy

[6] 240-168966153 Generation Tender Technical Evaluation Procedure

[7] 240- 53114002 Generation Engineering Change Management Procedure

[8] GVLO 002: Unit 3 & 6 Generator Degassing

[9] GVLO 0024: Unit 3 -6 Generator Gassing

[10] GVLO 0217: Generator Gassing Unit 1 & 2

[11] GVLO 0431: Unit 1 & 2 Generator Degassing

2.3 Definitions

2.4 Abbreviations

Abbreviation	Explanation
A	Ampere
C & I	Control & Instrumentation
CO_2	Carbon dioxide
DC	Direct current

Abbreviation	Explanation
DCF	Date Capturing Form
ECM	Engineering Change Management
GVL	Grootvlei
H_2	Hydrogen
Hazloc	Hazardous location
IA	Inspection Authority
LLD	Liquid level detector
NDT	Non-Destructive Testing
OEM	Original Equipment Manufacturer
O &M	Operating and Maintenance
OPS	Operating Department
P &ID	Piping and Instrumentation Diagram
PTM	Protection, Testing and Metering
RFx	Request for Proposal, Information, Quotation
RFQ	Request for Quotation
QC	Quality Control
SHEQ	Safety, Health, Environment and Quality
SOW	Scope of work
V	Voltage

2.5 Roles and Responsibilities

2.5.1 Supplier

a) Supply spares as requested by the *Employer.*

b) Perform all required modifications as per SOW from Electrical Engineering

c) Provide drawings, O & M manuals for all components used during the execution of modifications.

d) The drawings shall include general arrangement, layouts, including dimensions, P & IDs, Electrical diagrams, Hazloc drawings and C & I loop diagram where applicable.

e) Provide IA certificates for all equipment used in hazardous location as required by Eskom Standards

f) Supply, install, test and commission the integrated system as per SOW from Electrical Engineering

g) Provide project plans, timelines, cost, and deliverables before commencements of any plant modification on the H_2 skid.

h) Provide training to OPS, Engineering and Maintenance on how to operate the H_2 skid after completion of modification SOW.

i) Assist Grootvlei Power Station with updating of Generator degassing and gassing up procedures for Unit 1, 2 and 3 Generators.

j) Performs all the maintenance activities as described in this scope of works.

k) Confirm correctness of the supplied spares information

l) Provide spares technical information in accordance with this scope of work.

m) Timeously inform the Employer of any delays or when outstanding or additional information from the Employer is required.

n) Responsible to ensure that a quality product is delivered.

o) Responsible to ensure that every effort is made to keep to the agreed program and plan.

p) Provide all required technical datasheets and/or product brochures for all the spares supplied.

q) Conform to all the other requirements stipulated in this document.

r) Supply all the necessary test sheets/results, where applicable

s) Invite the Employer or representative thereof three (3) working days in advance for witness/hold points, if applicable, as agreed

2.5.2 Engineer

a) Provide input and compile this Scope of work.
b) Prepare all required documentation as per the ECM procedure.
c) Present all required modifications to the site SCCC.
d) Update all drawings, P&IDs and diagrams as required by the Eskom Configuration Standard
e) Present modification closeouts to the site SCCC as required by the ECM procedure.

f) Together with the OPS Department and the Supplier, update the degassing and gassing up procedures.

g) Compile the tender evaluation strategy taking into consideration the requirements of the Eskom Hydrogen Standard

h) Liaise with all relevant stakeholders for any input.

i) Ensure that the Scope of work is in accordance with Eskom policies and procedures.

j) Provide all necessary information to assist in spares procurement.

k) Participate in technical evaluation of the tender documents.

l) Assist with the preparation of all the reports to different tender committees, where applicable

m) Provide technical assistance to Materials Management and Procurement Departments during the execution of this Scope of work.

n) Perform Quality Checks on procured spares and accompanying documentation.

o) Provide Materials Management with fully populated DCFs for cataloguing of spares and record keeping where information is available.

p) Verification and acceptance of all supplied documentation

q) Responsible for QC at delivery of procured spares.

2.5.3 Materials Management

a) Catalogue the spares after completion of DCFs.

b) Confirm that the information supplied by the engineer is enough for cataloguing.

c) Perform QC on all submitted DCFs.

d) Make provision for storage of procured spares.

e) Work together with Engineering/Maintenance when accepting spares into stores.

2.5.4 Procurement

a) Perform all procurement processes outlined in this Scope of work.
b) Issue RFQ's and/or RFI's for the procurement of spares
c) Supply Engineering with *Supplier* information for sole source justifications, where applicable.
d) Set up clarification meetings between *Supplier* and *Employer*
e) Act as communication link between *Supplier* and *Employer*
a) Ensure all necessary payments are effected timeously and keep record thereof.
b) Arrange technical evaluation sessions.
c) Compile and present mandate to negotiate and arrange negotiation meetings if and when required and give feedback to relevant Tender Committee and give feedback to relevant Tender Committee
d) Keep record of all tender documentation

2.5.5 Maintenance

a) Perform inspections and QC on spares upon delivery.
b) Ensure spare items are stored properly by Materials Management as per relevant storage recommendations by the specific Manufacturers.

2.6 Process for Monitoring

Not Applicable

2.7 Related/Supporting Documents

Not Applicable

3. SUPPLY OF SPARES

The following are the *Supplier*'s requirement:

a) The *Supplier* will ensure that the correct spare is supplied and will replace or be liable for damage at his/her cost if the incorrect or defective spare/s is supplied. The costs may include, but not limited to, repairs and/or replacement as a result of a defective or incorrect spare.

b) The *Employer'*s (i.e. Eskom Holdings SOC) acceptance of delivered spare/s does not absolve the *Suppliers* of the liability to supply the correct and/or defect free spare.

c) The *Supplier* may, at the *Employer*'s discretion, be given access to the plant to verify the information of the installed spare.

d) The spare must be exactly the same (i.e. same Part Number) as specified on this scope of work and the part number will also be used to perform quality control checks. ***Notwithstanding the stipulated condition that the Supplier is responsible for verifying the correctness of the spares information provided by the Employer in relation to the existing installed spare. This may include the Supplier consulting the original supplier of the spare to ensure correctness of information provided by the Employer.***

e) The *Employer* may at his/her discretion make the *Employer*'s Engineer or employees or *others* available to the *Supplier* for the purpose of soliciting additional information or verifying information as the need arises.

f) The *Supplier* will supply any additional information such as brochure, general arrangement drawing, certificates, detailed specification, etc.

g) The *Supplier* provides the *Employer* with additional spares information and verifies information required in the data capturing forms (DCF) if provided at least three months after order placement or conclusion of the contract or (where lead time is less than three months) a week before delivery of respective spare.

h) The *Supplier* shall supply preservation and storage procedure/s, where applicable.

i) The Spares Procurement maximum limit indicated by the Employer in the attached table as one of the subheadings is the maximum number of spares the *Employer* may require at any given time during the five-year period of the contract. However, the *Supplier* may only supply the quantity as specified by the *Employer* in the individual order instruction and does not imply that the Supplier is entitled to supply the total number indicated in the Spares Procurement maximum limit.

j) The *Employer* reserves the right to exclude the supply of some spares items included in the contract with the Supplier should the *Employer* become aware that National Supply Contract exists or is placed by the *Employer* with Others in respect to those specific spares items.

k) If deemed necessary, the *Employer* may subject the *Supplier* to a quality assurance assessment at the *Supplier*'s or *sub-Supplier*'s premises as part of the technical evaluation or before the contract placement or at any time during the contract period.

l) Where the spare requires testing, the *Supplier* will inform the *Employer* to invite or make available the *Employer*'s representatives to witness the tests.

m) Should the *Employer* be dissatisfied with all or certain aspects relating to a specific spare test (including but not limited to suspected inferior quality or non-compliance) the *Supplier* will make good, rectify the faults, or supply a new spare at his/her cost.

n) Complete price breakdown must be supplied with the quotation and must include the cost of transport to Grootvlei Power Station. However, the *Employer* reserves the right to use the *Employer*'s own transport.

o) Spares will be opened for inspection, counting and quality control check at the *Employer*'s stores.

p) The *Employer* has provided the Bill of Material table with part numbers in order to assist the *Supplier* to meet the requirements of the Work to be performed by the *Supplier*.

q) The *Employer* may make clarification sessions available to either prospective *Supplier*/s in order to further assist the prospective *Supplier*'s to meet the requirements of the Work to be performed by the *Supplier*.

3.1 SPARES IDENTIFICATION

a) Section 10 lists all the spares to be procured under this scope of work. If DCFs exist, they will be provided to assist the Supplier with information for all spares to be procured. Each spare is identifiable by means of component/part description, OEM and/or OEM part number. Where the information available on the spares list in Section 0~~9~~ or that supplied by materials management as catalogued is not sufficient to positively identify the applicable spare, the Supplier shall notify the Employer such that the Employer can assist the Supplier in identifying the correct spare.

b) The spares to be provided to be the same as the original component, in all technical respects, as those utilised on the equipment it is intended for. This includes, but is not limited to, design (including dimensions and material specifications) and manufacturing (including manufacturing processes, standards, and acceptance testing).

c) The *Supplier* shall be liable to replace a supplied spare that is found to be defective and/or wrong.

3.2 INFORMATION TO BE PROVIDED

If DCF's exist, they will be provided to the *Supplier* by Materials Management; the information contained in the forms can assist the *Supplier* to procure the correct spares. The DCF is required by the *Employer*'s Material Management System to be able to book the item in the stores and the information should be sufficient to procure the goods in future. Where a field is populated, the *Supplier* needs to review and verify/correct the information against the OEM part number for correctness.
The following information to be provided with the spares:

a) Documentation detailing the technical characteristics of the procured spare item. This may be in the form of data sheet or brochure. The Employer reserves the right to reject the documentation if it is not deemed sufficient.

b) Any other additional information that has not been specified on the DCF / scope but necessary for storage, installation, and utilisation of spares where applicable.

c) Supply preservation and storage procedures of goods, where applicable

d) Any spares information which has been omitted which is deemed relevant for spares identification, storage, maintenance, etc.

e) In instances where the *Supplier* uses another company, other than the item OEM, to provide required information, this to be declared in advance to the *Employer.*

3.3 SPARES QUANTITIES

The spares quantities to be provided as stipulated in Section 10.

3.4 REPLACEMENT PARTS UPGRADED/MODIFIED

Where equipment or spares, including the whole assembly, have been upgraded / modified the *Supplier* shall indicate this to the *Employer* as part of the tender. The *Employer* shall be made aware immediately where the upgrade/modification to the component is only identified subsequent to the tender being issued. The detailed compatibility to the existing component shall be indicated. If the components to be supplied will be obsolete, or envisaged to be obsolete, in the 3 years subsequent to tender being issued, the *Supplier* shall indicate this to the *Employer* and indicate viable alternatives thereof.

3. 5 PACKAGING

All supplied spares shall be packaged in such a manner that they may be transported and stored for an extended period of time without resulting in damage to the packaged components. This includes preventing damage due to moisture ingress, especially for electronic components. Where possible, silica gel/desiccant may be included to ensure protection against moisture for at least 3 months. However, this inclusion should not lead to damage to the component.

Different spare types shall be packaged separately such that each spare type can be stored separately. Packaging shall be such that the spare can be identified without opening the packaging. Packaging shall be of material that will not be damaged, to an extent possible, by harsh weather conditions during transportation. If that is not possible, then the packaging shall be protected against such conditions.

Where possible, packaging to be such that procured spares can be positively identified through the packaging. Where this is not possible, the packaging to be such that it allows opening and closing of packaging and still maintain the packaging integrity thereafter.
Delivery packaging to have the following details on it:

a) Order number

b) Physical address of Grootvlei Power Station

c) Delivery notes number

d) Spares part number and quantity

3. 6 EXCLUSIONS

The following shall be noted as exclusions as per this scope of work:

a) The *Supplier* shall not supply offloading facilities during delivery of spares.

b) The *Supplier* shall not be responsible for the storage of spares after acceptance at delivery by *Employer*

c) Subcontracting shall not be permitted, unless declared and accepted prior to contract placement.

3.7 ACCEPTANCE OF SPARES

a) No incorrect, damaged, or faulty spares will be accepted.

b) All the spares will be inspected before payment could be processed.

c) Data capturing forms information must be supplied and must meet an acceptable level.

d) Where applicable; test certificates, calibration certificates, IA certificates, material certificate, manuals, data sheet and signature shall be provided as required.

e) The *Supplier* must provide references of the companies that they have supplied similar spares to, and include the respective supply order/contract value, the contact name, physical address, and telephone number.

3.8 CONSTRAINTS ON HOW THE *SUPPLIER* PROVIDES THE GOODS

3.8.1 WORK TO BE DONE BY THE DELIVERY DATE

A clarification meeting to be held 3 weeks subsequent to the issuing of the enquiry to confirm the scope of the Works and to confirm spares identification. All questions can be forwarded to the *Employer* during this meeting. Where more than one *Supplier* is available, all responses from the *Employer* will be forwarded to all *Supplier*s, regardless of which *Supplier* required the clarification.

All required spares to be delivered to the *Employer* 4 weeks from the day the purchase order is placed by the *Employer*. In instances where design reviews are necessitated, the 4 weeks will be from the day of design freeze. The *Employer* may request, in writing, that a spare be expedited quicker if its delivery in 4 weeks may lead to a delay that may result in undesirable consequences (loss of production, loss of revenue and/or safety to personnel or environment) to the *Employer*.

3.8.2 DOCUMENTATION CONTROL

The information for spares to be provided will either be in electronic format or hard copy. Other information provided with each spare to be either in electronic format or hard copy. Information provided to be documented in such a manner that the information for each spare will be easily identifiable. All documentation supplied shall bear the OEM's official name and logo.

3.8.3 QUALITY ASSURANCE REQUIREMENTS

The spares to be provided shall conform to all quality assurance requirements that will be defined at contracting phase.

3.8.4 PROGRAM CONSTRAINTS

The following shall be included in the *Supplier*'s program:

a) The delivery date as stipulated to be provisional. This date may change prior to delivery. The *Supplier* to indicate standing time and storage costs should the *Employer* delay the delivery date. Proof of actual costs to be provided.

b) Provision to be made for delays that may be caused owing to items being sourced from outside The Republic of South Africa.

3.9 INSURANCE OF THE GOODS

The Insurance of spare components is the responsibility of the *Supplier* until delivery and acceptance by the *Employer.*

3.10 SHEQ

The *Employer* reserves the right to request certification from the *Supplier* that proves compliance to relevant SHEQ legislations, standards, and procedures. If, during procurement, the *Supplier* is found guilty of contravention of any SHEQ legislations, the *Employer* shall, at *Employer*'s discretion, cancel the contract and the *Supplier* shall be liable to all the costs incurred therein.

3.11 WARRANTEES AND GUARANTEES

The Supplier shall ensure that there are guarantees and warrantees for defective spares delivered on site and for rework of planned maintenance activities; these shall be done at the Supplier's own cost.

3.12 MAINTENANCE WORK DURING OPERATION

The following activities are to be performed by the Supplier/Contractor during operation or when one of the units is offline for a short period of time i.e., these are weekend opportunity shutdown or unit shutdown due to breakdowns.

3.13 H_2 DRYER

1. Test blower motors and replace if damaged.
2. Test heater functionality and replace if damaged.
3. Check and clean water traps.
4. Check and replace the tower thermocouples where applicable.
5. Check, test and calibrate the dew point probes and issue calibration or verification certificate where applicable.
6. Check, test and perform functionality test on the PLC where applicable.
7. Check, test and perform functionality test on the temperature controllers.
8. Check, test and perform functionality tests on the dew point display equipment.

9. Install new dew point manual sampling point, to verify online dew point measurements.
10. Replace dryer desiccant.
11. Replace media filter in the OVF.
12. Calibrate the safety valve and provide certificate.
13. Pressure tests the dryer and issue a gas test certificate.
14. Perform a leak test at rated pressure and repair all identified leaks.
15. Check if the dew point readings observed on the dryer are similar to those seen on the DCS. Any deviations must be corrected on the dryer meters or on the DCS instruments.
16. Perform dryer functional tests.
17. Clean the dryer and area around it after the maintenance.
18. Dispose of all the waste in designated bins

3.13 H_2 SKID

1. Replace H_2 pressure regulator.
2. Check and calibrate pressure regulator.
3. Check all isolation valves for leaks, replace seals if necessary.
4. Check all flanges for leaks.
5. Check all screwed connections.
6. Check, calibrate the O_2 analyser. and issue calibration or verification certificate
7. Check, calibrate the Tri-gas analyser and issue calibration or verification certificate.
8. Check the flame arrestors for any oil blockages and advice Electrical Engineering on the SOW required to solve defect.
9. Check and calibrate all measuring transducers and gauges and issue calibration and verification certificate

10. Check the functionality of the flow indicators and correct if defective.
11. Replace all diaphragms on valves.
12. Perform the required modifications as per the SOW from Electrical Engineering
13. Test the activation of the LLDs and confirm that the signal is received at the DCS.

3.14 CO_2 EVAPORATOR

1. Check, test and perform functionality test on the temperature controllers.
2. Test blower motors and replace if damaged.
3. Test heater functionality and replace if damaged.
4. Check, test and perform functionality test on the PLC where applicable.
5. Check, test and perform functionality test on the temperature controllers.
6. Check and calibrate pressure regulators and issue calibration or verification certificate.
7. Check all isolation valves for leaks, replace seals if necessary.
8. Check all flanges for leaks.
9. Check all screwed connections.
10. Check and calibrate all measuring transducers and issue calibration or verification certificate.
11. Replace all diaphragms on valves.
12. Calibrate the safety valve and provide certificate.
13. Pressure test the CO_2 evaporator and issue a gas test certificate.
14. Perform a leak test at rated pressure and repair all identified leaks.
15. Perform purging station functional tests.
16. Replace defective temperature switches, pressure switches and controllers.

3.15 Gas analysers

1. Calibrate the CO_2 analyser cell and issue calibration or verification certificate.
2. Calibrate the O_2 analyser cell and issue calibration or verification certificate.
3. Calibrate the H_2 analyser cell and issue calibration or verification certificate.
4. Set regulators and flow meters.
5. Clean the analyser panel.
6. Replace defective analysers or analyser sub-components including valves and regulators.

Note: for all work done a field service report must be highlighting major findings and the repair method followed.

3.16 UNIT 1 TO 3 ONCE OFF MODIFICATION SOW

The Supplier shall execute the following general SOW:

1. The supplier shall install, test and commission new sampling points for the different stages of CO_2 purge
2. The supplier shall install, test and comission two inch pipes and valves to enhance flow of CO_2 during the purging process and for the prevention of CO_2 expansion and freezing and clogging of pipeworks
3. The supplier shall ensure that NDT are carried out on the two inch pipeworks, this activity shall be witness by the System Engineer
4. The sampling points shall comply with all the requirements of the Eskom Hydrogen Standard: 240-56227413, by ensuring that the hydrogen gas is released in a safe and contolle manner (double valve configuration)
5. The supplier shall install, test and commission an O_2 analyser, the new installed analyser shall comply with all the requirements of the Eskom Hydrogen Standard: 240-56227413 in terms of drift, response time and accuracy

6. The O_2 analyser shall comply with all the requirements of the Management of Hazardous Locations: 240-5653605 Standard, and it shall have an IA certificate to prove that it is certified to operate in a hazardous location.

7. The supplier shall install, test and commission a secondary Hydrogen purity meter, with a display equipment to continously measure and display Hydrogen purity levels as required by the Eskom Hydrogen Standard.

8. The newly installed Hydrogen purity meter and display equipment shall comply with all the requirements of the Management of Hazardous Locations: 240-5653605 Standard, and it shall have IA certificates to prove complaince in hazardous locations.

9. The newly installed analysers shall be protected from oil contamination, by an oil detection mechanism with an auto-shut off valve, which shall shut off supply to the analysers once oil has been detected on Hydrogen Skid System.

10. The oil detection mechanism shall incorporate LLD, an auto-shut off magnetic valve, oil visual indicator, drain valves, micron filters and an light display equipment to warn OPS staff whenever there is oil ingress into the system so for oil to be drained from the system

11. The liquid level detector and the auto- shut off valve shall comply with the requirements of of the Management of Hazardous Locations: 240-5653605 Standard, and it shall have IA certificates to prove complaince in hazardous locations.

12. The LLD drain valves shall be key operated to ensure that release of hydrogen into the atmosphere is done in a safe controlled manner, to avoid incidental release of hydrogen into the atmosphere

13. All instrumentation and display equipment shall be rated at 4-20mA at 24V DC (OEM Data Sheet to be consulted for actual rating of instruments)

14. The new O_2 analyser shall be shupplied from the current exsting 24V DC supply

15. New 24V DC Supply shall be provided on the currently existing C & I H_2 Skid Customer Interface Panel for the supply of the LLD, auto-shut off valve, secondary H_2 purity meter and the indication light in case of oil ingress into the H_2 skid

16. The supplier shall provide drawings which shall show pipework and valve configuration, instrumentation and the general arrangement of the entire system and dimensions

17. The supplier shall prove C & I loop diagrams as well as Operating and Maintenance Manuals

18. The supplier shall provide training to the Operating, Miantenance and Engineeering personell on how to operate the new system

19. Optimise the CO_2 evaporator plant, advice Electrical Engineering on the required modifications
20. Replace or modify the existing cable conduits on the hydrogen dryer plant to prevent H2 ingress into the H_2 dryer plant
21. Install an Ex rated cable, Ex rated cable glands on the H_2 dryer control panel

4. ACCEPTANCE

This document has been seen and accepted by:

Name	Designation
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Lebo Mokgwabone	C & I Maintenance Manager
Mlungisi Hlongwane	Turbine Maintenance Manager
Ndumiso Nxumalo	Senior Advisor - C& I Engineering
Mnelisi Dladla	Turbine System Engineer
Harrison Ncube	EMD – Senior Supervisor Technical
Thato Morodi	EMD – Senior Supervisor Technical
Thabo Mokoena	Materials Manager
Siyanda Mthenjana	Outage Management
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5. REVISIONS

Date	Rev.	Compiler	Remarks
May 2024	1	D. Mazeka	New document
September 2024	2	D. Mazeka	Document reviewed by stakeholders including C& I and Turbine Engineering Departments.

6. DEVELOPMENT TEAM

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

- S Mzamane
- K Makweya
- T Mtsweni

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- Electrical Team at Grootvlei Power Station
- Siyanda Mthenjana – Outage Department
- Gcina Dlamini – Kriel Power Station

10. BILL OF MATERIALS

CRITICAL SPARES	PART NO	MIN HOLDING	MAX HOLDING
H2 AND CO2 CYLINDER HOSES	SS-TP8-SS8 (8 METER)	12	15
H2 BULL NOSE NUT AND STEM	W003081	6	9
CO2 BULL NOSE NUT AND STEM	W003079	6	9
H2 CYLINDER SUPPLY REGULATOR	S8500AGM	3	6
U-TUBES- MADE UP PER SKID UNIT H2 AND CO2 WITH QUICK CONNECTORS PRICE PER SET	SS-1610-1-16RP-1" QC FNPT-BRZ/BRZ	3	6
100 DIAL PRESSURE INDICATORS- RANGE TO BE DETERMINED UPON REQUEST	PBB-10-SS-D 1/2"	10	15
HDF120A FLOAT DRAIN HYPERDRAIN	HDF-120-A HYPERDRAIN	2	4
CO2 TEMPERTURE CONTROLLER	16CT-F-B-00	2	4
CO2 TEMPERATURE SWITCH	16-JC-B-B-00	2	4
DRYER HMI ALLEN BRADLEY (OLD HMI OBSOLETE)	2711R-T4T	1	2
DRYER PLC AB (OLD PLC OBSOLETE)	2080-L50E-24AWB	1	2
DRYER MOTOR STARTER PROTECTOR	3RV1021-1CA10	4	8
DRYER HEATER AND MOTOR CONTACTORS	3RT2017-1AK61	4	8
CO2 EVAPORATOR FLANGED HEATER ELEMENT	50KW 3LD	1	2
CO2 EVAPORATOR UE PRESSURE SWITCH	UE-J120, EX (800)	1	2
CO2 EVAPORATOR INLET ACTUATOR SOLENOID	ASCO-1/4" 10001/21	1	2
CO2 EVAPORATOR INLET VALVE ACTUATOR	BRKTVLN-25-SW-150	3	6
DRYER TEMPERATURE CONTROLLERS	16-JF-B-B-00-CY	2	4
DRYER INLET AND OUTLET DEW POINT PROBES	AMS-0110/4-20	2	4
DRYER INLET AND OUTLET DEW POINT DISPLAYS	DS8B-IRRB	2	4

DRYER 1064W HEATER ELEMENTS	1064-5 FRAME-120VAC (12-14OHMS)	2	4
DRYER BLOWER MOTORS	110144.00	2	4
1 INCH DIAPHRAGMS	88015139-600 25M 4	12	18
1 INCH DIAPHRAGMS WITH VALVE BONNET	88027412-9675 25Z	2	4
1-1/2" DIAPHRAGMS	88015140-600 25M 4	2	4
1-1/2" DIAPHRAGMS WITH VALVE BONNET	88027413-9675 25Z	2	4
2 INCH DIAPHRAGMS	88015141-600 25M 4	2	4
2 INCH DIAPHRAGM WITH VALVE BONNET	88027414-9675 25Z	2	4
PRESSURE TRANSMITTER- REPLACEMENT FOR ROSEMOUNT-YOKOGAWA EJX530A	EJX530A (1/2" NPTF)	4	4
LEVEL SWITCH SECONDARY O2 ANALYSER	5124300100120M-E	1	2
FLOW INDICATOR SECONDARY GAS ANALYSER	SW-01.2.1.2.16c.1.6.1.0	1	2
O2 CELL SECONDARY O2 ANALYSER	A59022	1	2
CO2 CONTROL RELAY HOUSINGS	Relay Module - PLC-RSC-120UC/21-21 2967086	10	15
CO2 CONTROL RELAY UNIT	Relay Module - PLC-RSC-120UC/21 -2966197	10	15